Aerolineas Argentinas

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CHAPTER 56 - WINDOWS

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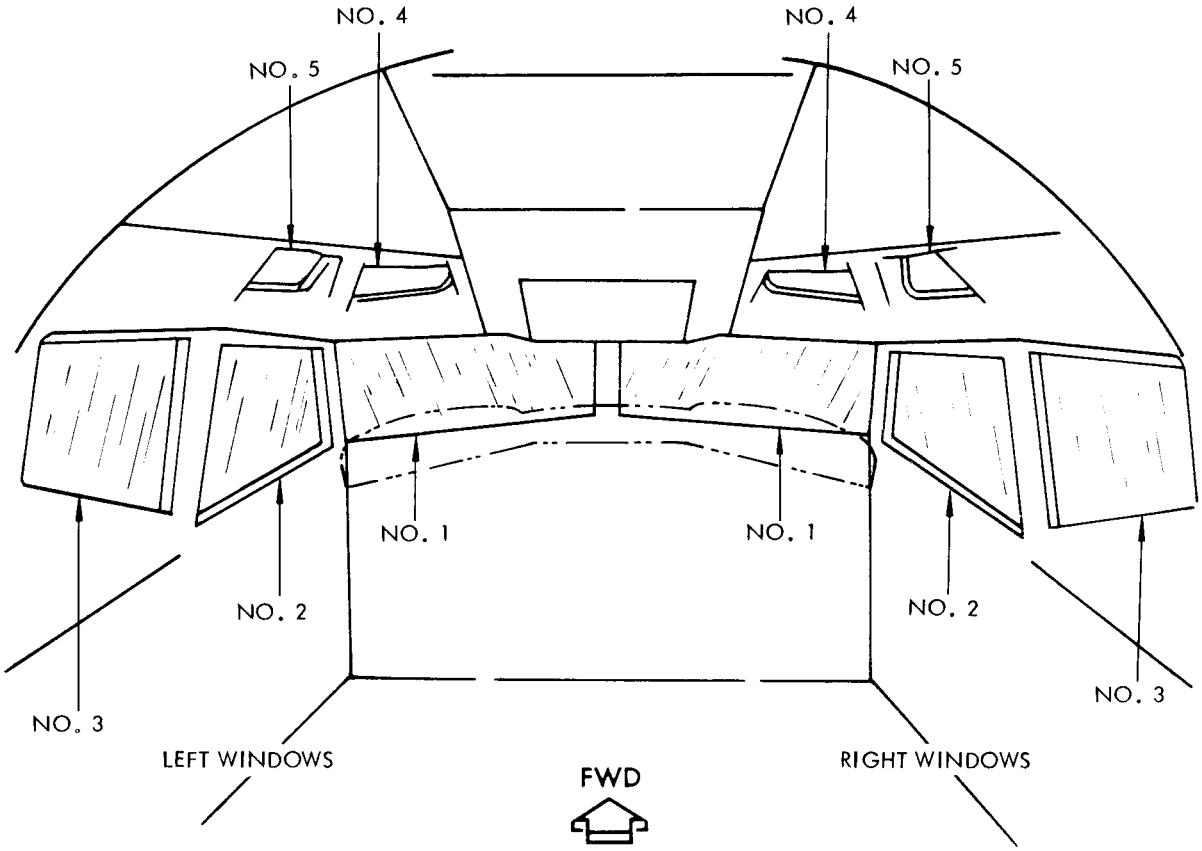
WINDOWS - DESCRIPTION AND OPERATION

1. General
   A. The windows on the airplane are grouped as follows:
      (1) Flight Compartment Windows
      (2) Passenger Cabin Windows
      (3) Door-Mounted Windows
      (4) Viewers and Observation Windows
   B. All windows, except the cargo compartment observation windows, and the APU fire extinguisher bottle window, are designed to withstand cabin pressurization loads, and are designed with fail-safe features.

FLIGHT COMPARTMENT WINDOWS - DESCRIPTION AND OPERATION

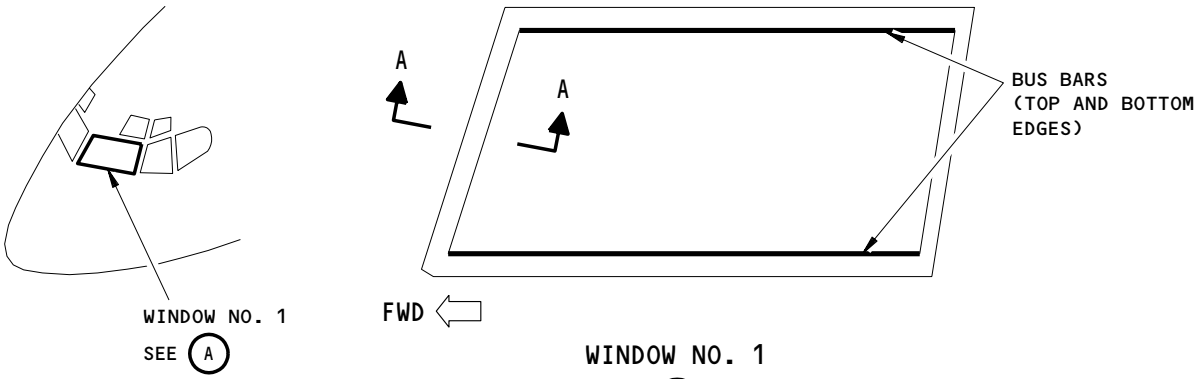
1. General
   A. There are ten windows symmetrically located around the flight compartment. They are named and numbered as shown on figure 1. Windows No. 1, 3, 4 and 5 are fixed in place. Window No. 2 is a sliding window, mounted on tracks, to permit ventilation and communication on the ground.
   B. The window seals which are used on the flight compartment windows consist of fixed window pressure seals, which are used on windows No. 1, 3, 4, and 5, and the sliding window pressure seals. The sliding window pressure seals are installed on windows No. 2. The primary purpose of the two types of pressure seals is to prevent cabin pressurization leakage around the windowpanes when the flight compartment is pressurized.
   C. The sealants that are used on the windows prevent moisture penetration, water entrapment, and provide aerodynamic flushness of the outer windowpane and the window frame. The pressure seals, sealants, and the other components used to seal each window in its frame are described in 56-11-0 and 56-12-0.



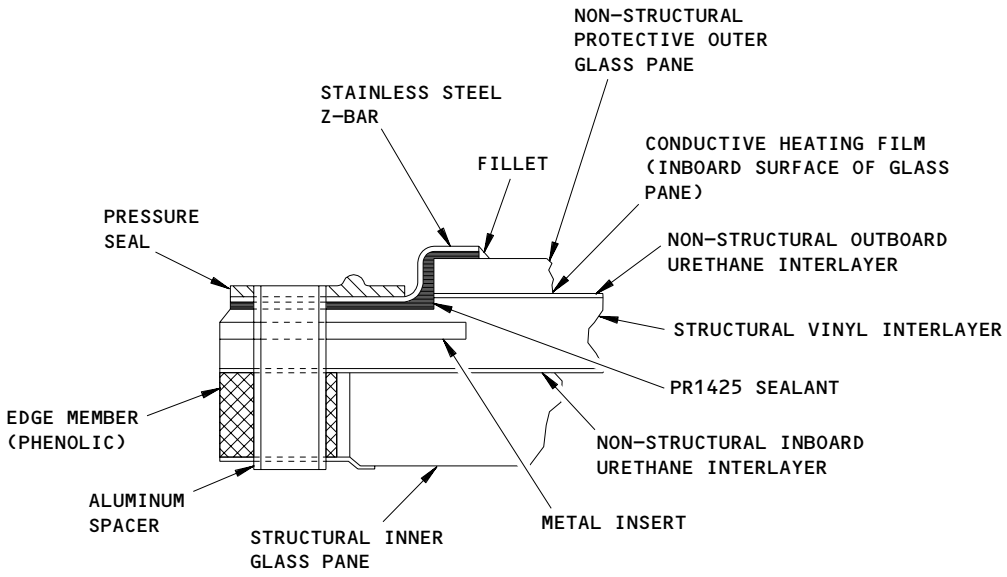
Flight Compartment Window Location
Figure 1

FIXED CONTROL CABIN WINDOWS - DESCRIPTION AND OPERATION

1. Window No. 1 (Forward Windshield)
   A. Genral
      (1) The left No. 1 window is the pilot's windshield. The right No. 1 window is the co-pilot's windshield. The left and right windshields are opposite assemblies and installations. The windshields install internal to the airplane.
      (2) The windshields have laminated transparent layers, a phenolic edge material, and weigh approximately 50 pounds (23 kg). The windshields use bolts to attach to the fuselage structure through the phenolic edge material.
   B. Construction
      (1) Each windshield is a laminated assembly of layers of glass and vinyl or urethane. The structural inner glass pane carries pressure loads. The vinyl interlayer is structural for bird impact resistance and fail-safe pressure loads.
      (2) The current windshield manufactured by PPG has these layers: an non-structural outer glass pane, a non-structural urethane interlayer, a structural vinyl (polyvinyl butyral or PVB) interlayer, a non-structural urethane interlayer and an structural inner glass pane.
      (3) Prior windshield manufactured by Triplex (XXX) has these layers: an non-structural outer glass pane, a structural vinyl (polyvinyl butyral or PVB) interlayer and an structural inner glass pane.
      (4) Prior window manufactured by Sierracin has these layers: an non-structural outer glass pane, a structural vinyl (polyvinyl butyral or PVB) interlayer and an structural inner glass pane.
      (5) A conductive film is located on the inner surface of the outer glass pane, which is a part of the windshield heat system that supplies the anti-fog and the anti-ice function. Bus bars, embedded in the windshield contact the conductive film near the top and bottom edges of the windshield. Along the edges of the windshield near the conductive film, there are two embedded temperature control sensors.
      (6) One control sensor is necessary to operate the windshield heat system. The second control sensor is a spare sensor that can be connected if the first sensor does not operate. Wires from the bus bars and sensors extend through the windshield to the terminals on the top and bottom edges.
2. Window No. 3 (Crew Side Window)
   A. General
      (1) The left No. 3 window is the pilot's side window. The right No. 3 window is the co-pilot's side window. The left and right windows are opposite assemblies and installations. The windows install internal to the airplane.



WINDOW NO. 1
A



WINDOW NO. 1
(TYPICAL)
A–A

Control Cabin Cross Section
Figure 1

(2) The unheated window has two stretched acrylic panes. A phenolic spacer gives separation between the panes. The spacer attaches to the panes by pressure sensitive tape which also operates as an air seal. The phenolic spacer gives an insulation cavity which prevents fog on the inner surface of the windows. There is a small hole in the upper forward corner of the inner pane. This hole must be open at all times. It permits pressure in the air space to be equal to the pressure in the cabin. The outer pane carries pressure load and inner pane will carry fail-safe pressure. The window weighs approximately 15 pounds (7 kg). The windows use bolts to attach to the fuselage structure through the edge of the acrylic panes and phenolic spacer.

3. Window No. 4 (Eyebrow Window)

A. General

(1) The left No. 4 window is the pilot's eyebrow window. The right No. 4 window is the co-pilot's eyebrow window. The left and right windows are opposite assemblies and installations. The windows install internal to the airplane.

(2) The windows have laminated transparent layers, a phenolic edge material, and weigh approximately 7 pounds. The windows use bolts to attach to the fuselage structure through the phenolic edge material.

B. Window Construction

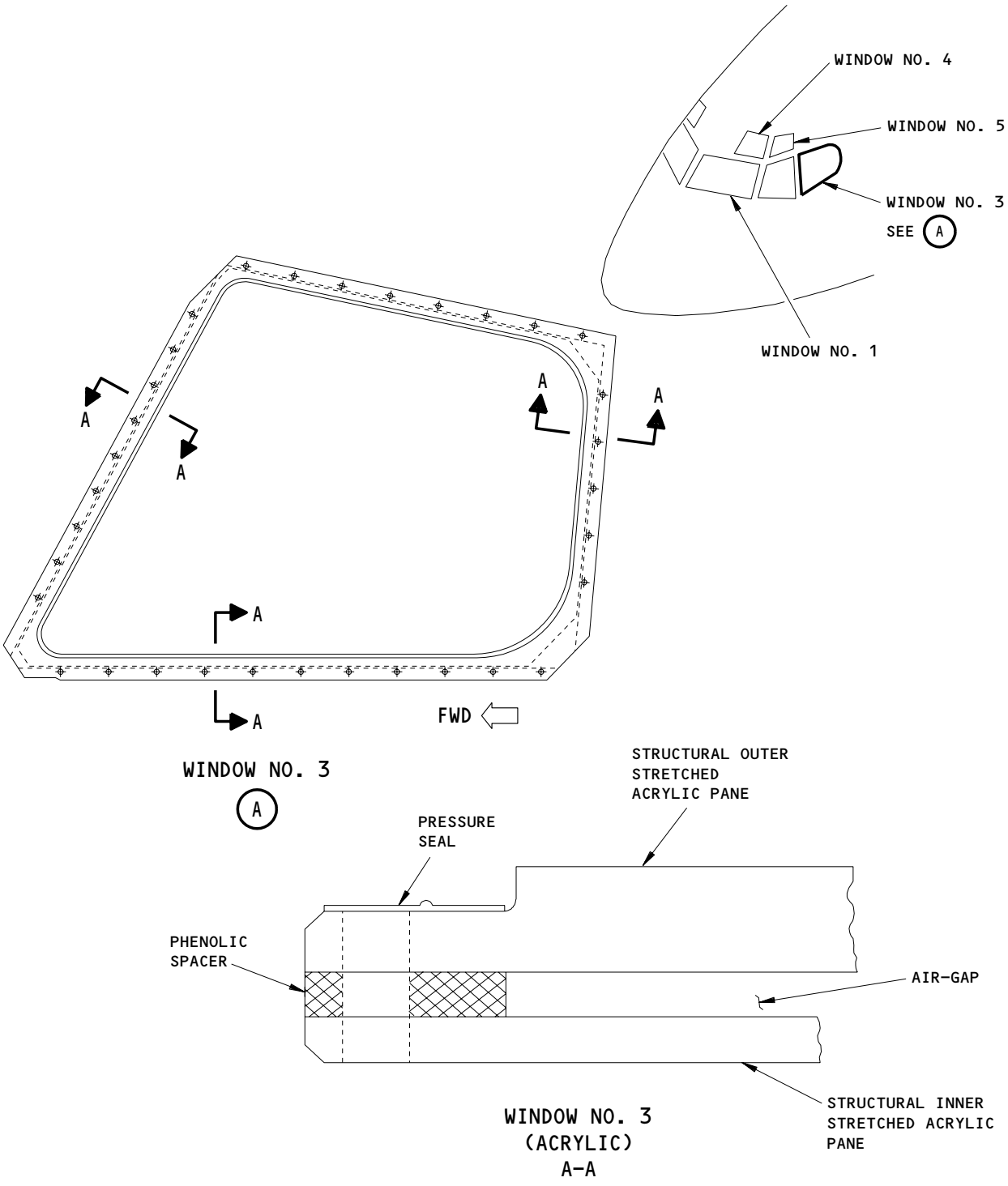
(1) Each window is a laminated assembly of layers of glass, acrylic, vinyl and urethane. The structural inner glass pane to carry pressure loads. The vinyl interlayers are structural for bird impact resistance and fail-safe pressure loads.

(2) The current window manufactured by PPG has these layers: an non-structural outer glass pane, a non-structural urethane interlayer, a structural vinyl (polyvinyl butyral or PVB) interlayer, an structural inner glass pane, a structural vinyl interlayer and a non-structural cast acrylic ane (crew shield).

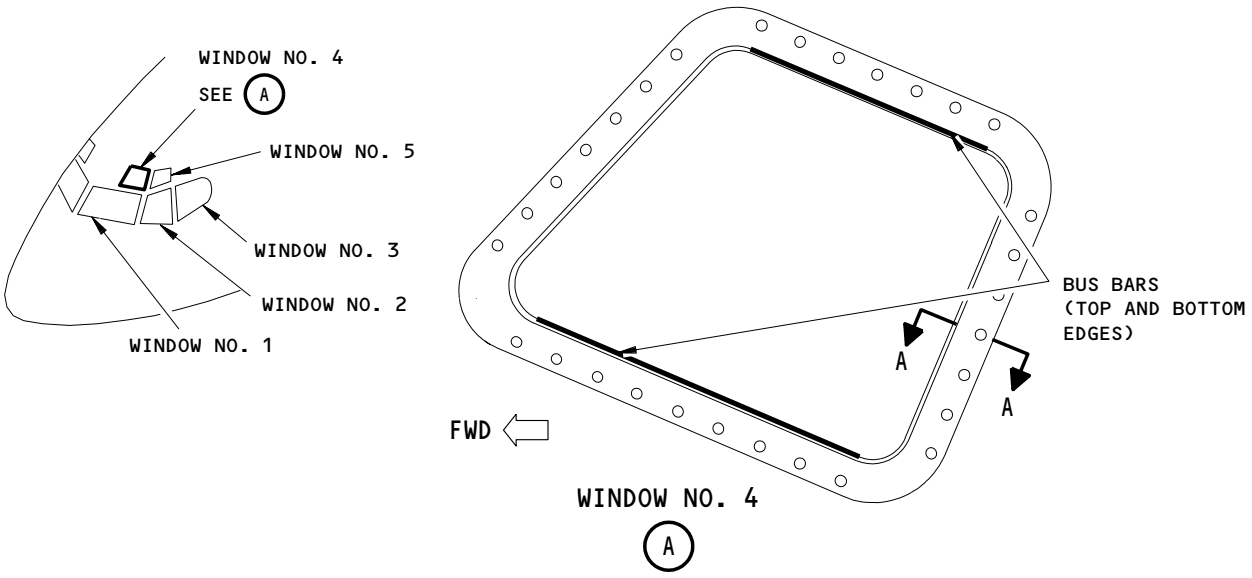
(3) The previous windows manufactured by PPG and Triplex (XXX) has these layers: an non-structural outer glass pane, a structural vinyl (polyvinyl butyral or PVB) interlayer, an structural inner glass pane, a structural vinyl interlayer and a non-structural cast acrylic crew shield.

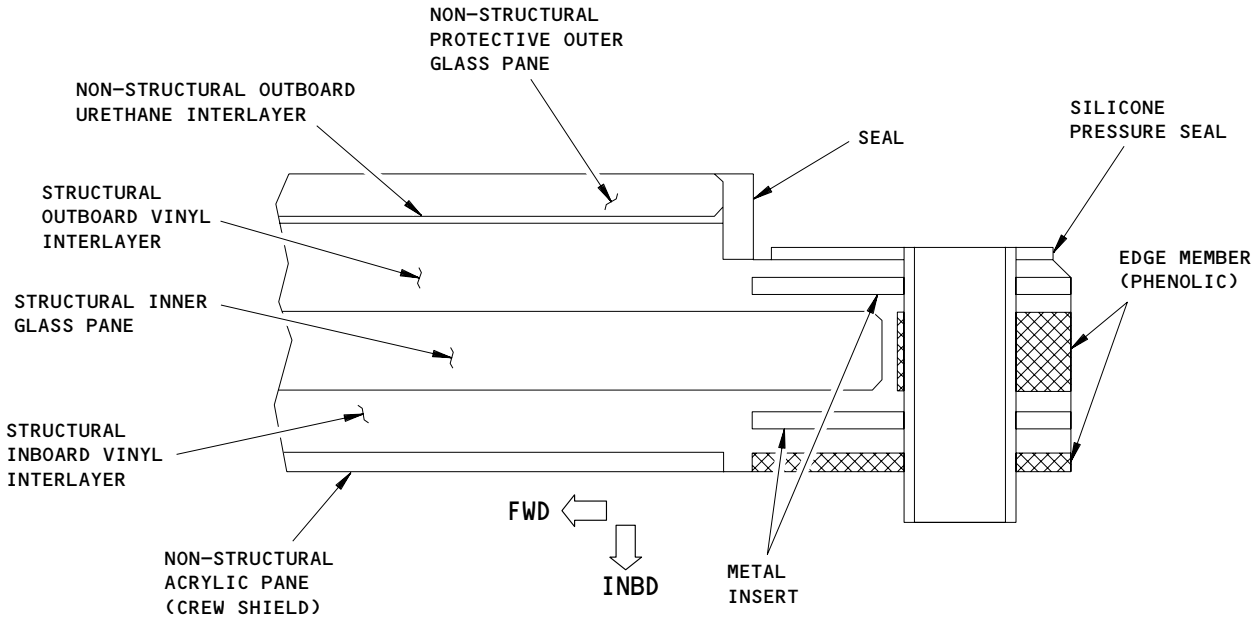
C. Window Heat

(1) A conductive film is located on the outer surface of the inner glass pane, which is a part of the window heat system that supplies the anti-fog function. Bus bars, embedded in the window contact the conductive film near the top and bottom edges of the window. The thermal switch attached to the No. 5 window controls the heat.



Control Cabin Window Cross Sections
Figure 2





A–A
WINDOW NO. 4

Windows – Control Cabin Fixed Window – No. 4
Figure 3

4. Window No. 5 (Eyebrow Window)

A. General

(1) The left No. 5 window is the pilot's eyebrow window. The right No. 5 window is the co-pilot's eyebrow window. The left and right windows are opposite assemblies and installations. The windows install internal to the airplane.

(2) The windows have laminated transparent layers, a phenolic edge material, and weigh approximately 7 pounds (3 kg). The windows use bolts to attach to the fuselage structure through the phenolic edge material.

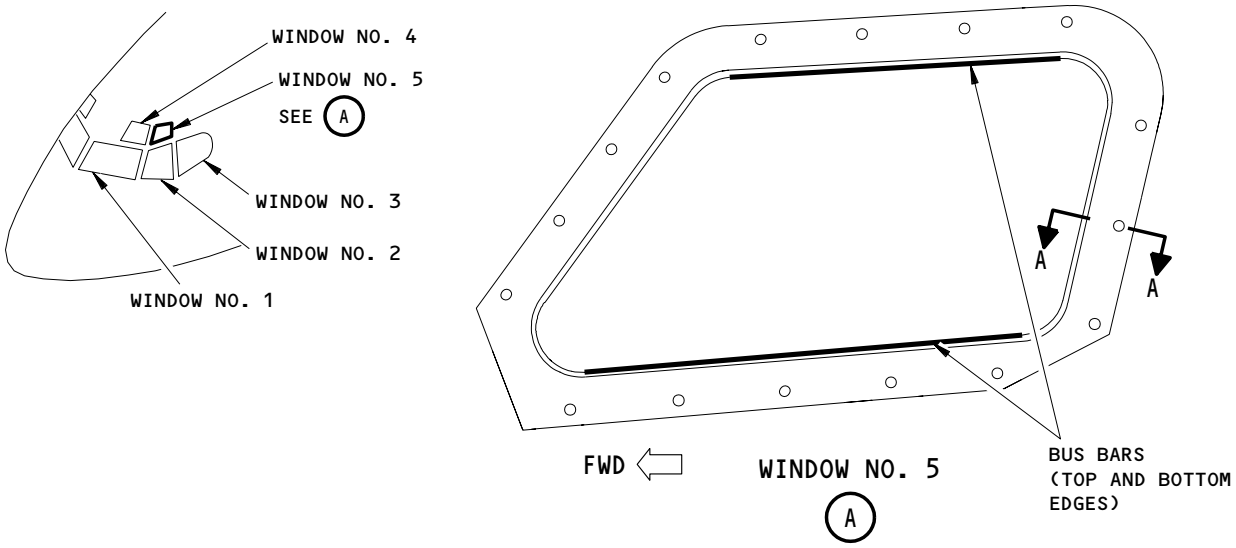
B. Window Construction

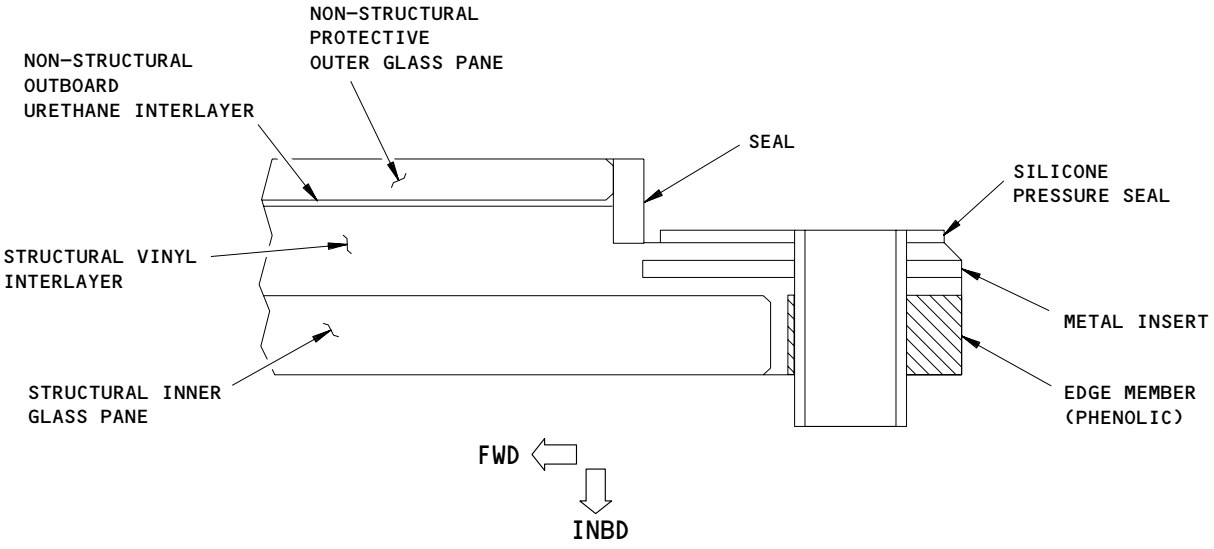
(1) Each window is a laminated assembly of layers of glass, vinyl and urethane. The structural inner glass pane carries pressure loads. The vinyl interlayer is structural for fail-safe pressure loads.

(2) The current window manufactured by PPG has these layers: an non-structural outer glass pane, a non-structural urethane interlayer, a structural vinyl (polyvinyl butyral or PVB) interlayer and an structural inner glass pane.

(3) The previous windows manufactured by PPG and Triplex (XXX) have these layers: an non-structural outer glass pane, a structural vinyl (polyvinyl butyral or PVB) interlayer and an structural inner glass pane

C. Window Heat





A–A
WINDOW NO. 5

Windows – Control Cabin Fixed Window – No. 5
Figure 4

CONTROL CABIN WINDOWS - MAINTENANCE PRACITICE

1. General
   A. No. 3 window made of stretched acrylic plastic are to be cleaned and waxed per the procedures in par. 2 and 3. (For No. 1, 4 and 5 windows, and No. 3 glass window Ref 12-40-0 MP).
   B. The optical qualities of any window are of prime importance. Any window whose condition impairs visibility must be replaced no matter how well it might meet the requirements of par. 4.

      NOTE: Paragraph No. 4 describes damage criteria for windows with glass panes. (For damage criteria for window No. 3, refer to Window No. 3 - Inspection/Check, 56-11-21.)

2. No. 3 Window Cleaning
   A. Equipment and Materials
      (1) Cloth or sponge, soft, clean, and oil-free
      (2) Chamois, Clean and Oil-Free KK-C-300 (Ref 20-30-51)
      (3) Canton (cotton) flannel, clean and oil-free, any source
      (4) Soap, Orvus WA paste (Ref 20-30-31)
      (5) Aliphatic Naphtha - TT-N-95 (Ref 20-30-31)
   B. Clean No. 3 Window
      (1) Remove loosely adhering dirt and grit from window exterior by flushing with water filtered free of dirt and abrasive materials.
      (2) Wipe exterior with a soft, damp cloth or sponge. Keep cloth or sponge free of abrasive materials by rinsing it frequently in clean water.
      (3) Wash both sides with nonabrasive soap and water. Use a soft, thoroughly clean cloth, sponge, or chamois for washing, if required, but only as a means of carrying the soapy water to the plastic. Go over surface only with bare hand so that any abrasive can be quickly detected and removed before it scratches the plastic surface.

         NOTE: All rubbing operations on acrylic plastics must be done with as light a pressure as possible.

      (4) Dry window surfaces with a clean, damp chamois. A clean, cotton-flannel cloth may be used if care is taken not to rub plastic after surface is dry.

         CAUTION: DO NOT RUB DRY PLASTIC WITH A DRY CLOTH. THIS WILL CAUSE SCRATCHES AND BUILD UP AN ELECTROSTATIC CHARGE WHICH ATTRACTS DUST PARTICLES.

(5) Remove oil and grease by rubbing lightly with a cloth wetted with aliphatic naphtha. Dry with a clean, cotton-flannel cloth.

CAUTION: DO NOT USE THE FOLLOWING MATERIALS ON ACRYLIC PLASTICS: GASOLINE, ALCOHOL, BENZINE, HEZANE, ZYLENE, ACETONE, CARBON TETRACHLORIDE, FIRE EXTINGUISHER FLUIDS, DEICING FLUIDS CONTAINING ISOPROPYL ALCOHOL, LACQUER THINNERS, OR WINDOW CLEANING SPRAYS BECAUSE THEY SOFTEN THE PLASTIC AND/OR CAUSE CRAZING.

3. No. 3 Window Waxing
   A. Equipment and Materials
      (1) Static stop cleaner wax (Ref 20-30-31)
      (2) DuPont No. 7 Auto Polish and Cleaner (Ref 20-30-31)
      (3) Maguires Mirroglaze, Mirror Bright Polish Co., Irvine, California
      (4) Canton (cotton) flannel
   B. Wax No. 3 Window
      (1) Thoroughly agitate wax to ensure a homogeneous mixture.
      (2) Apply wax directly to acrylic surface or to flannel polishing cloth and spread a thin coat evenly and thoroughly over the surface.
      (3) Remove excess wax with flannel cloth.
      (4) Polish to a high luster by light polishing with a clean flannel cloth. Polishing may be done before or after wax has dried.
      (5) Remove any streaks or fingerprints from waxed acrylic surfaces by lightly polishing with a clean flannel cloth. If appearance is still unsatisfactory, reapply wax in accordance with above procedure.
4. Damage Criteria
   A. A delamination is the separation of a glass pane from the vinyl core. It is sometimes difficult to detect unless viewed at an angle with indirect light. The delaminated area is usually smooth in appearance, although visual distortion may occur along the perimeter. Delamination occurs most frequently around the edges of the windows, and in the unheated areas. Care should be taken not to confuse a delamination with the edge of the parting medium, slip panes, or soft vinyl layers which are sandwiched between the inner glass pane and the vinyl core around the periphery of each window.

      NOTE: Delaminations on the glass windows do not affect the structural integrity of the window assembly.

B. Chips are flakes or layers of glass broken from the surface (Fig. 201). They usually occur on the laminated surfaces in the unheated areas and are caused by high internal window stresses. They can also occur on the exterior glass surfaces if these are struck by a sharp object. Chips have a rough or grained appearance and are readily detectable. The rough surface usually makes visibility through the area very poor. There are two types of chips: conchoidal and V-shaped. Concoidal chips are usually circular or curved in shape with many fine striations that follow the outline of the outer edge, rather similar to a clamshell. V-shaped chips have a sharp narrow V-shaped which appears to propogate toward the interior of the glass. These chips occur only rarely in tempered glass.

C. Small bubbles within the vinyl core of a glass window are not a delamination nor are they structurally dangerous. They are formed by a gas liberated by the vinyl under overheat conditions (at approximately 230 degrees Fahrenheit) and need not be a cause of window replacement unless they excessively impair the optical qualities or they continue to grow. Their presence, however, may indicate a defective window heat control system and before heat is applied, the control system for that particular window should be checked. Refer to Chapter 30, Control Cabin Window Anti-Icing System.

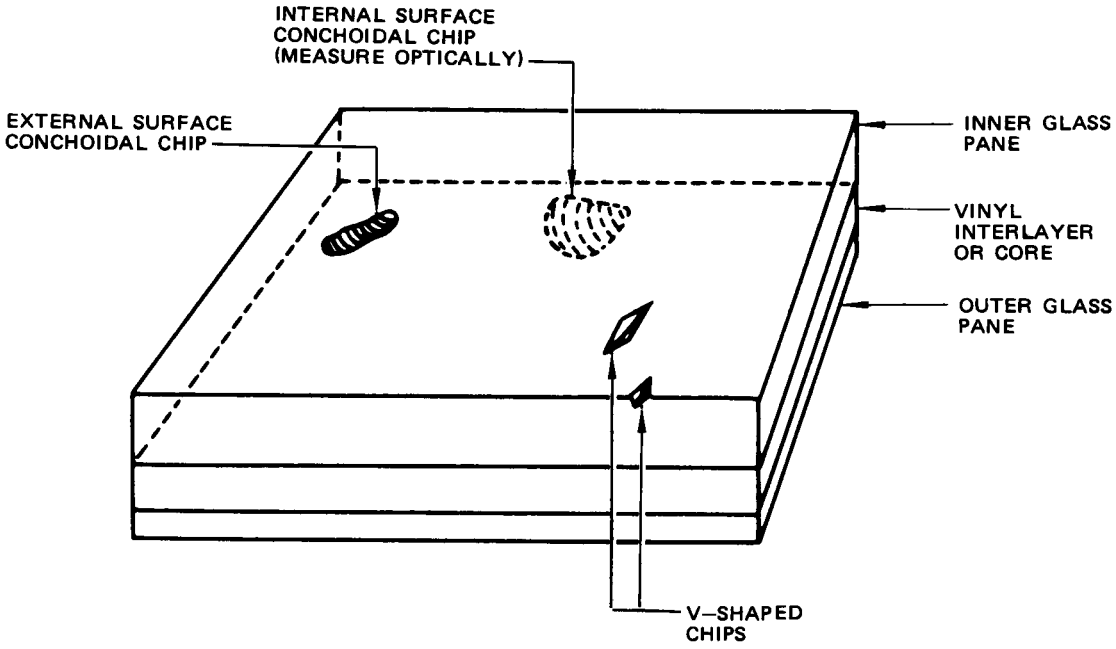
CAUTION: IF BUBBLES CONTINUE TO GROW, OPEN APPLICABLE WINDOW HEAT CIRCUIT BREAKERS LOCATED ON P6 CIRCUIT BREAKER PANEL UNTIL CAUSE OF TROUBLE CAN BE REMEDIED.

D. The inner glass pane is the major structural component of each window. Since the glass is fully tempered both surfaces are under compression, and scratches or chips on either surface will cause stress concentrations, which may cause window failure if the scratches or chips are excessively deep. Conchoidal chips are permitted on these panes within the limits specified. A V-shaped chip is likely to propagate and is definite cause for window replacement.

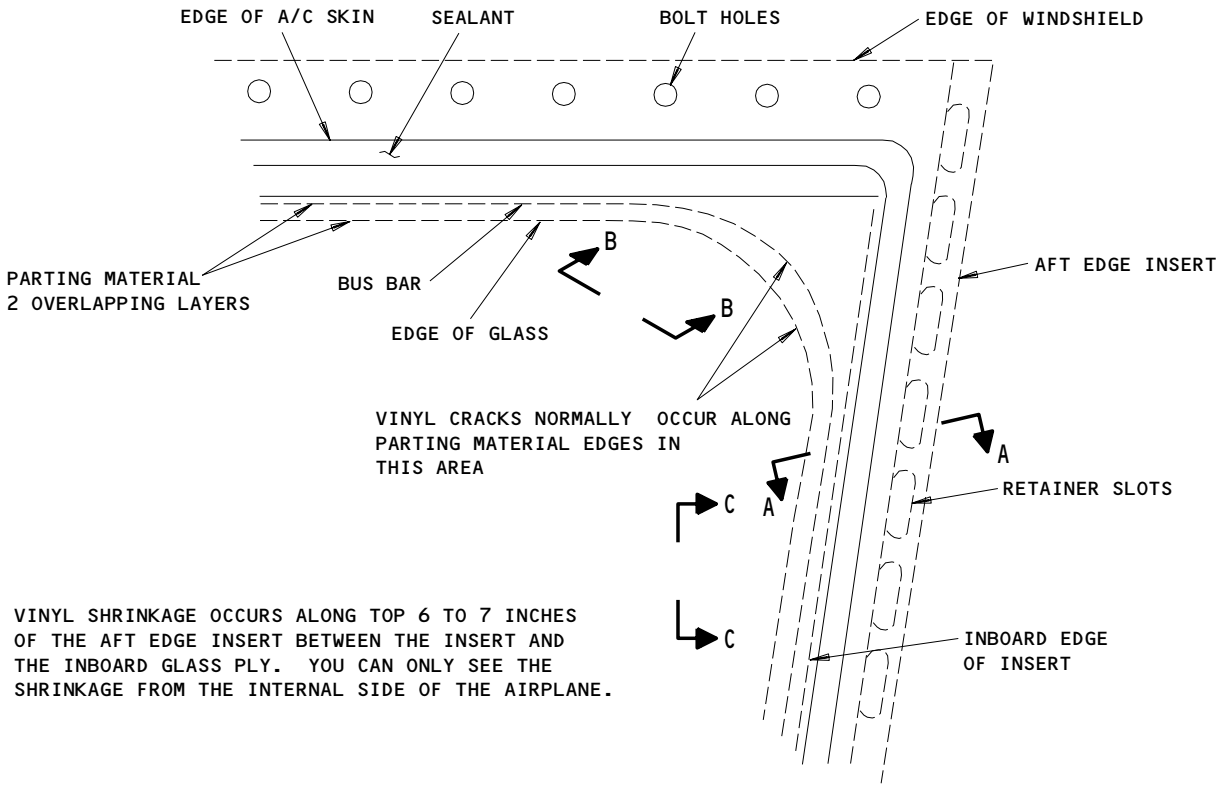
E. Glass windows are structurally unpredictable. One that appears in good condition may fail unexpectedly, while one that has scratches, chips or delaminations may endure for along time before failure. This makes it difficult to establish rules for window replacement, and each window should be considered individually. Operational experience, however, supports the criteria, and these may be used as a guide in determining the necessity for window replacement.

F. Arcing is the visible passage of current between two points of circuit discontinuity. Arcing usually occurs at or near window bus bars, painted stripes or conductive material along the top and bottom interior of each window. Brown and/or black burned spots are evidence that arcing has occurred. Confirmed existence of arcing in the main heating system is cause for window replacement because it will often lead to cracking of the outer pane. However, if the windshield warms when heat is turned on and there is no additional arcing or decrease in the visual capacity, the windshield does not have to be replaced immediately provided all other inspection criteria are met. Also, the main heating system may be inoperative if the requirements of the Boeing 737 Flight Manual are met. On windshields with embedded wires some arcing may occur. This usually appears as an intermittent glow, but may not be visible in daylight. This arcing is caused by a break in the wire and forms a small bubble (approximately 0.03 inch in diameter) in the vinyl interlayer. These windshields may be left in normal service as long as the arcing is not too distracting to the flight crew and all other inspection criteria are met.

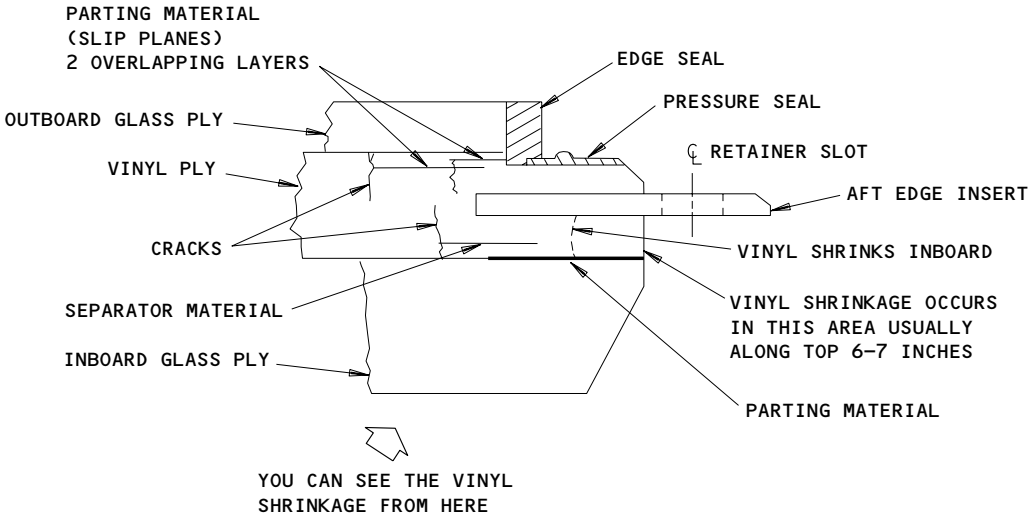
G. The vinyl interlayer core ply is susceptible to cracking and shrinking. Vinyl interlayer cracks or tears occur most often in the upper aft and lower inboard corners of the No. 1 window. Vinyl cracks can occur at the edge of the slip panes or the separator material anywhere around any glass cockpit window. The cracks usually appear as a thick or broken line or as hash marks in the vinyl interlayer along the edge of the slip panes or the separator material. Usually, but not always, the cracks will be perpendicular to the inner and outer panes and have depth which can be detected. Do not confuse vinyl cracks with wrinkles in the slip pane material. Windows that develop cracks in the vinyl interlayer should be replaced. The vinyl core is required for fail-safe capability should the structural inner glass pane crack.



Control Cabin Window Inner Pane Chip Identification
Figure 201

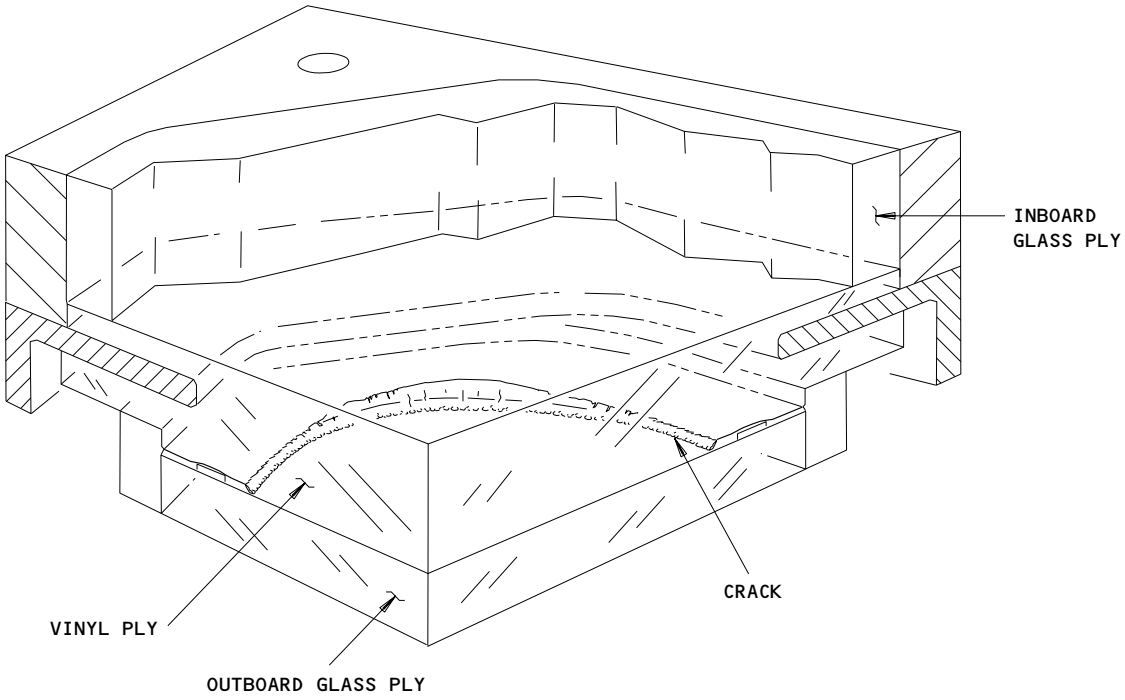


GLASS COCKPIT WINDOW UPPER AFT CORNER
VIEWED FROM OUTSIDE

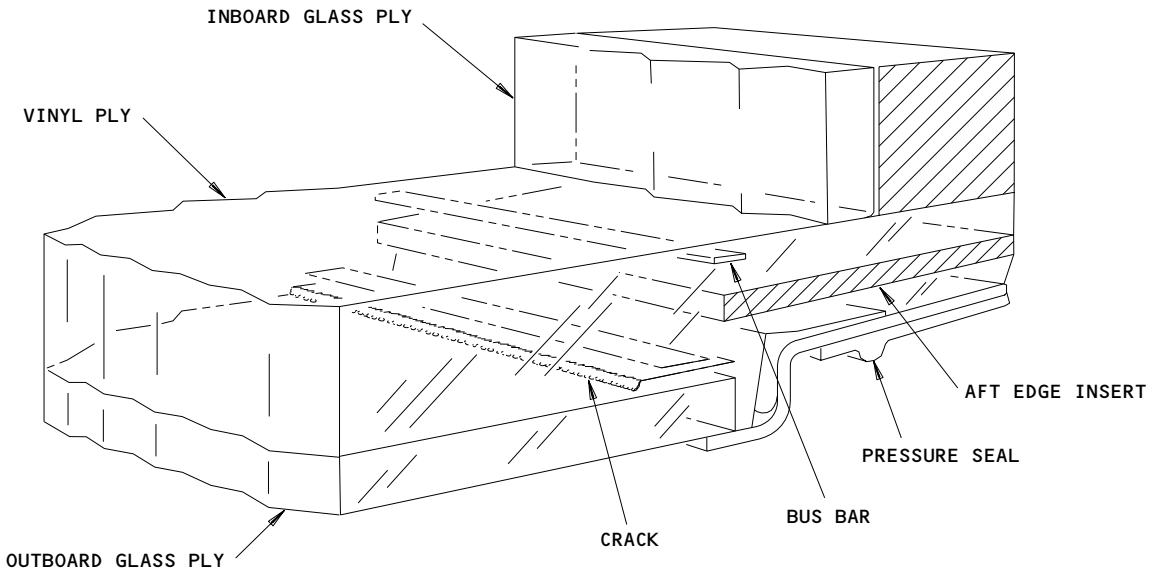


GLASS COCKPIT WINDOW AFT EDGE
A-A

Glass Cockpit Window Cross Section of Edge Showing Vinyl Interlayer Cracking
Figure 202 (Sheet 1)



GLASS COCKPIT WINDOW
B-B



GLASS COCKPIT WINDOW
C-C

Glass Cockpit Window Cross Section of Edge Showing Vinyl Interlayer Cracking
Figure 202 (Sheet 2)

CONTROL CABIN FIXED WINDOWS - INSPECTION/CHECK

1. General
   A. This procedure has these tasks:
      (1) Inspection of the Flight Deck Windows for damage

TASK 56-11-0-206-001
Inspect the Flight Deck Windows
A. General
   (1) General Flight Deck Windows Vocabulary
      (a) Window Components
         1) Aerodynamic Smoother (Aero-Smoother): Sealant applied during installation to fillthe space between the window and airplane structure. Also used as a moisture barrier on some windows.
         2) Cast Acrylic: A clear plastic material that is the crew shield for the No. 4 window.
         3) Crew shield: A non-structural acrylic pane designed as protection for the flight crew from broken glass.
         4) Edge Seal: Seal around the edge of the window assembly used to prevent moisture penetration into the interlayer material.
         5) Erosion Seal (Hump Seal): A type of Edge Seal that protrudes into the air stream.
         6) Fail-Safe Interlayer: Interlayer that will hold the pressure loads if there is a failure of a structural pane.
         7) Fail-Safe Pane: An acrylic pane that will hold the pressure loads if there is a failure of the primary structural pane.
         8) Interlayer: A flexible transparent layer that bonds glass or acrylic panes together. It can be a structural component for pressure fail-safety and bird impact resistance.
         9) Laminate: Assembly of interlayer materials and glass or acrylic panes bonded together by application of heat and pressure.
         10) Metal Insert: A thin piece of metal around the periphery of the window used to transfer failsafe pressure or bird impact loads from the interlayer to the window installation fasteners.
         11) Pane: One layer of glass or acrylic in a window.
         12) Parting Agent (DOPE): Yellow Material painted on edges of eyebrow structural panes to prevent internal laminate chips.
         13) Phenolic edge filler: A material that is a support for the window edge around the periphery of the window.

14) Pressure Seal: A rubber gasket that makes a pressure seal between the window and the fuselage.
15) Spacer tube: A metal bushing used to prevent clamp up of the window edge from the fasteners.
16) Stretched Acrylic: Made from cast acrylic and used as a primary and fail-safe structural pane.
17) Slip planes or Release Tape: Transparent material embedded in the interlayer around the periphery of some Triplex (XXX), or Sierracin manufactured windows. The internal tape is almost transparent, but can include visible wrinkles, frequently in the corners of the windows. The internal tape does not in the PPG manufactured windows.
18) Structural Pane: A glass or acrylic pane that holds the pressure loads of the window.
19) Urethane: A type of interlayer material.
20) Vinyl (Polyvinyl Butyral or PVB): A type of interlayer material.
21) Z Seal: A Z-shaped piece of metal that is bonded to the window edge. The seal is a barrier used to prevent external moisture penetration into the window laminate.

(b) Window Vision Terms
1) Clear View Area (Daylight Opening or DLO): The transparent area of the window for external vision.
2) Critical Vision Area (Zone I): The area of primary vision through the window that does not include the Non-Critical Vision Area.
3) Decreased Visual Quality: A reduction of vision through the clear view area, which can cause interference with the flight crew visual operations of the aircraft in the air or on the ground. Damage to the window can result in decreased visual quality.
4) Non-Critical Vision Area (Zone II): A 2.0 in. (5.1 cm) band around the periphery of the window measured into the clear view area.
5) Tong Marks: Small dimples or indentations that are sometimes on the surface of No. 1, No. 2 or No. 3 window non-structural outer glass panes and cause local distortion in the clear view area. These are a by-product of the manufacturing procedure.
6) Visual Quality: The property of the window that allows visual operation of the aircraft in the air or on the ground.

(c) Electrical Componenets

1) Bus Bar: Two thin electrical conductors put on opposite edges of the window, and used to transmit electrical current from the power wires to the conductive heating film.
2) Conductive Heating Film (Coating): A transparent metallic film located on a glass pane used to heat the window for anti-ice and anti-fog function when electrical current is applied
3) Power Terminal: The location where the wire bundle that supplies power for the window heat is connected to the window.
4) Power Wire: A braided wire in the window laminate that connects the power terminals for the window heat to the bus bars.
5) Sensor Terminal: The location where the wire bundle that supplies temperature sensor input is connected to the window.
6) Sensor Wires: Thin solid or braided wire in the window laminate that connects the sensor terminals for the window heat to the temperature sensors embedded in the window.
7) Solder Joint: Solder or a bonding application used to attach the power wire to the bus bar in the window laminate.
8) Temperature Sensor: A sensor embedded in the window that has resistance that changes with temperature. The WHCU uses the embedded sensor to control power to the window and regulate temperature.
9) Thermal Switch (Hockey Puck Sensor): A Bi-metallic switch that removes or applies electrical power to control the window temperature.
10) Window Heat Control Unit (WHCU): A device that constantly monitors window temperature through the temperature sensors and controls the power to the window

(2) Flight Deck Windows Damage Description

(a) Arcing: An electrical arc is a discharge or short circuit across a discontinuity in a wire, bus bar, conductive heating film, or other internal window components. Arcs usually occur near the window bus bars, and are typically the result of moisture ingress. The heat from an arc can cause dark brown or black burn marks on the bus bar and in the interlayer or the fracture of a glass pane. It is also possible to see small bubbles in the interlayer at the location of an arc. Arcs in the heating film away from the bus bar can occur as a jagged line (Example: Fig. 610) ("lightning bolt pattern").

(b) Crazing (Acrylic Panes): Crazing is a series of very small cracks or fissures that can occur on the surface of acrylic windows. Crazing is not easy to find, it is easier to see when a light is shown at different angles through the window.

(c) Crack: A crack is a break or discontinuity of the material. A list of descriptions of cracks by material follows.

1) Acrylic Panes: Cracks in an acrylic pane do not always grow to an edge in a window and can occur as many small fissures in a pane.
   a) Cast acrylic panes: Cracks will look equivalent to smooth fissures perpendicular to the surface.
   b) In-plane cracking: A crack that grows parallel to the surface of the ply, and it starts from the edge of the pane or at a deep surface cracks. It will look equivalent to a smooth surface of fissures, or series of fissures internal to the pane. Usually found by the reflection of light from the surfaces of the fissure.
   c) Stretched Acrylic Panes: Cracks propagate at angles to the surface of stretched acrylic panes. Cracks in stretched acrylic can have a chevron or clamshell growth lines that propagate from a stress riser such as a scratch, chip, craze, or other surface damage.
2) Glass Panes: Cracks in a glass pane will always grow to an edge or adjacent crack in the window. (A line arc can be confused with a crack but one end typically stops in the center area of the window.)
   a) Non-Structural Pane: Cracks will look equivalent to smooth fissures perpendicular to the surface and through the entire thickness of the pane. There are usually many cracks across the glass surface (spider web pattern) of the pane. Cracks will not significantly decrease visual quality. (Example: Figure 605).
   b) Structural Pane: The pane will break into many small irregularly shaped pieces, typically no larger than 0.5 inch (12.7 mm) maximum dimension. Visual quality is significantly decreased. (Example: Figure 605). The No. 4 window structural glass pane can break into many small irregularly shaped pieces, typically no larger than 5.0 in. (127.0 mm) maximum dimension.

(d) Interlayers:
1) Urethane: Cracks can occur in urethane interlayer around the outboard edge of the window and at bolt hole locations. The cracks are usually in a network that does not run parallel to the edges of the window and are usually in random directions (also referred to as crackling). Urethane interlayer cracks frequently occur with white or yellow discoloration. See also moisture ingression.(Examples: Figure 611).
2) Vinyl: Cracks that can occur in the vinyl interlayer around the perimeter of the window and follow or extend from the edges of internal features, for example, the metal inserts, or bolt holes, or slip tapes. The cracks usually appear as thick or broken lines perpendicular to the window panes. It is possible in some extreme conditions to see the vinyl interlayer as stretched or separated from the metal insert.

(e) Scratch: The linear removal or displacement of material from the surface of a pane.

(f) Chips: The removal of material from the surface of a glass or acrylic pane, usually from the impact with a hard object. The descriptions that follow are a list of different types of chips.
1) External chips:
a) Shell type chips are in the surface or edge of the pane. These chips have a circular or curved shape with many fine lines or ridges that follow the outline of the edge of the chip that give it almost the same shape of a shell. The width of the chip is more than its depth.
b) "V" shaped chips have the shape of a sharp narrow "V". Depth of the chip is equal to or larger than the width.
2) Internal chips:
a) Peel Chips: Chips that occur on the internal surface of glass panes. Chipped areas have a curved, rough grained shape, and are easily seen in reflected light. The chipped area can have small glass flakes, usually white. The view through the window will distort through the rough surface of the chip. Usually the chips start very small but can continue to grow with the continued use of the airplane. (Example: Figure 609)

(g) Delamination: Delamination is the separation of a pane or panes from the interlayer internal to the window. Delamination looks like an air bubble that starts from the edge, is flat, smooth, and has a circular edge. Delaminations can have an edge with smooth finger-like projections. The delamination will cause a reflection of light when you look at it from an angle to the surface of the window. A delamination can distort vision through the delaminated area.

(h) Moisture Ingression: A cloudy white or yellow haze internal to the window usually around the periphery. It can follow wires internal to the window, along the bus bar and also in areas of delamination. Long term exposure to moisture can lead to electrical arcing of the heating system internal to the window.

(i) External aerodynamic smoother: Erosion and Cracking: External aerodynamic smoother will degrade with time because of wind, rain and UV exposure. Erosion or cracks of the aerodynamic smoother will let moisture penetrate into the window laminate. Repair and maintenance of external aerodynamic smoother is necessary to get as much window life as possible.

(j) Bubbles: Small isolated or irregular shaped voids in the interlayer internal to the window not at the window edge. Bubbles can be the result of a defective window heat control system. Multiple bubbles together in a small group, or black or dark brown bubbles are an indication of a defective window heat control system.

(k) Vinyl deformation: A section of the vinyl interlayer that is stretched or disconnected from the metal insert.

B. References

(1) AMM 30-41-00/501, Control Cabin Window Anti-Icing System
(2) AMM 56-11-11/401, Windshield (No.1 Window)
(3) AMM 56-11-21/401, No.3 Window
(4) AMM 56-11-31/401, No.4 Window
(5) AMM 56-11-41/401, No.5 Window

C. Equipment

(1) Optical Micrometer - Model 966A or 966A1
Monocle Industries
Coppel Tx. USA 75019
tel (214) 393-9920
fax (214) 393-9926

D. Access

(1) Location Zone
101/102 Control Cabin

E. Prepare to Check the Flight Deck Windows

S 866-002
(1) Set the window heat switches to the OFF positions.

S 866-003

WARNING: DO NOT TOUCH THE WINDOWS UNLESS THE CIRCUIT BREAKERS ARE OPEN AND THE WINDOW HEAT SWITCHES ARE OFF. FAILURE TO DO THIS CAN CAUSE AN ELECTRICAL SHOCK. CAUSE INJURY TO PERSONS.

(2) Open the window heat circuit breakers, and attach DO-NOT-CLOSE identifiers.

S 216-004
(3) Clean the windshields if necessary: Flight Compartment Windows (AMM 12-40-00/201).

NOTE: Clean windshields are necessary to do the inspection.

F. Windshield (No. 1 window) Check (Fig. 601)

S 216-005
(1) Identify the windshield manufacturer for each windshield, PPG, GKN (also Pilkington, Triplex or XXX), or Sierracin.
(a) Look at the placard on the windshield inner surface along the outboard edge.

S 216-006
(2) Examine the windshield for chips in the glass panes (Fig. 608):

NOTE: Chips in structural glass panes can decrease structural capability. Chips can also decrease the visual quality of a windshield.

(a) Replace the windshield for one or more of the subsequent list of damages (AMM 56-11-11/401):
1) A chip or group of chips on the surface of a structural pane that are more than 0.015 in. (0.381 mm) in depth are a cause for the removal of the windshield.
2) A chip or chips on glass surfaces internal to the window are a cause for the removal of the window.
3) A chip or group of chips that decrease the visual quality of the windshield is a cause for the removal of the windshield.

4) The outer glass pane is non-structural. Unless chips decrease the visual quality, they are permitted.

S 216-007

(3) Examine the windshield for delamination:
   (a) Replace the windshield if the delamination decreases the visual quality (AMM 56-11-11/401).

NOTE: Delamination can cause arcing and ply cracks because of moisture ingress. The recommended limit for windshields 2.0 in. (50.8 mm) from the edge of the windshield frame.

S 216-008

(4) Examine the windshield for arcing (Fig. 610).
   (a) Examine the windshield for arcing near the bus bar.
   (b) Examine the windshield for line arcs.
   (c) Replace the windshield if there are indications of arcing (AMM 56-11-11/401).

S 216-009

(5) Examine the windshield for bubbles:
   (a) Multiple bubbles together in a small group, or black or dark brown bubbles are a typical indication of a defective window heat control system.
      1) Do a check of the heater control system (AMM 30-41-00/501). for that windshield.
   (b) Replace the windshield if the bubbles decrease the visual quality or bubbles are black or dark brown in color (AMM 56-11-11/401).

NOTE: Tong Marks can be found on the non-structural outer glass panes and are not a cause for a removal.

S 216-010

(6) Examine windshield for scratches:
   (a) The inner glass pane is structural. Replace the windshield if the inner glass pane has a scratch with a depth more than 0.015 in. (0.381 mm).
      1) Use an optical micrometer (accuracy ±0.0002 in.) to measure the depth of the scratches.
   (b) A scratch or group of scratches that decreases the visual quality on a pane of the windshield is a cause for the removal of the windshield.

(c) The outer glass pane is non-structural. Unless scratches decrease the visual quality, they are permitted.

S 216-011

(7) Examine the windshield for cracks in the vinyl interlayer:
(a) Examine the vinyl interlayer for cracks along the edges of the metal insert.
(b) Examine the vinyl interlayer for cracks that extend out from the bolt holes.
(c) AIRPLANES WITH SIERRACIN OR GKN WINDOWS;
Examine the vinyl interlayer for cracks along the edges of the slip tapes.
(d) Replace the windshield if you find cracks in the vinyl interlayer (Example: Fig 612).

NOTE: Cracks in the urethane interlayer do not decrease the windshield structural capability and are not a cause for a windshield removal unless they decrease the visual quality.

S 216-012

(8) Examine the windshield for cracks (Fig. 605).
(a) Replace the windshield if you find cracks in a glass pane (AMM 56-11-01/401).

S 216-013

(9) Examine the external aerodynamic smoother for for deterioration and cracks.
(a) It is recommended to repair the aerodynamic smoother if cracked, eroded or loose (AMM 56-11-00/801).

G. No. 3 window (Acrylic) - Inspection/Check

S 216-024

(1) Examine the No. 3 window for chips in the acrylic panes.
(a) Replace or repair the stretched acyrlic window panes if limits are larger than the following (AMM 56-11-00/801, AMM 56-11-21/401).
1) Chips: A chip or group of chips on the surface of a structural pane that are more than 0.01 in. (0.25 mm) in depth are a cause for the removal of the window.
2) A chip or group of chips that decreases the visual quality on a pane of the window is a cause for the removal of the window.

S 216-025

(2) Examine the window for in-plane cracks (Fig. 613)

(a) Replace or repair the window for one or more of the subsequent list of damages (AMM 56-11-00/801, AMM AMM 56-11-21/401).

(b) Examine the periphery of the window for visible in-plane cracks:

1) Replace the window if an in-plane crack extends more than 0.400 in. (10.16 mm) from the window edge.

(c) Examine the rabbet edge of the window:

1) Replace or repair the rabbet edge if an in-plane crack extends more than 0.05 in. (1.27 mm) from the rabbet edge.

S 216-026

(3) Examine the window for scratches.

(a) Replace the window for one or more of the subsequent list of damages (AMM 56-11-21/401).

	Outer Pane		Inner Pane	
Scratch Depth	Maximum length of each Scratch	Maximum cumulative length of all Scratches	Maximum length of each Scratch	Maximum cumulative length of all Scratches
0.050 in. (1.270 mm)	Not Allowed	Not Applicable	Not Allowed	Not Applicable
0.020 in. (0.508 mm)	1.0 in. (25.0 mm)	5.0 in. (127.0 mm)	Not Allowed	Not Applicable
0.010 in. (0.254 mm)	3.0 in. (76.2 mm)	9.0 in. (228.6 mm)	3.0 in. (76.2 mm)	9.0 in. (228.6 mm)
0.005 in. (0.127 mm)	4.0 in. (101.6 mm)	10.0 in. (254.0 mm)	4.0 in. (101.6 mm)	10.0 in. (254.0 mm)

(b) Polish the window to decrease the severity of the scratches. (AMM 56-11-00/801).

S 216-027

(4) Examine the No. 3 window aerodynamic smoother.

(a) It is recommended to repair the aerodynamic smoother if cracked, eroded or loose (AMM 56-11-00/801).

H. No. 4 window - Inspection/Check

S 216-028

(1) Examine the window for chips in the structural inner glass pane (Fig 609).

NOTE: Chips in structural glass pane can decrease structural capability. Chips can also decrease the visual quality of a window.

(a) Replace the window for one or more of the subsequent list of damages (AMM 56-11-31/401).

1) A chip or chips on glass surfaces internal to the window are a cause for the removal of the window.

2) A chip or group of chips that decreases the visual quality on a pane of the window is a cause for the removal of the window.

S 216-029

(2) Examine the window for chips in the non-structural outer glass pane and the non-structural acrylic pane (crew shield).

(a) A chip or group of chips that decreases the visual quality on a pane of the window is a cause for the removal of the window.

(b) The outer glass pane and inner acrylic pane are non-structural. Unless chips decrease the visual quality, they are permitted.

S 216-030

(3) Examine the window for delamination:

(a) Replace the window if the delamination decreases the visual quality (AMM 56-11-31/401).

NOTE: Delamination can result in moisture ingress which cause arcing and pane cracks. The recommended limit for delamination in a window is 1.0 in. (25.4 mm) from the edge of the window frame.

S 216-031

(4) Examine the window for arcing (Fig. 610):

(a) Examine the window for signs of arcing near the bus bar.

(b) Examine the window for line arcs.

(c) Replace the window if there are indications of arcing (AMM 56-11-31/401).

S 216-032

(5) Examine the window for bubbles:
   (a) Multiple bubbles together in a small group, or black or dark brown bubbles are a typical indication of a damaged window heat control system.
      1) Do a check of the heater control system for that window , if necessary (AMM 30-41-00/501).
   (b) Replace the window if the bubbles decrease the visual quality or bubbles are black or dark brown in color (AMM 56-11-31/401).

S 216-033

(6) Examine the window for scratches in the non-structural outer glass pane and the inner acrylic pane (crew shield):
   (a) A scratch or group of scratches that decreases the visual quality on a pane of the window is a cause for the removal of the window.
   (b) The outer glass pane and inner acrylic pane are non-structural. Unless scratches decrease the visual quality, they are permitted.

S 216-034

(7) Examine the window for cracks in the vinyl interlayer:
   (a) Examine the vinyl interlayer for cracks along the edges of the metal insert. It is possible in some extreme conditions to see the vinyl interlayer as stretched or disconnected from the metal insert (typically along the forward edge of the window).
   (b) AIRPLANES WITH SIERRACIN OR GKN WINDOWS;
   Examine the vinyl interlayer for cracks along the edges of the slip tapes.
   (c) Replace the window if you find cracks in the vinyl interlayer (Examples: Fig/614).

      NOTE: Cracks in the urethane interlayer do not decrease the window structural capacity and are not a cause for a window removal unless they decrease the visual quality.

S 216-035

(8) Examine the window for cracks (Example: Fig 607).

(a) Replace the window if cracks are found in any glass pane or inner acrylic pane (crew shield) (AMM 56-11-31/401).

NOTE: The structural inner glass pane is inside the window laminate (Fig 603).

S 216-036

(9) Examine the external aerodynamic smoother for for deterioration and cracks.

(a) It is recommended to repair the aerodynamic smoother if cracked, eroded or loose (AMM 56-11-00/801).

I. No. 5 Window - Inspection/Check

S 216-037

(1) Examine the window for chips in the structural inner glass pane pane (Example: Fig. 605).

NOTE: Chips in structural glass panes can decrease structural capability. Chips can also decrease the visual quality of a window.

(a) Replace the window for one or more of the subsequent list of damages (AMM 56-11-31/401).

1) A chip or group of chips on the surface of a structural pane that are more than 0.015 in. (0.381 mm) in depth are a cause for the removal of the window.
2) A chip or chips on glass surfaces internal to the window laminate are a cause for the removal of the window.
3) A chip or group of chips that decreases the visual quality on a pane of the window is a cause for the removal of the window.
4) The outer glass pane is non-structural. Unless chips decrease the visual quality, they are permitted.

S 216-038

(2) Examine the window for delamination:
  (a) Replace the window if the delamination decreases the visual quality (AMM 56-11-31/401).

NOTE: Delamination can result in moisture ingress which can cause arcing and pane cracks. The recommended limit for delamination in a window is 1.0 in. (25.4 mm) from the edge of the windowframe.

S 216-039

(3) Examine the window for arcing (Example: Fig 610)
  (a) Examine the window for signs of arcing near the bus bar.
  (b) Examine the window for line arcs.
  (c) Replace the window if there are indications of arcing arcing (AMM 56-11-31/401).

S 216-040

(4) Examine the window for bubbles:
  (a) Multiple bubbles together in a small group, or black or dark brown bubbles are a typical indication of a damaged window heat control system.
  (b) Do a check of the heater control system for that window, if necessary (AMM 30-41-00/501).
  (c) Replace the window if the bubbles decrease the visual quality or bubbles are black or dark brown in color color (AMM 56-11-31/401).

S 216-041

(5) Examine window for scratches:
  (a) The inner glass pane is structural. Replace the window if the inner glass pane has a scratch with a depth more than than 0.015 in. (0.381 mm).
    1) Use an optical micrometer (accuracy +/- 0.0002 in.) to measure the depth of the scratches.
  (b) A scratch or group of scratches that decreases the visual quality on a pane of the window is a cause for the removal of the window.
  (c) The outer glass pane is non-structural. Unless scratches decrease the visual quality, they are permitted.

S 216-042
(6) Examine the window for cracks in the vinyl interlayer:
(a) Examine the vinyl interlayer for cracks along the edges of the metal insert.

NOTE: It is possible in some extreme conditions to see the vinyl interlayer as stretched or separated from the metal insert (typically along forward edge of the window). (Example: Fig 615).

(b) AIRPLANES WITH SIERRACIN OR GKN WINDOWS;
Examine the vinyl interlayer for cracks along the edges of the slip tapes.
(c) Replace the window if you find cracks in the vinyl interlayer.

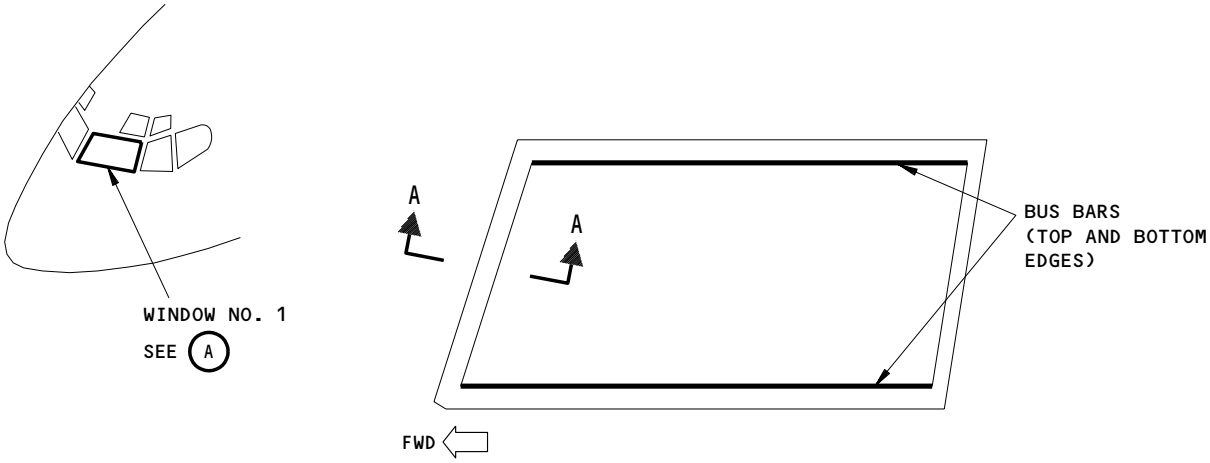
NOTE: Cracks in the urethane interlayer do not decrease the window structural capacity and are not a cause for a window removal unless they decrease the visual quality. (Example: Fig 611).

S 216-043
(7) Examine the window for cracks (Example: Fig 605).
(a) Replace the window if cracks are found in any glass pane pane (AMM 56-11-31/401).

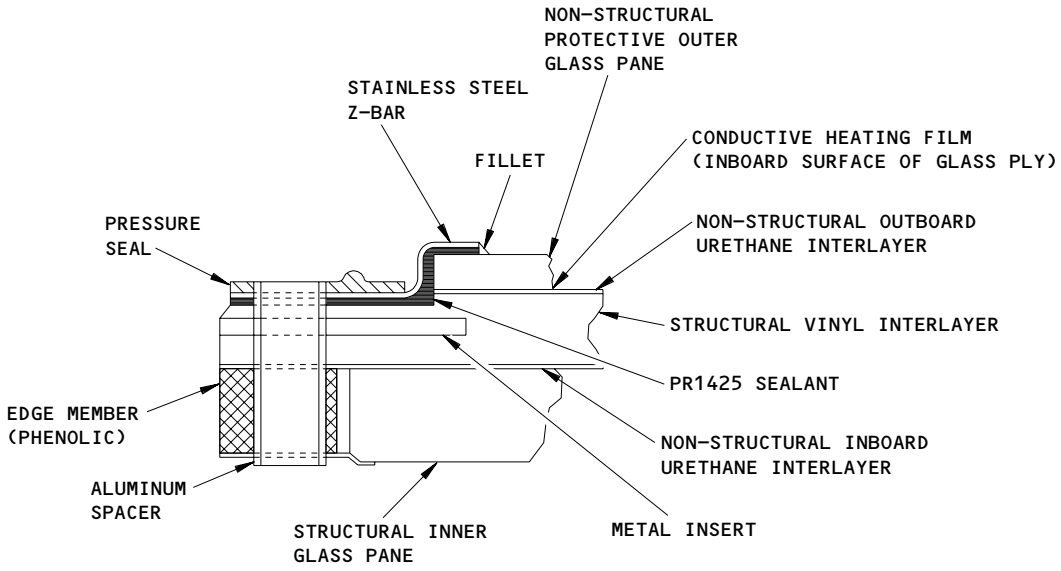
S 216-044
(8) Examine the external aerodynamic smoother for for deterioration and cracks.
(a) It is recommended to repair the aerodynamic smoother if cracked, eroded or loose (AMM 56-11-00/801).

S 866-045
(9) Close the window heat circuit breakers and remove DO-NOT-CLOSE tags.

S 866-046
(10) Put the Airplane Back to Its Usual Condition

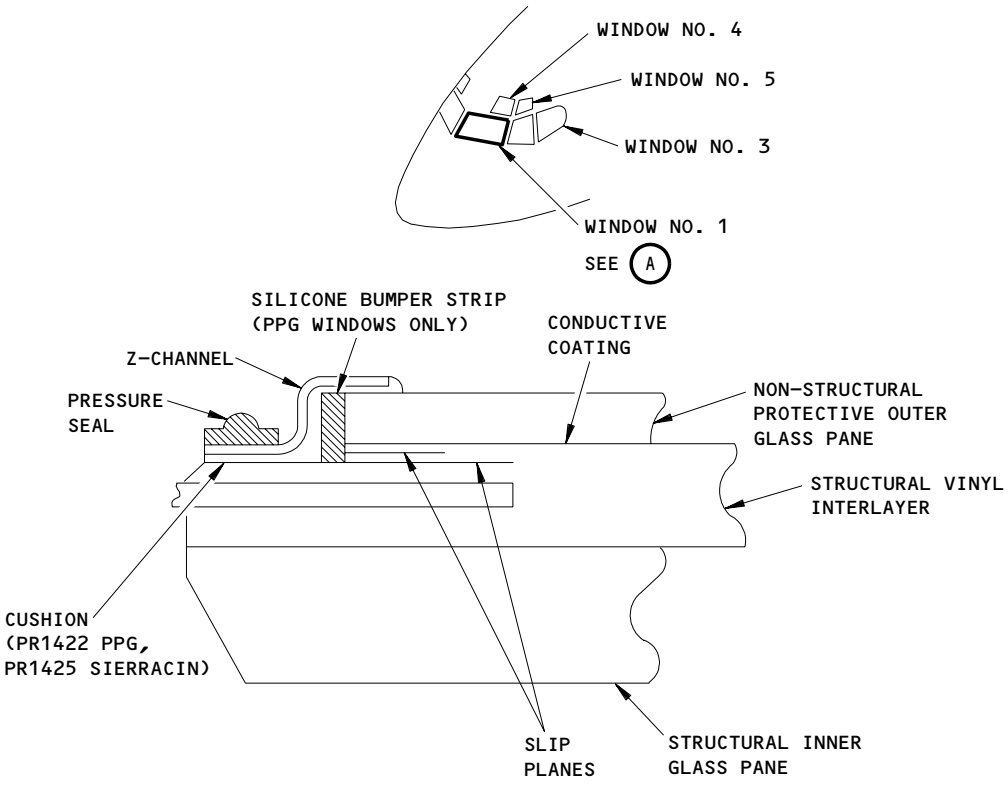


WINDOW NO. 1
A



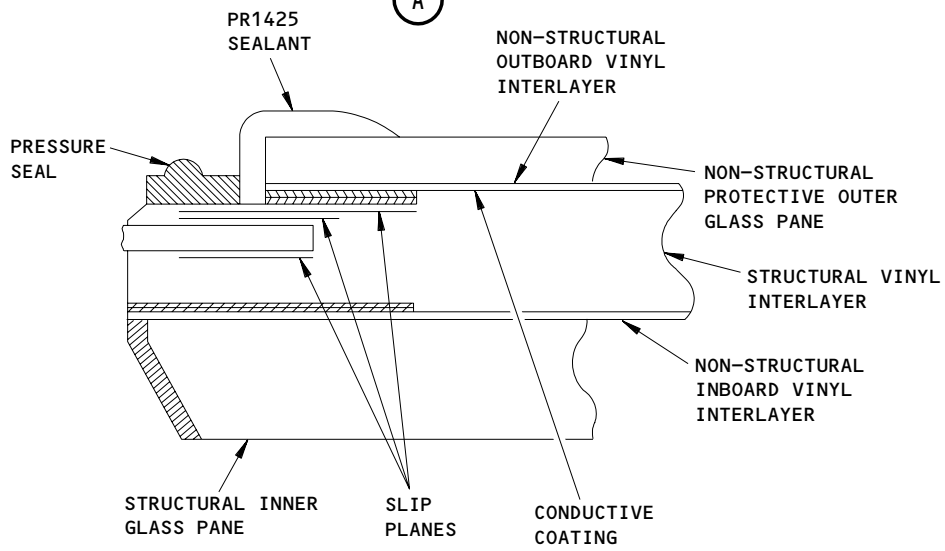
WINDOW NO. 1
(TYPICAL)
A–A

Windows – Control Cabin Fixed Windows – No. 1 Window
Figure 601



WINDOW NO. 1
(SIERRACIN MANUFACTURED)

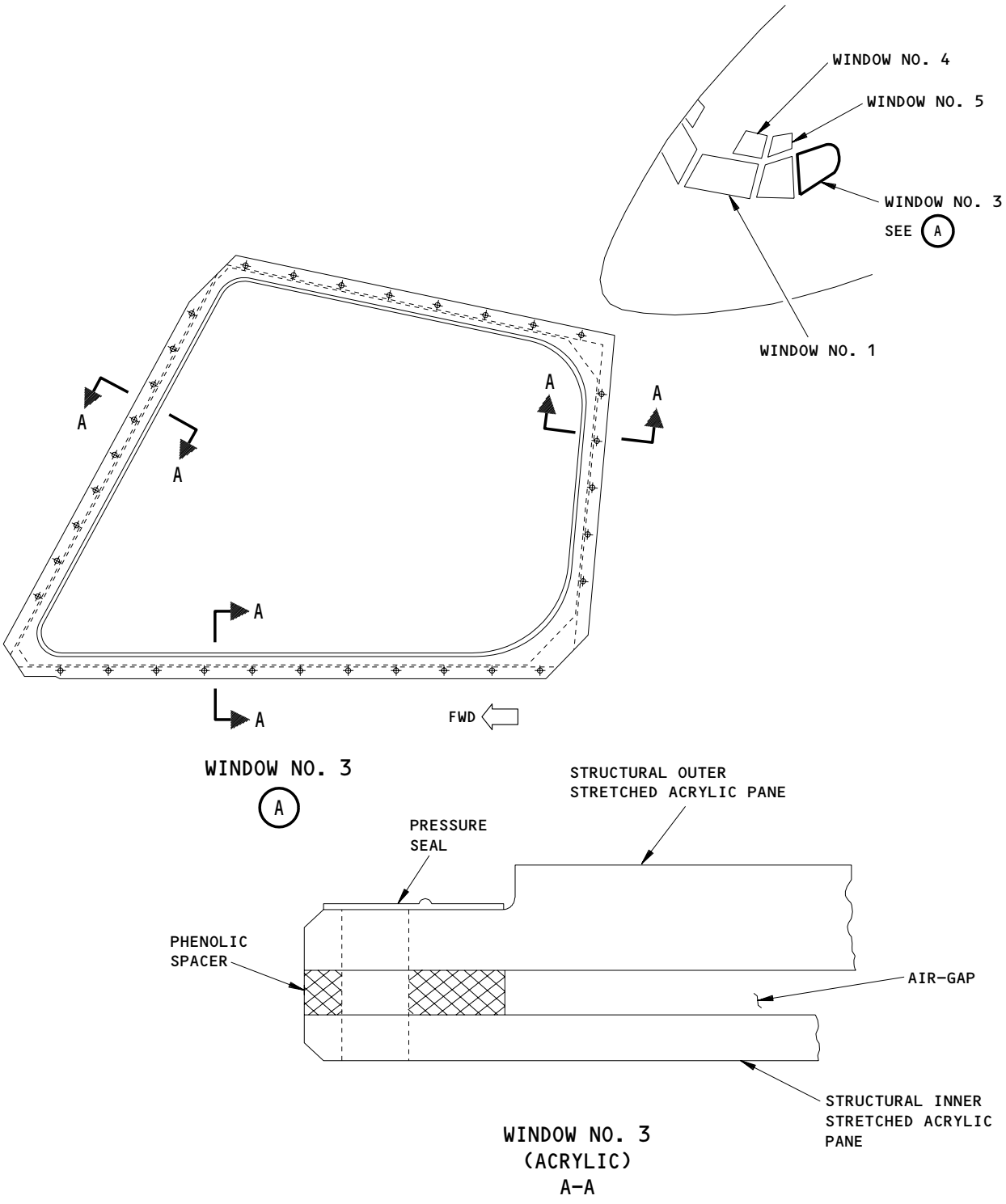
A



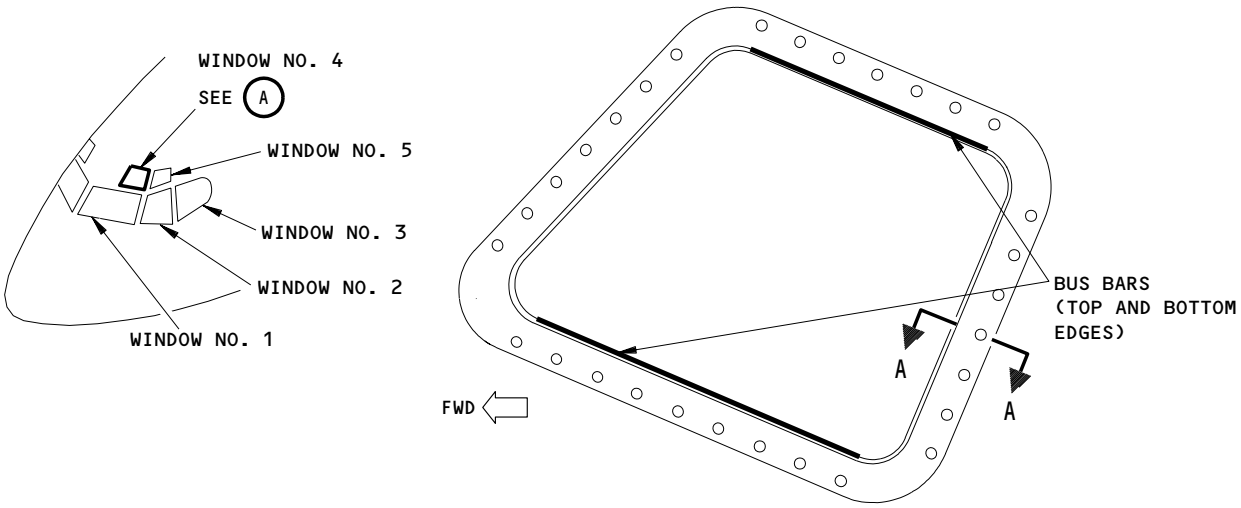
WINDOW NO. 1
(TRIPLEX MANUFACTURED)

A

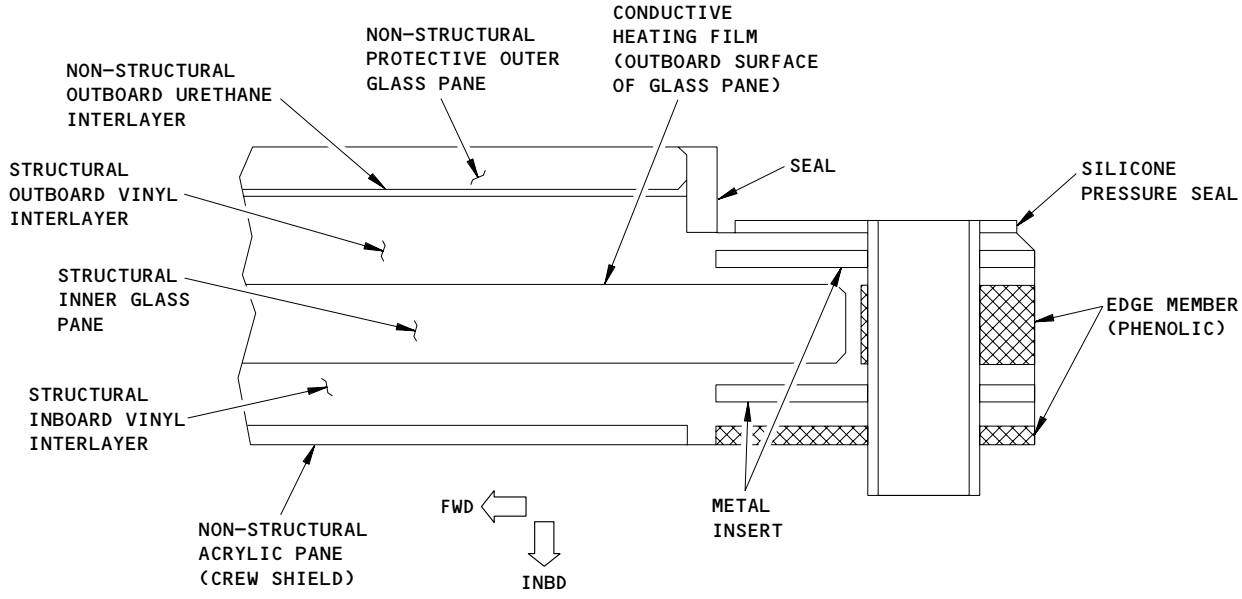
Control Cabin Window Cross Sections
Figure 601A



Control Cabin Window Cross Sections
Figure 602

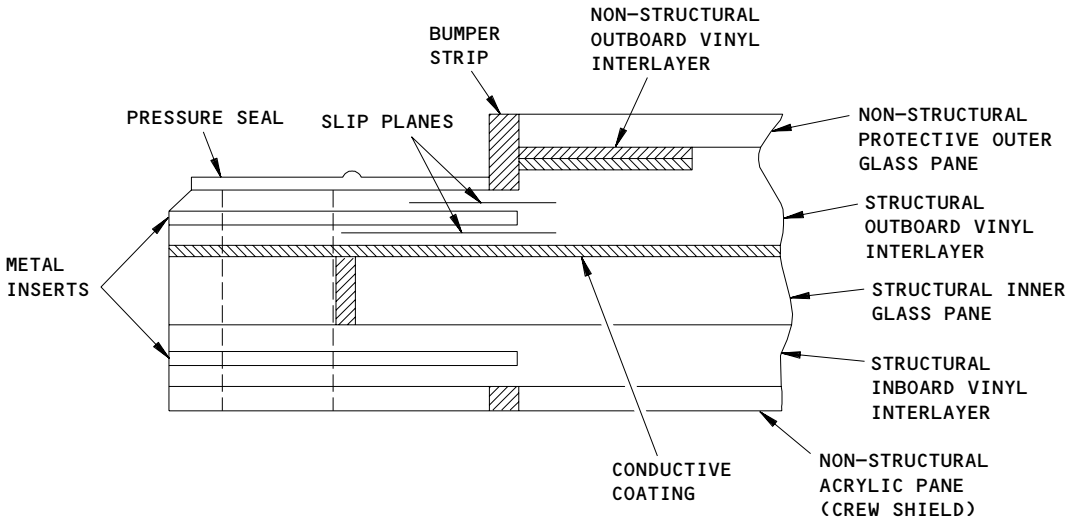


WINDOW NO. 4
A

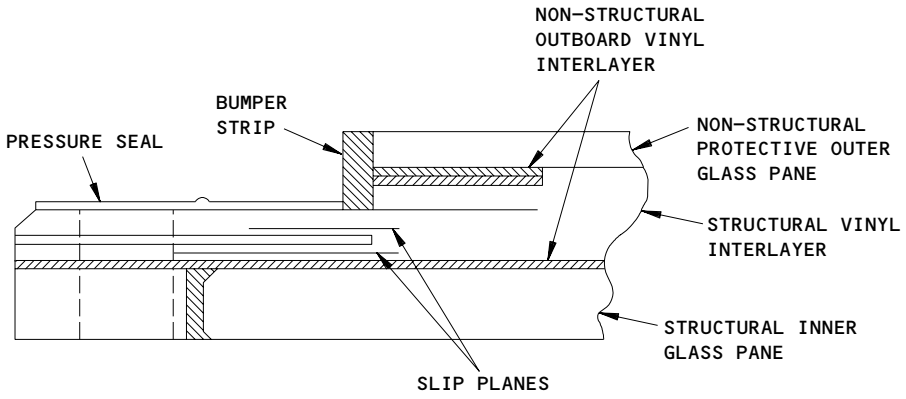


WINDOW NO. 4
A–A

Windows – Control Cabin Fixed Window – No. 4
Figure 603

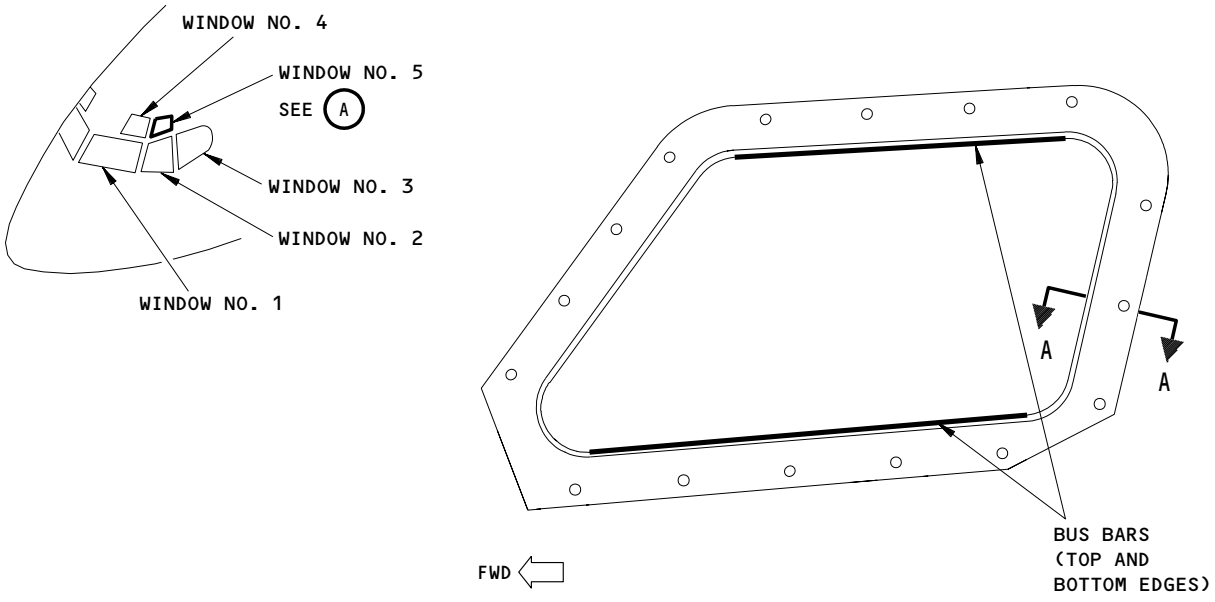


WINDOW NO. 4
(TRIPLEX MANUFACTURED)

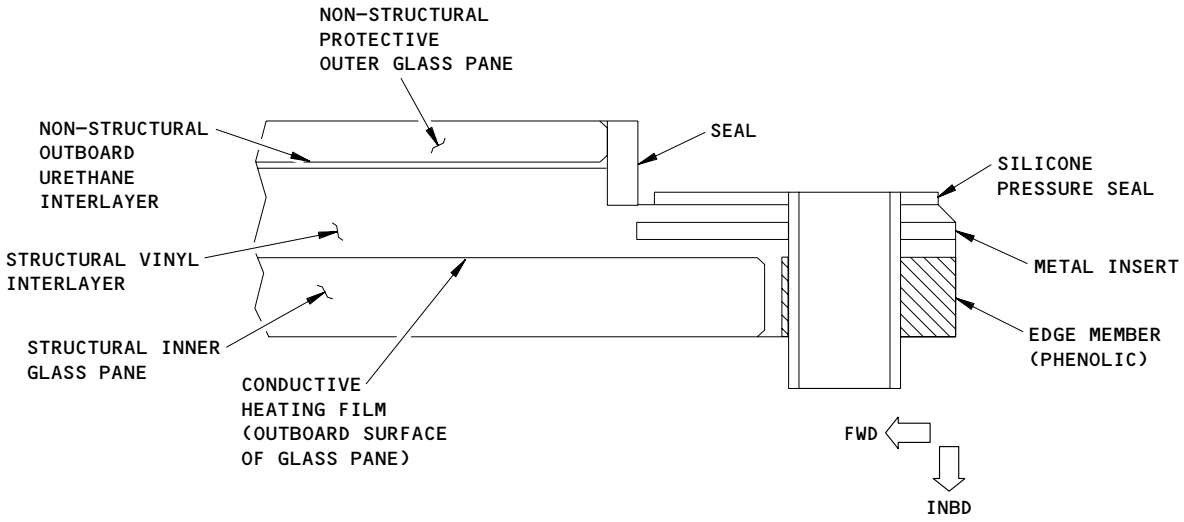


WINDOW NO. 5
(TRIPLEX MANUFACTURED)

Triplex No. 4 And No. 5 Windows
Figure 603A

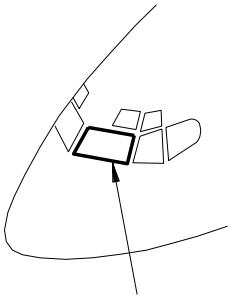


WINDOW NO. 5
A



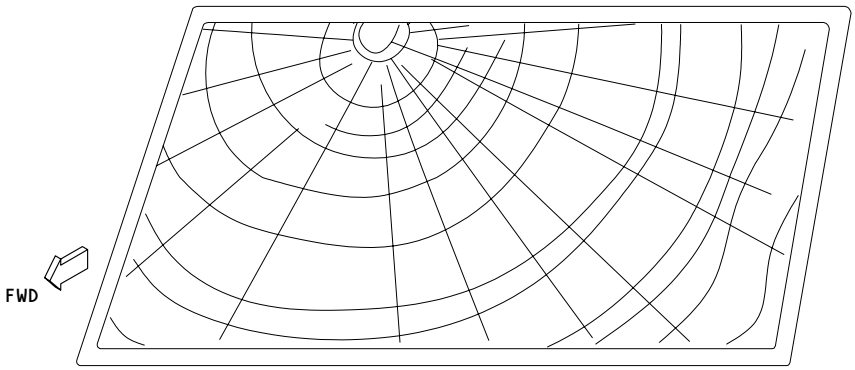
WINDOW NO. 5
A–A

Windows – Control Cabin Fixed Window – No. 5
Figure 604



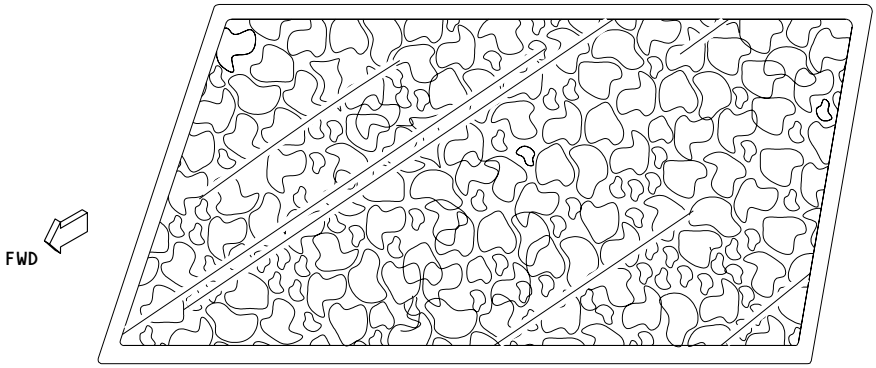
GLASS PANE CRACKS
WINDOW NO. 1

SEE (A)



GLASS PANE CRACKS
(NON-STRUCTURAL)

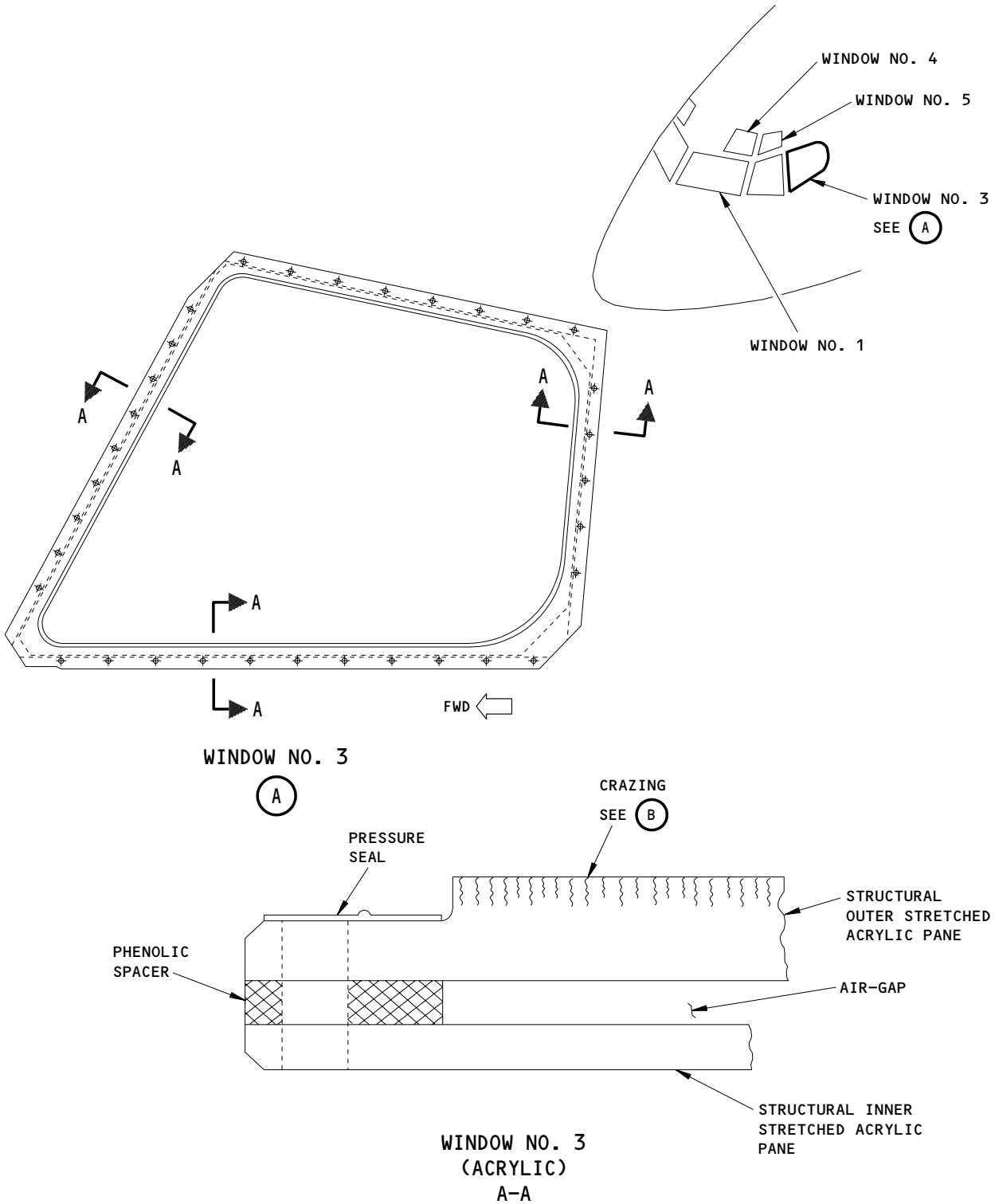
(A)



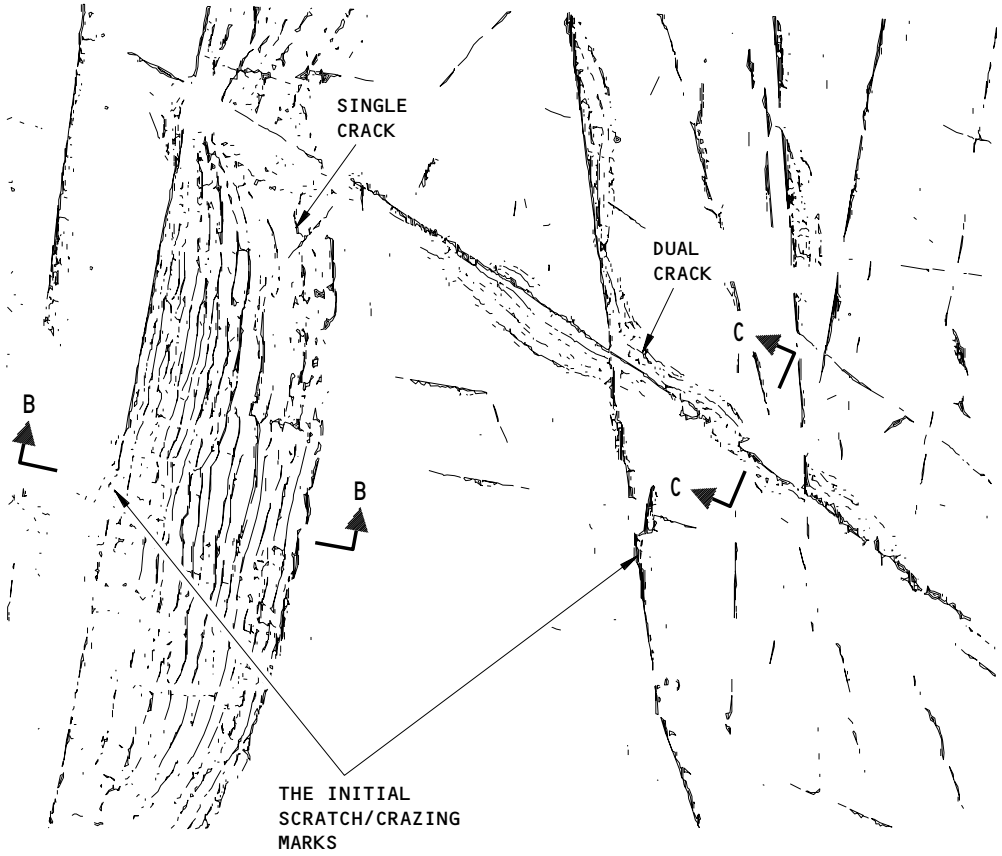
GLASS PANE CRACKS
(STRUCTURAL)

(A)

Glass Pane Cracks (Typical)
Figure 605

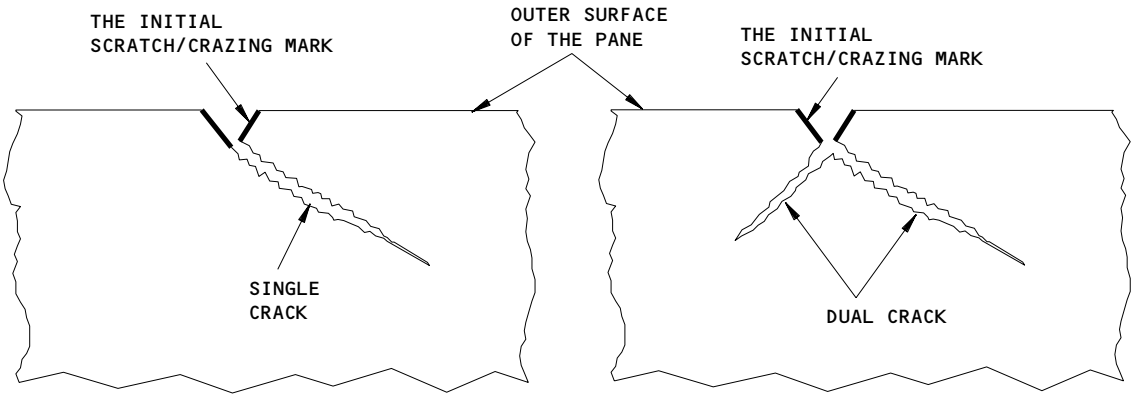


Flight Compartment No. 3 Window - Acrylic
Figure 606 (Sheet 1)



VIEW OF WINDOW SURFACE

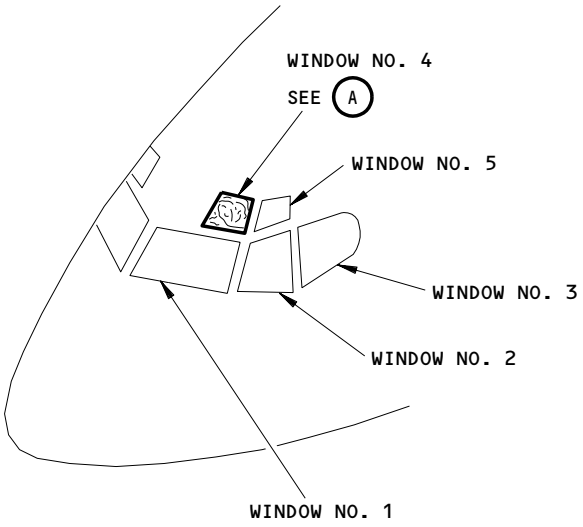
B

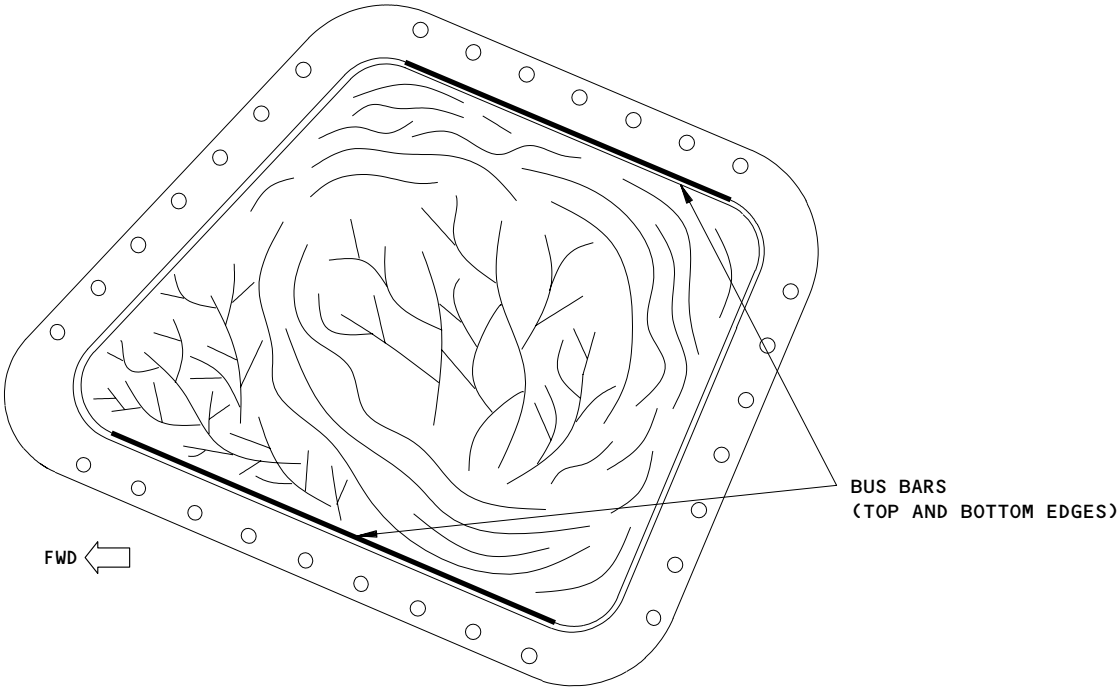


B–B C–C

NOTE: NOT TO SCALE.
THESE SECTION VIEWS AND ILLUSTRATIONS SHOW CRACKS THAT ARE LARGER THAN THE ACTUAL CRACKS, TO SHOW THE PROPERTIES OF CRACKS WHICH DEVELOP.

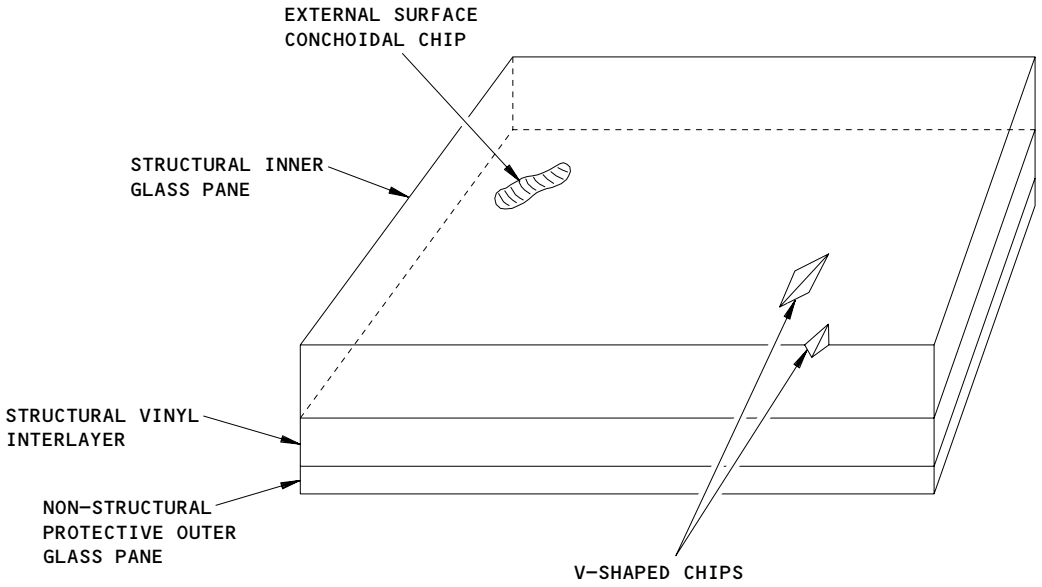
Flight Compartment No. 3 Window – Acrylic
Figure 606 (Sheet 2)



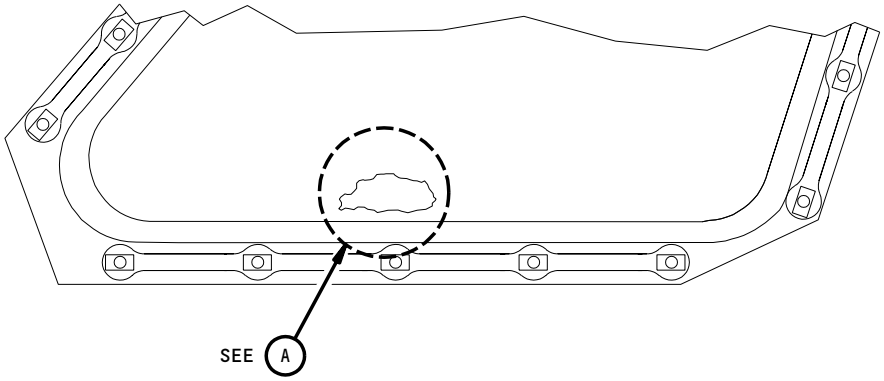


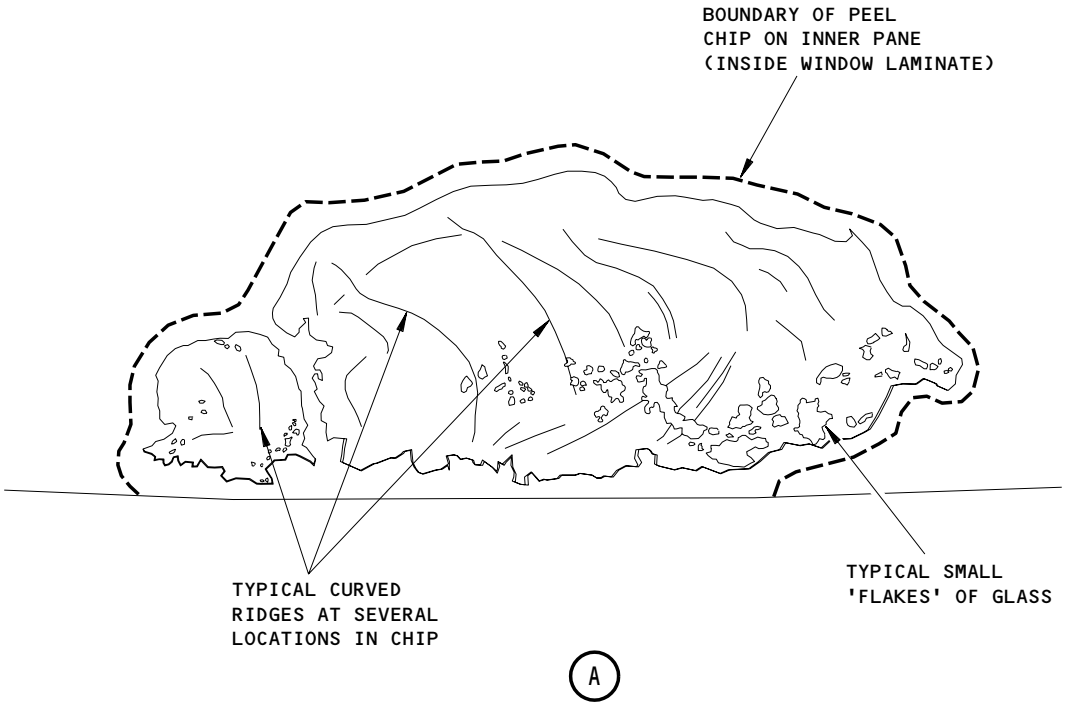
WINDOW NO. 4
A

No. 4 Structural Pane Cracks
Figure 607

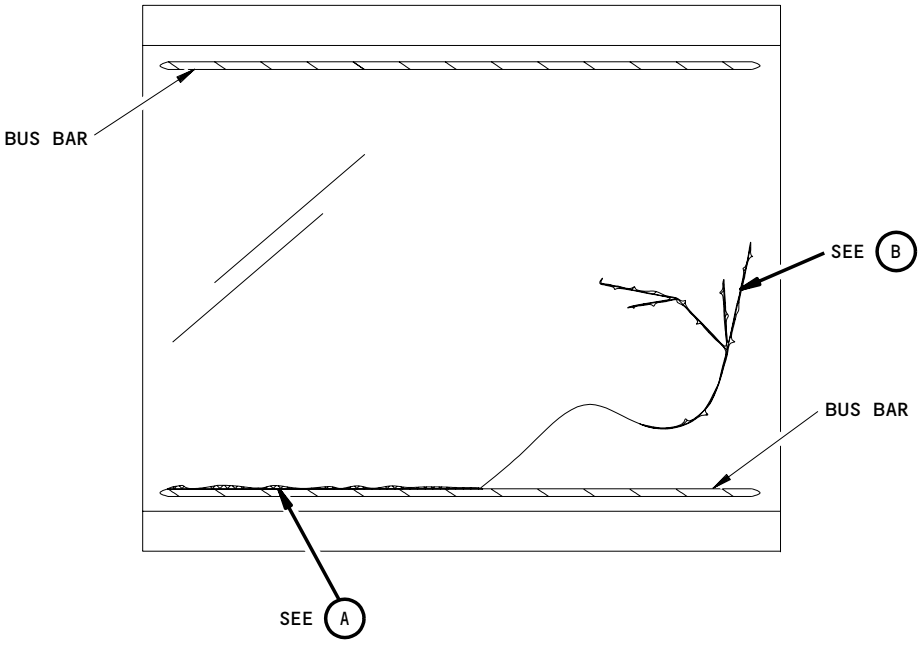


Control Cabin Window Inner Pane Chip Identificaion
Figure 608

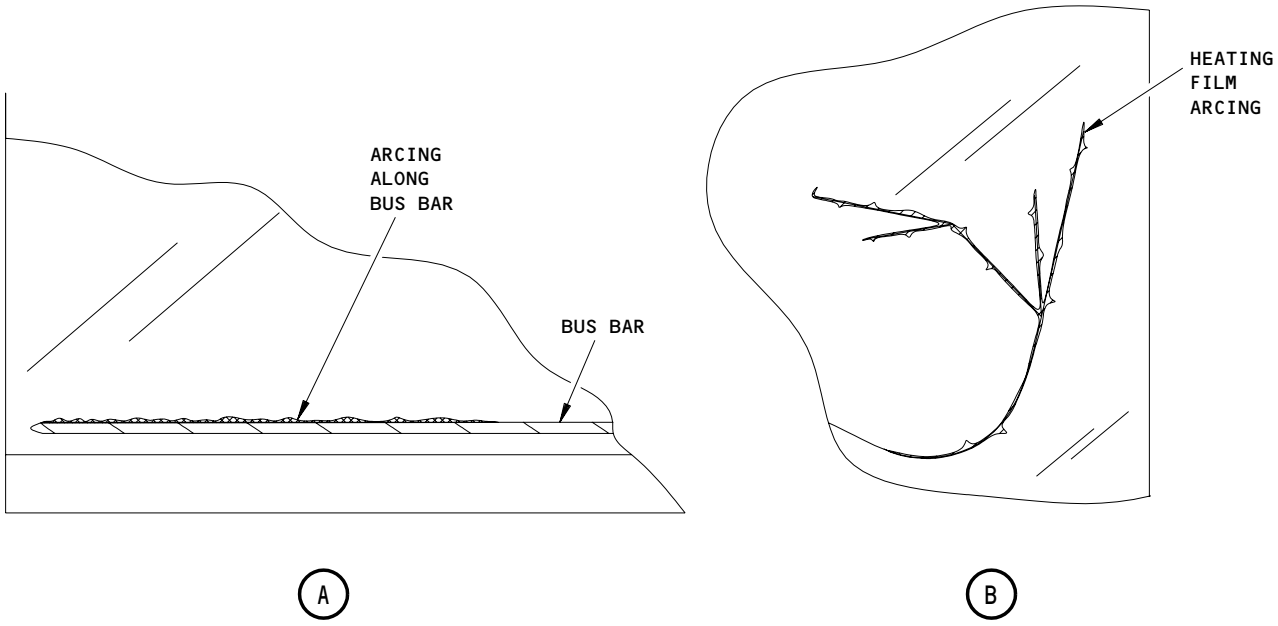




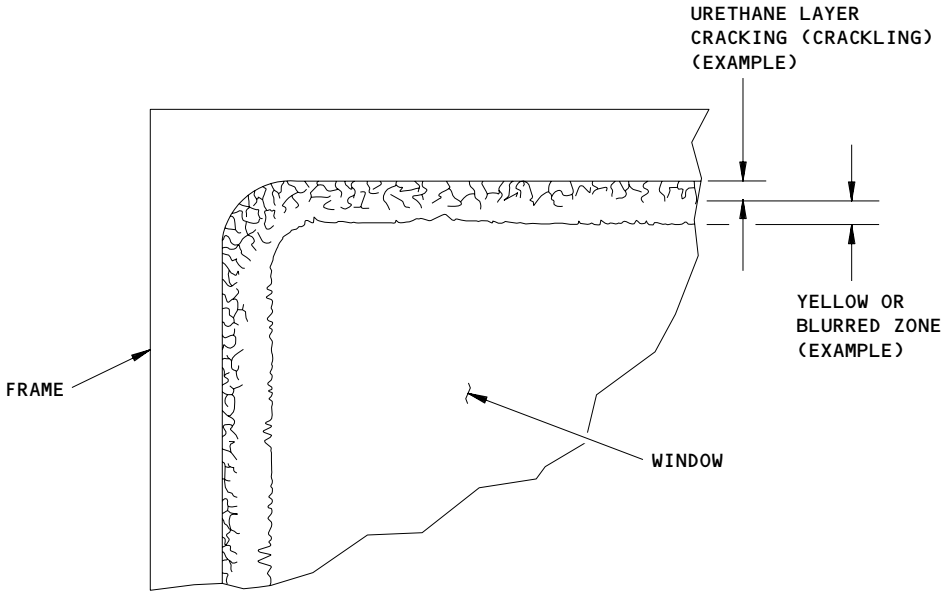
Peel Chips
Figure 609



WINDOW HEAT ARCING

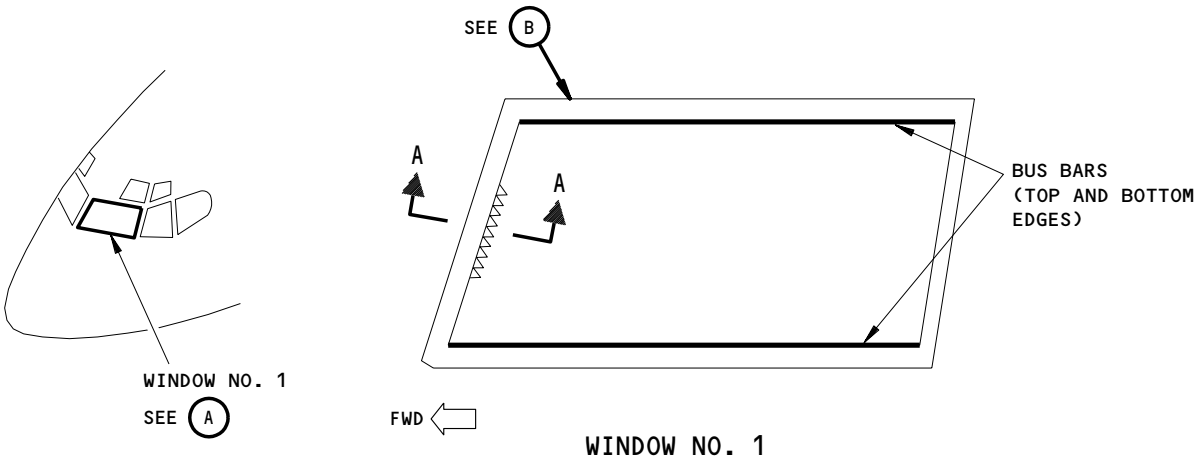


Window Heat Arcing
Figure 610

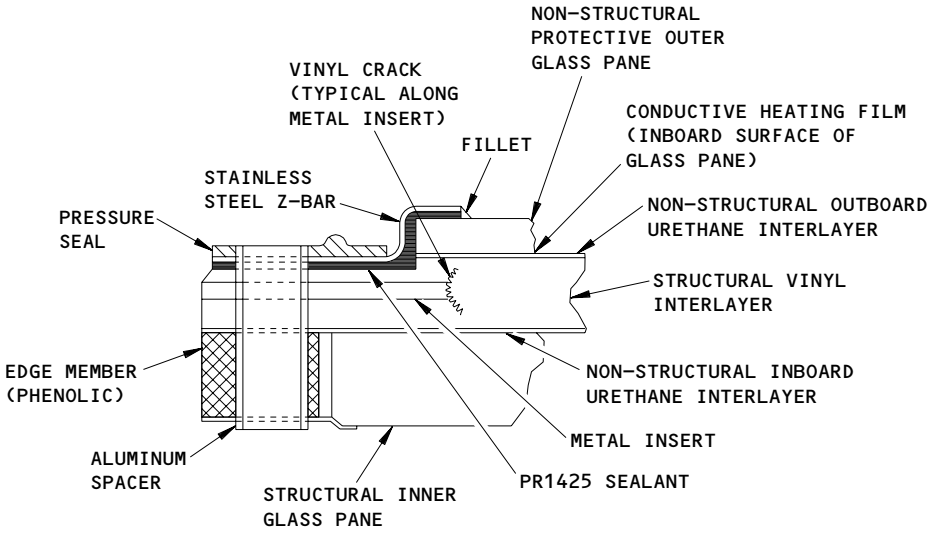


URETHANE INTERLAYER CRACKS

Urethane Interlayer Cracks
Figure 611

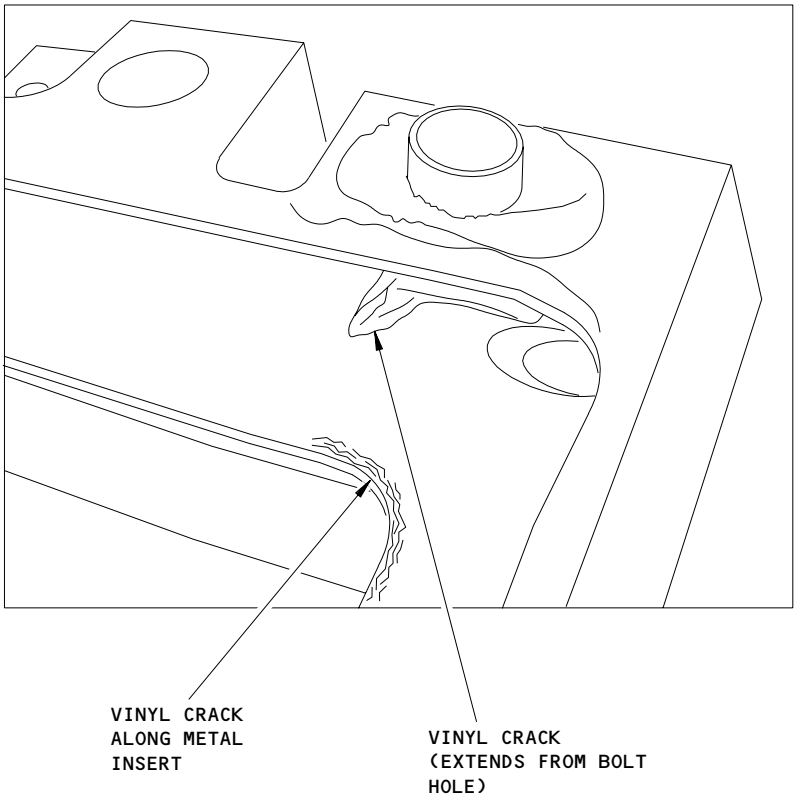


WINDOW NO. 1
A



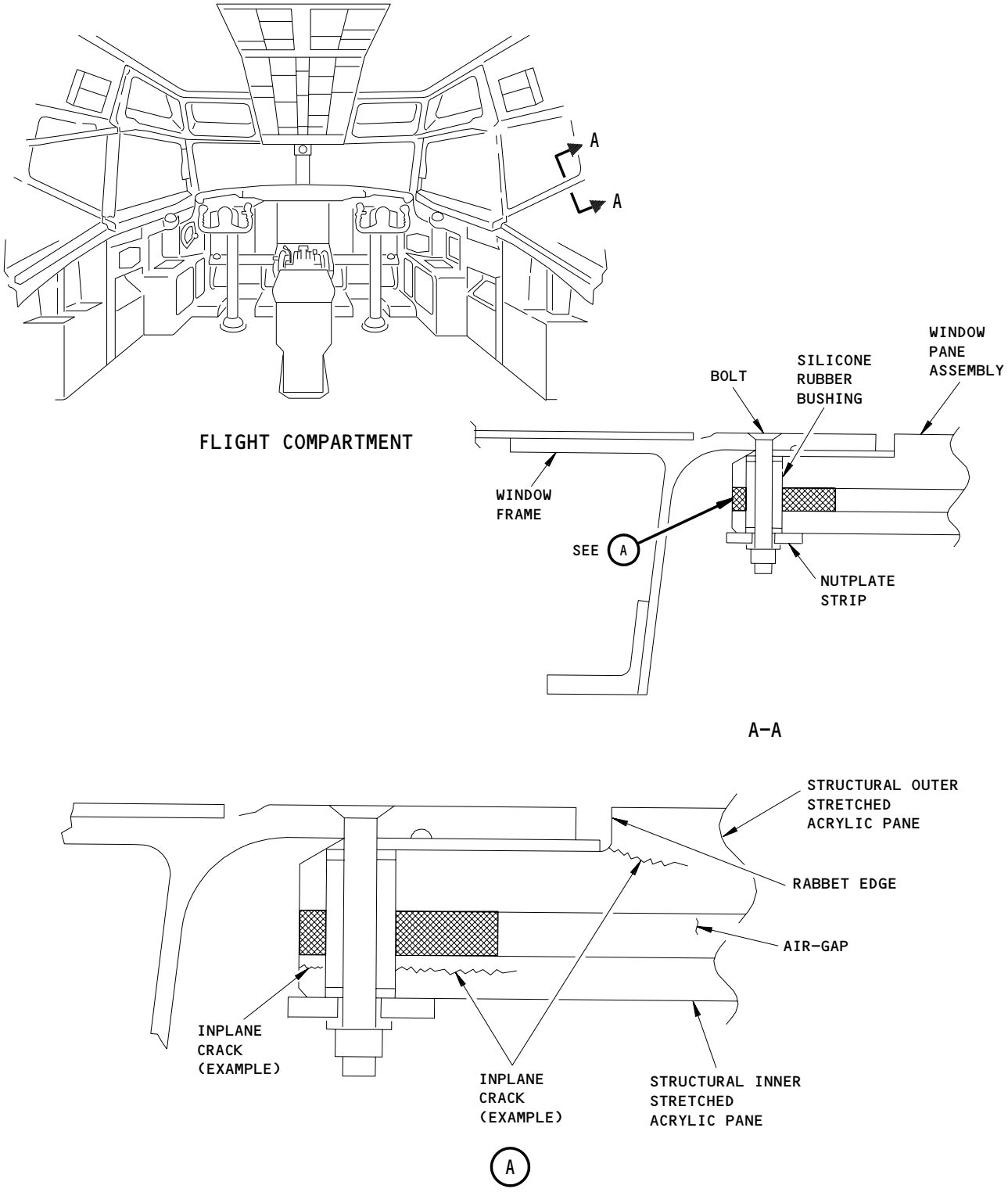
WINDOW NO. 1
(TYPICAL)
A–A

Windows – Control Cabin Fixed Windows – No. 1 Window
Figure 612 (Sheet 1)

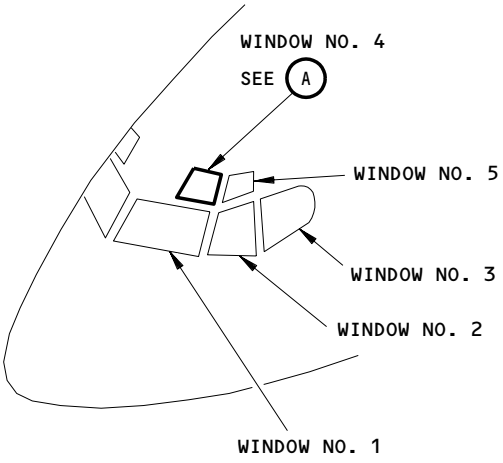


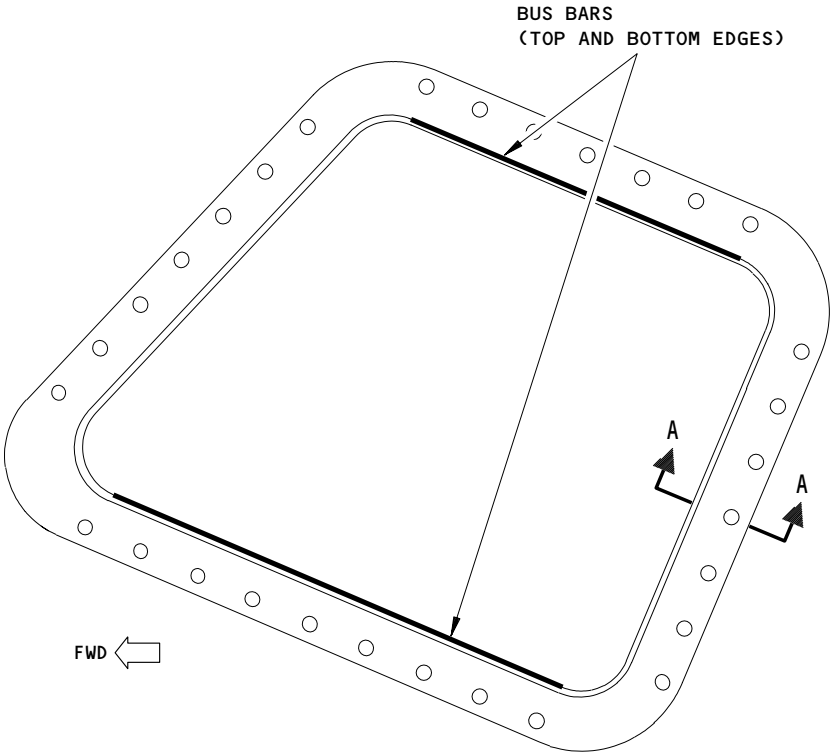
B

Windshield Vinyl Interlayer Cracks
Figure 612 (Sheet 2)



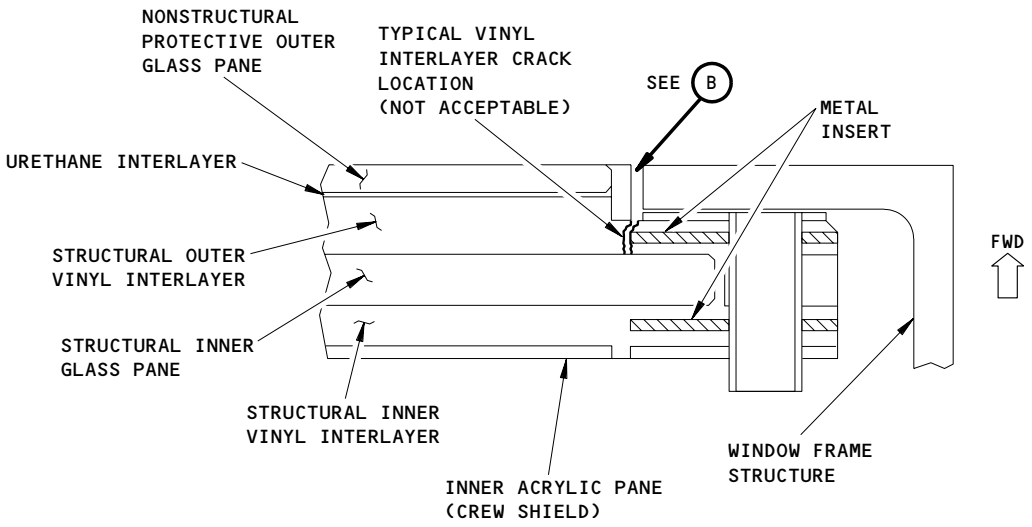
Flight Compartment No. 3 Window – In–plane Cracks
Figure 613



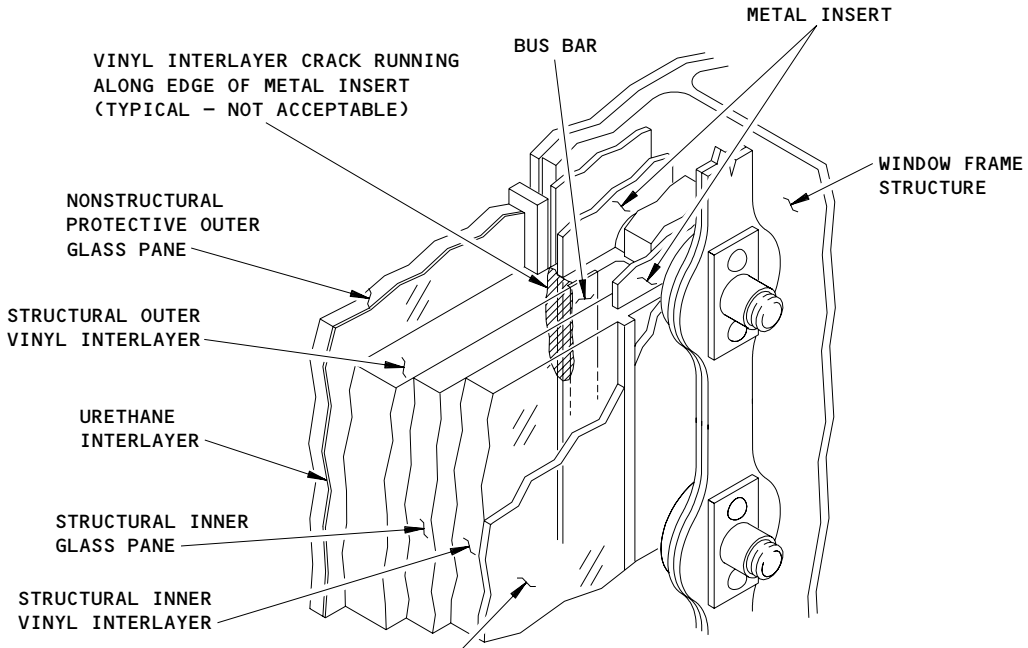


WINDOW NO. 4
A

No. 4 Eyebrow Window Vinyl Interlayer Cracks
Figure 614 (Sheet 1)

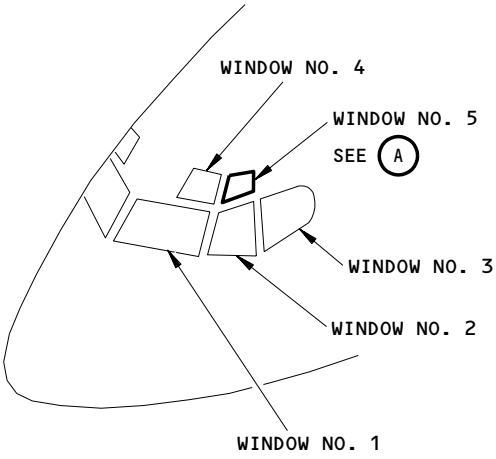


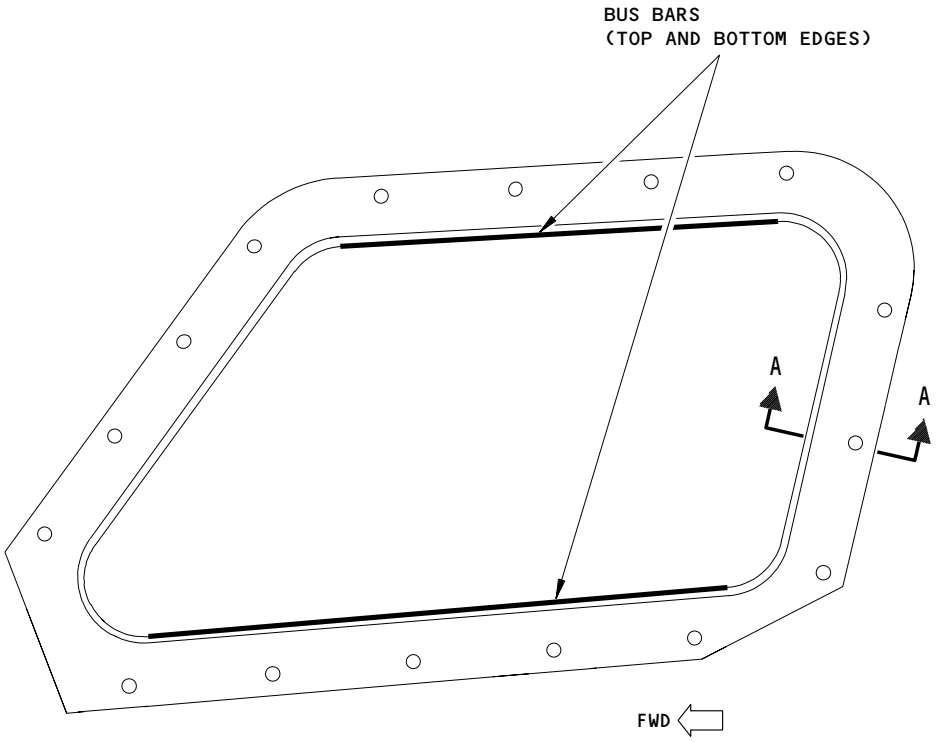
(TYPICAL)
A-A



(TYPICAL)
B

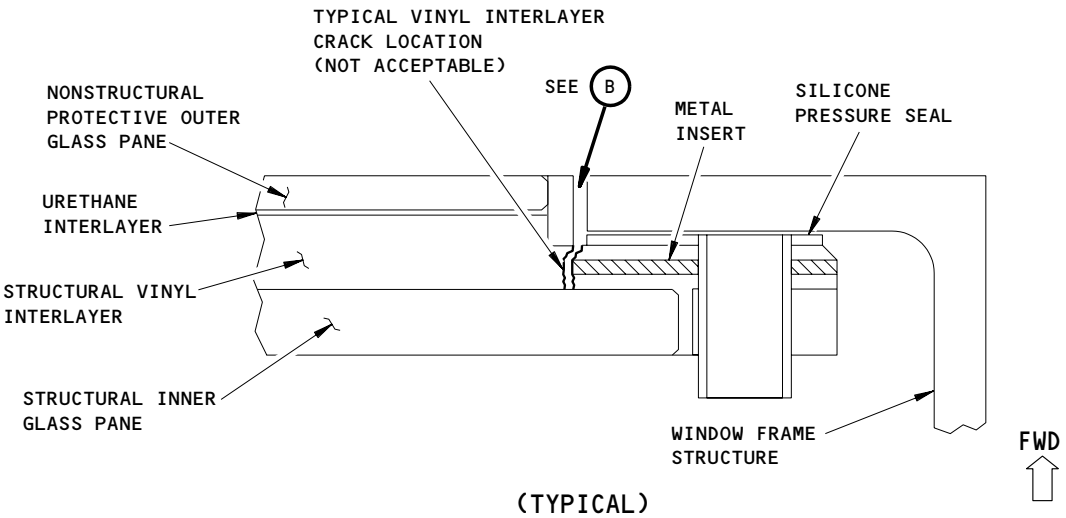
No. 4 Eyebrow Window Vinyl Interlayer Cracks
Figure 614 (Sheet 2)



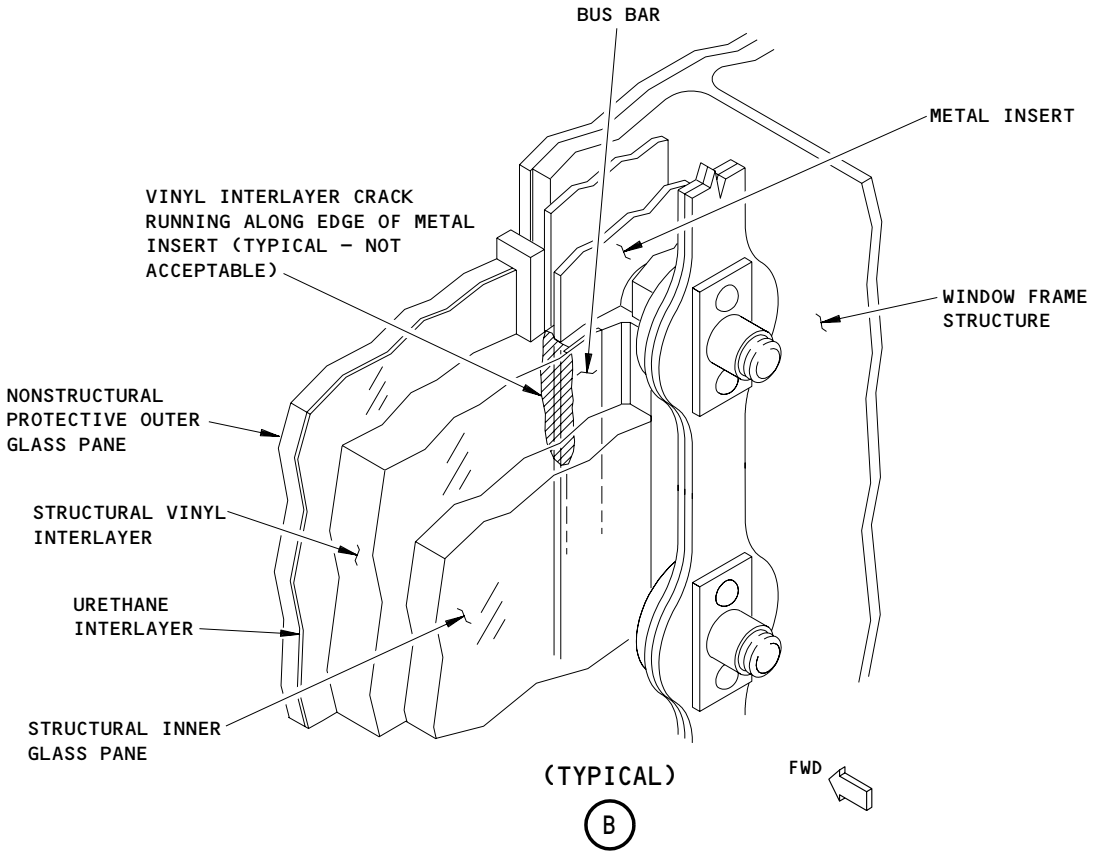


WINDOW NO. 5
A

No. 5 Eyebrow Window Vinyl Interlayer Cracks
Figure 615 (Sheet 1)

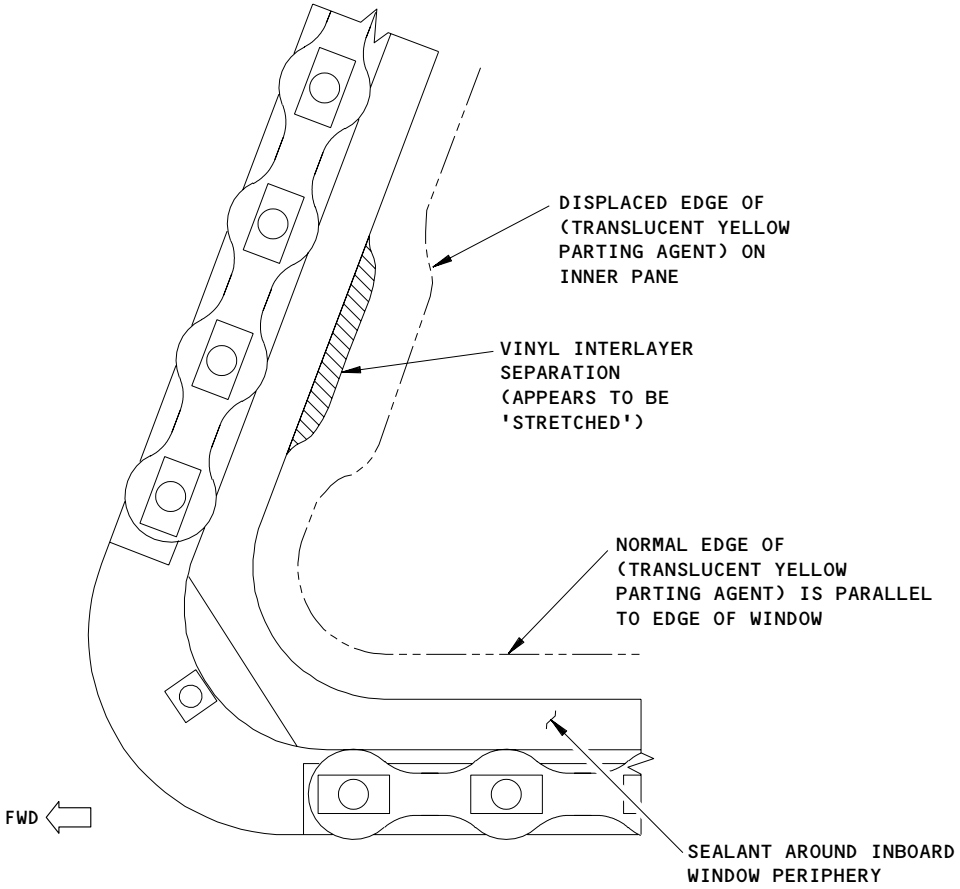


(TYPICAL)
A-A



(TYPICAL)
B

No. 5 Eyebrow Window Vinyl Interlayer Cracks
Figure 615 (Sheet 2)



Vinyl Separation (Typical)
Figure 616

FIXED CONTROL CABIN WINDOWS - APPROVED REPAIRS

1. General
   A. Aerodynamic smoother (sealant), installed around all control cabin windows, is subject to erosion and cracking and must be maintained in good condition to ensure longest possible window life.
   B. Fairing compound is installed on the window frames of control cabin windows No. 1, 4 and 5. Whenever the fairing compound is cracked, chipped, broken or damaged in any way, the fairing compound should be repaired before installation of the window.

      NOTE: An exception is local crushing of the fairing compound, around the ends of the spacers installed with the window assembly; this condition does not require repair.

2. Aerodynamic Smoother (Sealant) - Approved Repairs
   A. Equipment and Materials
      (1) Masking Tape - No. 221 (AMM 20-30-51)
      (2) Aliphatic Naphtha - TT-N-95A, Type II (AMM 20-30-31)

          NOTE: Freon-TF may be used in lieu of aliphatic naphtha for general cleaning of windows.

      (3) Polysulfide Sealant (Preferred for longer life) - PR 1425 (AMM 20-30-11)
      (4) Polysulfide Sealant (Alternate) - Pro Seal 860 class B (AMM 20-30-11)
      (5) Polysulfide Sealant (Alternate) - BMS 5-45 (AMM 20-30-11)
      (6) Polysulfide Sealant (Alternate) - BMS 5-79 (AMM 20-30-11)
      (7) Cheesecloth - Lint- and oil-free
      (8) Spatula
      (9) Sealant Gun - Semco Model 250
   B. Repair Aerodynamic Smoother (Sealant)
      (1) Make sure that power is OFF in window-heating circuit.

          WARNING: OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGES FROM 250 TO 350 VOLTS. BE CAREFUL WHEN WORKING ON CONTROL CABIN WINDOWS.

      (2) Remove all sealant that is cracked, eroded or not bonded to glass (AMM 51-31-0/201).

          CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

(3) Clean remaining sealant and adjacent window and frame with cheesecloth wetted with aliphatic naphtha.

CAUTION: WET CHEESECLOTH ONLY. EXCESS SOLVENT COULD PENETRATE WINDSHIELD LAMINATIONS, CAUSING DAMAGE.

(4) Apply masking tape on glass and window frame where sealant is to be applied.
(5) Mix sealant according to manufacturer's instructions.
(6) Inject sealant with sealant gun to completely fill gap between frame and glass and to provide a small excess. Use care and proceed slowly to prevent voids or entrapment of air in sealant.

NOTE: Refer to par. 1. General concerning sealant to be used.

(7) Smooth and shape excess sealant with spatula or by hand to shape shown in Fig. 801 and 802.
(8) Removing masking tape before sealant skins over or begins to set.
(9) Allow sealant to cure per Fig. 803.

3. Fairing Compound - Approved Repairs

A. In the case of a repair covering a large part of the fairing compound surface, the installed fairing compound must be a flat plane within 0.00 ±0.03 inch around the entire periphery of the window. The method used in manufacture is to make up a faceplate, with a surface as nearly as possible corresponding to that of the replacement window, and clamp or bolt it in position. For very small areas of repair, the compound should be smoothed off with a hand tool as evenly as possible.

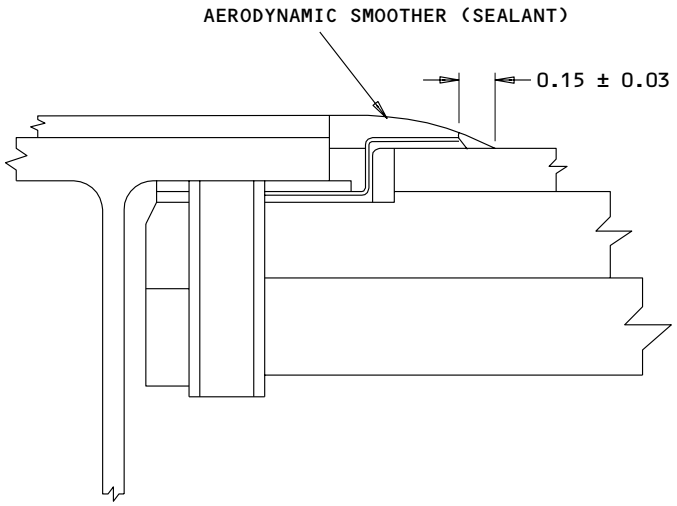
B. In the case of all partial repairs the window frame should be prepared as described in par. D.(1)(a). If the old fairing compound has been completely removed, new compound should be applied to the window frame as described in par. D.(1)(b).

C. Equipment and Materials

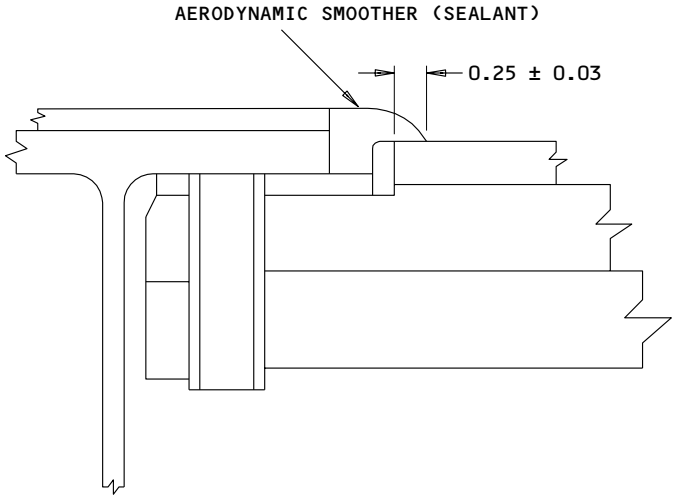
(1) Sandpaper - 400 grit
(2) Cleaning Solvent - BMS 11-7
(3) Cheesecloth - Lint and oil-free, or equivalent
(4) Aliphatic Naphtha - TT-N-95A, Type II

NOTE: Freon-TF, or equivalent may be used in lieu of aliphatic naphtha, TT-N-95A, Type II, for general cleaning of windows.

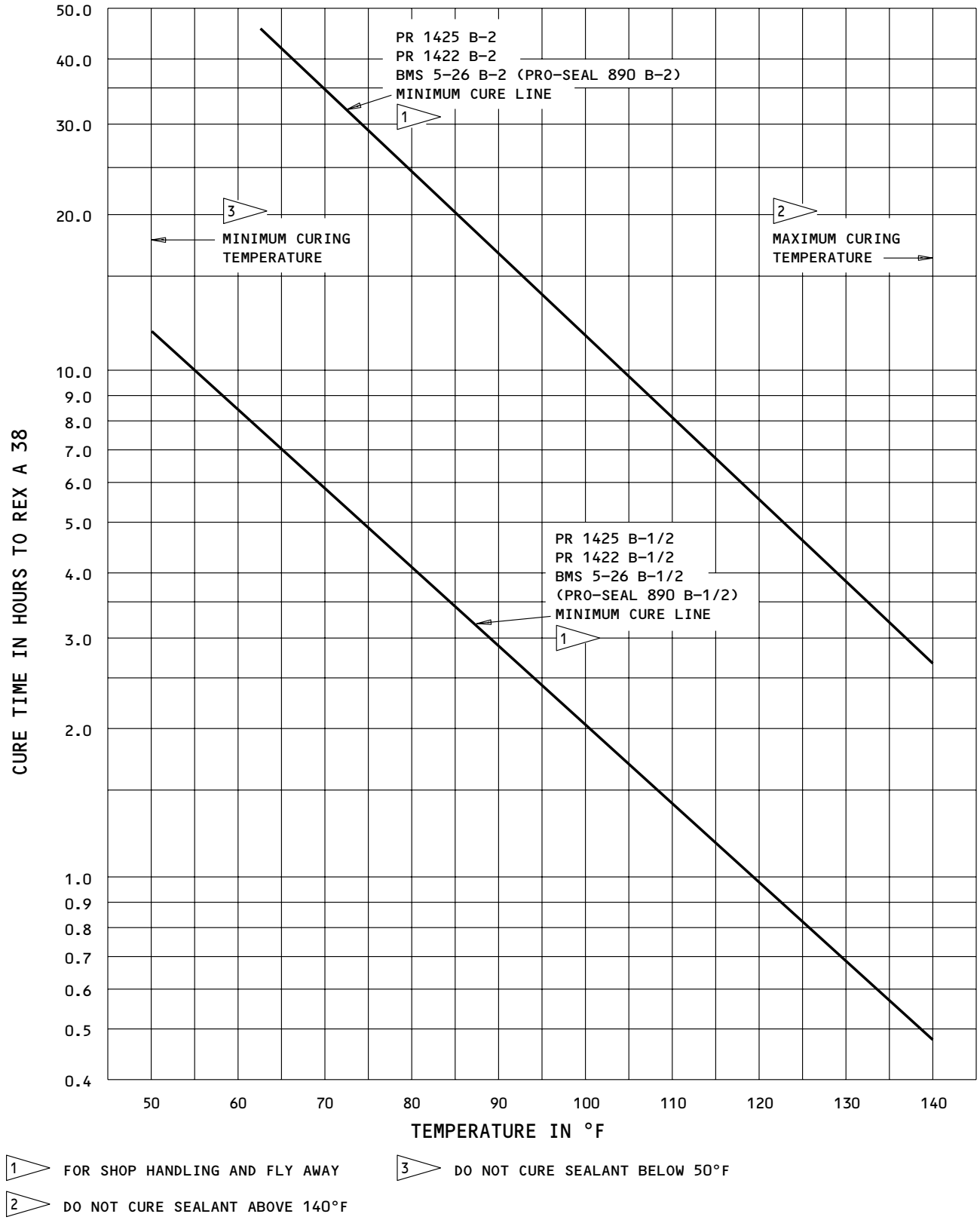
(5) Fairing Compound - EC-3587-1/4, EC-3587-1 or Tereco 175M (AMM 20-30-11)
(6) Spatula - Or Semco Model 250 Sealant Gun, or equivalent
(7) Teflon Pressure Sensitive Tape - or Ivory soap and a soft-bristle brush
(8) Mold Faceplate (for large repairs)



Sealant Shape–Windows With Z Channel Seal
Figure 801



Sealant Shape–Windows Without Z Channel Seal
Figure 801



1 FOR SHOP HANDLING AND FLY AWAY

2 DO NOT CURE SEALANT ABOVE 140°F

3 DO NOT CURE SEALANT BELOW 50°F

Sealant Cure Times
Figure 802

D. Prepare Window Frame and Fairing Compound for Repair

(1) Prepare Window Frame

NOTE: The procedures which follow assume that the extent of the area being repaired justifies the use of a faceplate as a forming tool. If the area is small enough to be repaired by a hand tool, it is less necessary to ensure that the newly applied compound is fully hardened before the window is installed.

(a) Prepare window frame for replacement of missing portion of fairing compound.

1) Clean affected portion of window frame surface by lightly sanding. It is not necessary to remove old fairing compound if in good condition or unless a new window being installed cannot be flushed up with the skin.
2) Wipe off sanded surface with a clean cloth soaked in cleaning solvent, just prior to application of fairing compound. Avoid use of excess solvent.

WARNING: SOLVENT CLEANER IS FLAMMABLE.

(b) Prepare window frame from which old fairing compound has been completely removed.

1) Clean surface of window frame with cloth soaked in BMS 11-7 solvent and wipe off, while wet, with a clean dry cloth.
2) Continue cleaning and drying until no soil is visible on the final drying cloth.

(c) Wipe faying surface of faceplate with a clean cloth soaked in aliphatic naphtha. The cleaner should be wiped off, while wet, with a clean, dry cloth. The use of excessive cleaner must be avoided.

WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

(d) To ease removal, mask the contacting surface of the faceplate with one of the following:

1) Teflon tape, baked on Teflon, room temperature cured Teflon, or a brush coat of Ivory soap applied with a soft bristle brush,

E. Prepare Fairing Compound

(1) The fairing compounds are available in pre-measured two-part kits. Tereco 175 is also supplied in one-part ready-to-use frozen cartridges (refer to Table I for characteristics of the different materials).

WARNING: FAIRING COMPOUNDS AND SOLVENT CLEANER ARE TOXIC AND FLAMMABLE. AVOID PROLONGED OR REPEATED CONTACT WITH THE SKIN. DO NOT GET IN EYES. KEEP AWAY FROM SOURCES OF IGNITION.

CAUTION: MINIMIZE ENTRAPEMNT OF AIR DURING MIXING.

F. Repair Fairing Compound on Window Frame

(1) Apply fairing compound with a spatula or an extrusion gun to the uneven surfaces, gaps and voids of window frame and fair to the desired contour and smoothness. Care must be exercised to avoid air entrapment and the formation of surface air bubbles during application of the fairing compound.

(2) Position faceplate or window in window frame immediately after application of the fairing compound. Press the faceplate gently against the window frame until high spots on the window frame are in contact with the faceplate.

CAUTION: STEPS (1) THRU (5) MUST BE COMPLETED DURING THE APPLICATION TIME OF THE COMPOUND - REFER TO TABLE I.

(3) Apply a sample bead of compound, from batch used in step (A), to a piece of scrap metal and set aside to cure under the same atmospheric conditions.

NOTE: To accelerate curing of compound, circulate warm air, not to exceed 120°F (46°C), over the compound and metal surfaces.

(4) Install every third or fourth bolt and tighten bolts enough to hold the faceplate in position. Compound should extrude from all points around faying surface being repaired.

CAUTION: DO NOT OVERTIGHTEN BOLTS AND WARP FACEPLATE OR WINDOW FRAME, BECAUSE SPRINGBACK MAY NECESSITATE FURTHER FAIRING.

(5) Remove excess compound, from boltholes by inserting bolts, and from around frame (AMM 51-31-0/201).

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE EXCESS COMPOUND. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

(6) Remove the faceplate after the time shown under "Release from Mold" in Table I.

TABLE I - APPLICATION TIME AND CURE RATE

Material	Temperature (°F)	Temperature (°C)	Application Time (Hrs)	Release From Mold (Hrs)	Sandable (Hrs)	Full Cure (Hrs)
Tereco 175 M	75 ±5	24 ±3	3	24	48	240
	120 ±5	46 ±3	N.A.	2.5	5	24
EC 3587 -1/4	75 ±5	24 ±3	.25	2	4	48 *[1]
	120 ±5	46 ±3	N.A.	1	2	20
EC 3587 -1	75 ±5	24 ±3	1	8	16	96 *[1]
	120 ±5	46 ±3	N.A .	2	4	30

*[1] Shore A reading of 90 (min.) 5-second reading.

NOTE: N.A. = Not Applicable

(7) Make sure that the sealant is cured.

NOTE: If the appropriate hardness testing equipment is not available, it can be sufficient to check that the sample compound is "tack free," or hard enough not to adhere to the finger when touched. This check is important. If flight is allowed with a window installed on fairing compound of which large areas are wet, cabin pressure may cause leaks around the window edge.

(8) Trim excess compound from window frame.
(9) Fill any voids in excess of 0.01 inch diameter with additional compound and allow it to harden.

WINDOW NO. 1 - REMOVAL/INSTALLATION

1. General

A. The number 1 window (windshield) is pressure sealed on installation by means of a gasket like, molded-in-place rubber seal. The beaded silicone rubber seal surface mates with the window frame to ensure an effective pressure and moisture tight seal around window (Fig. 401). On windows without Z-channel strip, the rubber pressure seal is molded to windshield glass. A bumper strip is an integral part of pressure seal and provides protection against chipping edge of glass and moisture penetration. On windows with Z-channel strip, the pressure seal is an integral part of the window assembly and in combination with a formed stainless steel Z-channel strip, is bonded to periphery of windshield glass.

CAUTION: DO NOT ATTEMPT TO REMOVE Z-CHANNEL STRIP FROM WINDSHIELD GLASS, DOING SO WILL DISTURB INTEGRITY OF PRESSURE SEAL.

B. Fairing compound is applied to the window frame and its purpose is to accommodate the irregularities in the frame surface, ensuring that a perfectly flat surface is presented to the windowpane. The thickness of the compound varies, at high spots on the window frame there is no compound.

C. Also shown on Fig. 401 are some items which are not components of the pressure seal. They are:

(1) Aerodynamic Smoother

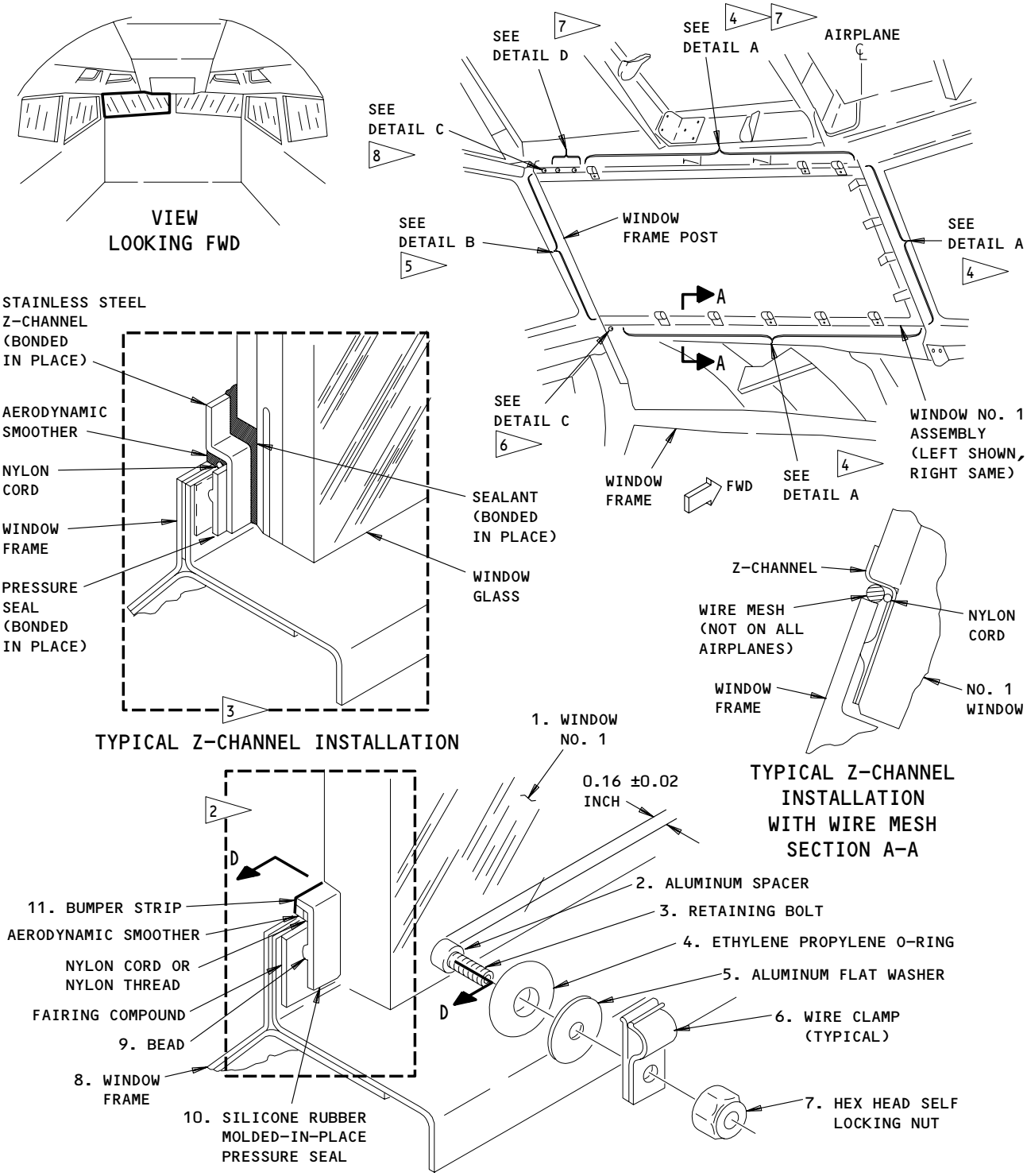
(a) Aerodynamic smoother is installed in the gap between the window frame and the edge of the bumper strip and provides aerodynamic flushness and protection against water entrapment. A nylon cord or nylon thread is installed under the aerodynamic smoother to facilitate its removal when required.

(2) O-Rings

(a) Ethylene propylene O-rings are installed under the nut washers except on the fasteners where seal washers are installed. The O-rings are allowed to compress a predetermined amount thereby transmitting sufficient compression load into the window assembly to compress the seal bead to make a weather seal. On fasteners adjacent to windshield heat terminals, colored silicone rubber O-rings, being nonconductive, are preferred to ethylene propylene rings. No clearance with terminal is required when using nonconductive O-rings. Rubber O-rings may also be used in place of ethylene propylene O-rings at other locations if desired.

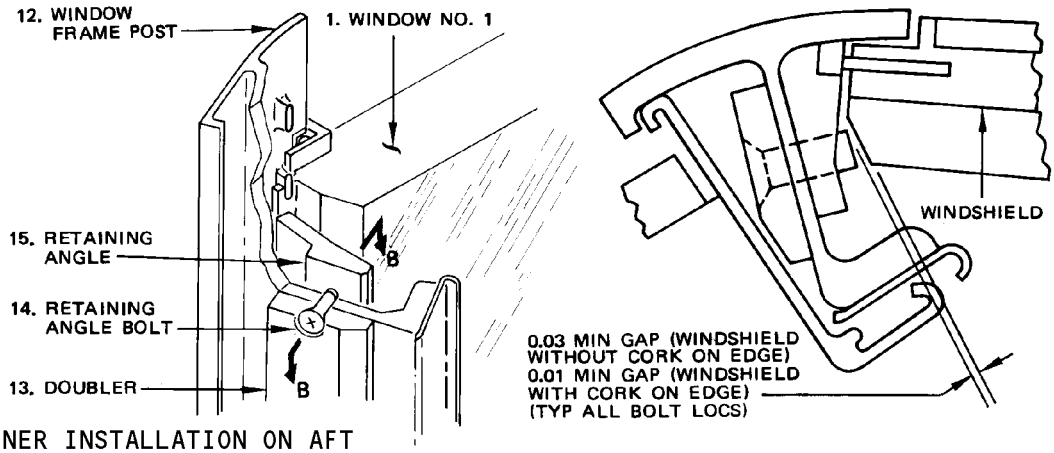
(3) Seal Washers

(a) Silicone rubber seal washers are installed over the inboard end of the spacers and under the nut washer at the fastener locations on the window shown on Fig. 401. The silicone rubber seal washers function in a similar manner to the O-rings as described.



TYPICAL FASTENER INSTALLATION ON TOP, BOTTOM AND FORWARD EDGE OF WINDOW NO. 1 EXCEPT AS SHOWN ON DETAILS C AND D DETAIL A

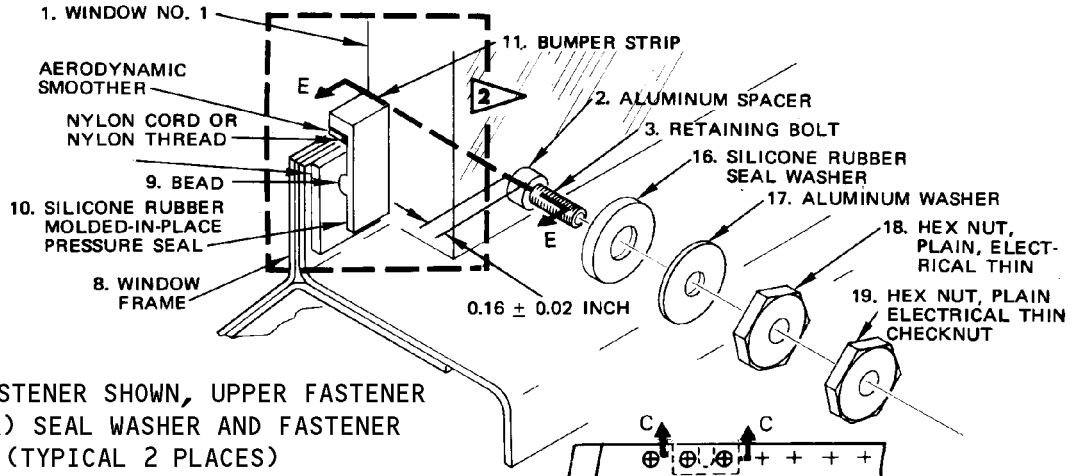
Window No. 1 Installation
Figure 401 (Sheet 1)



FASTENER INSTALLATION ON AFT EDGE OF WINDOW NO. 1 (WINDOW WITHOUT Z-CHANNEL SHOWN OTHER WINDOW SIMILAR)

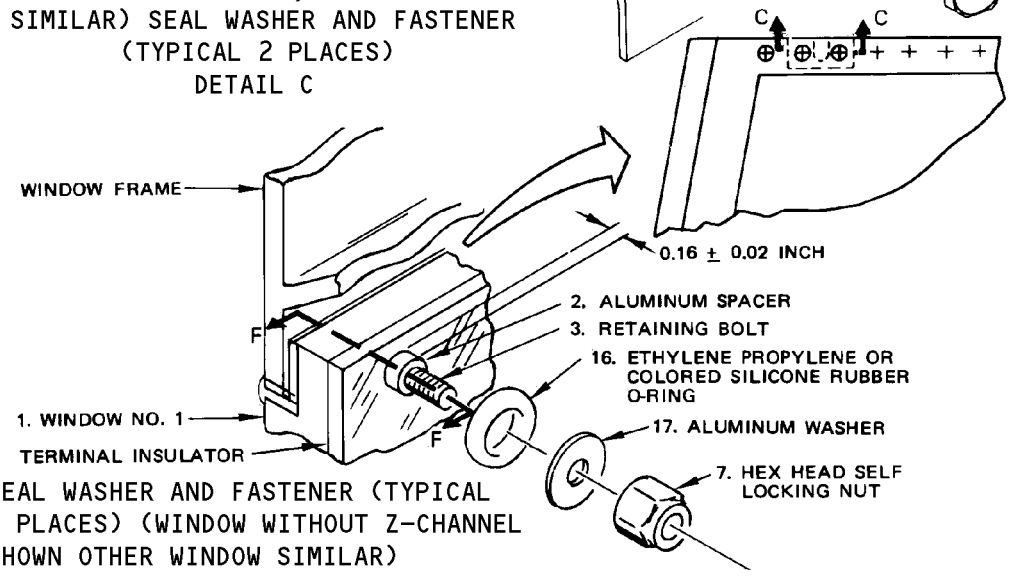
DETAIL B

SECTION B-B



(LOWER FASTENER SHOWN, UPPER FASTENER SIMILAR) SEAL WASHER AND FASTENER (TYPICAL 2 PLACES)

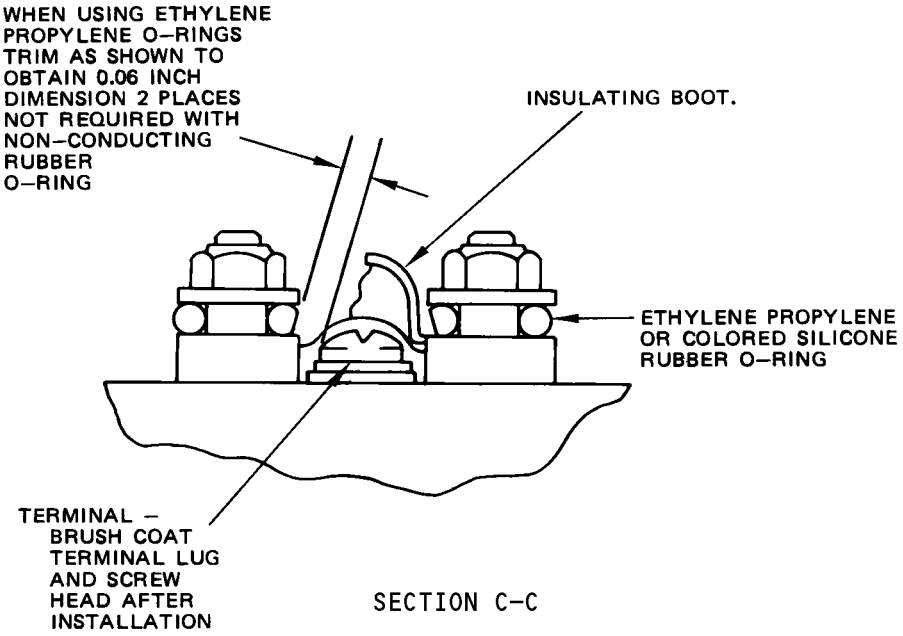
DETAIL C

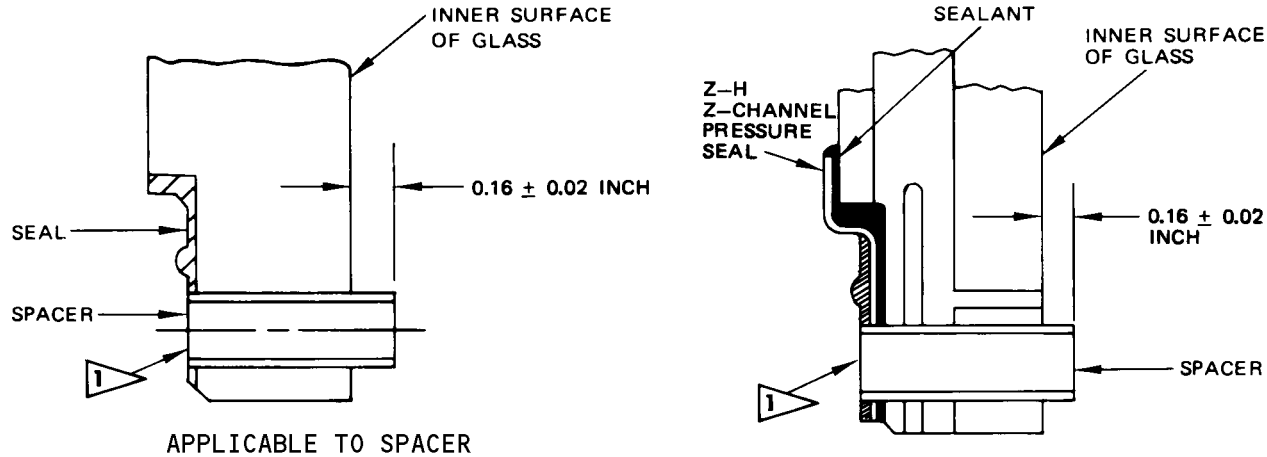


SEAL WASHER AND FASTENER (TYPICAL 2 PLACES) (WINDOW WITHOUT Z-CHANNEL SHOWN OTHER WINDOW SIMILAR)

DETAIL D

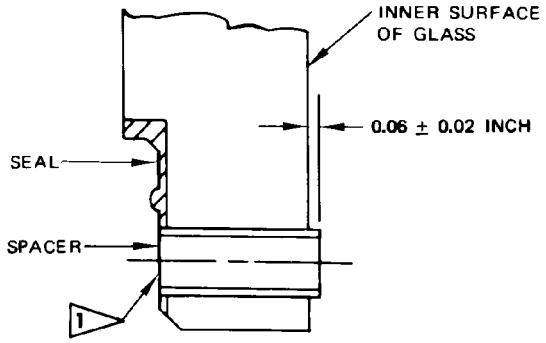
Window No. 1 Installation
Figure 401 (Sheet 2)



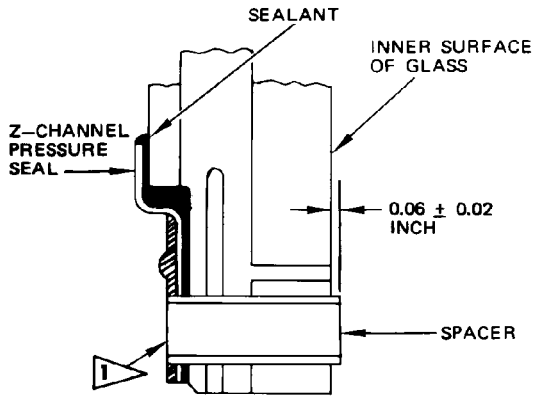


NOTE: RETAINNING BOLT AND WINDOW FRAME REMOVED FOR CLARITY.

Window No. 1 Installation
Figure 401 (Sheet 3)

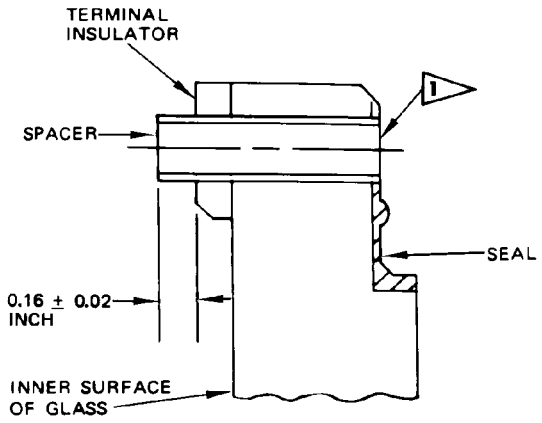


APPLICABLE TO SPACER
5-89354-44 AND -45

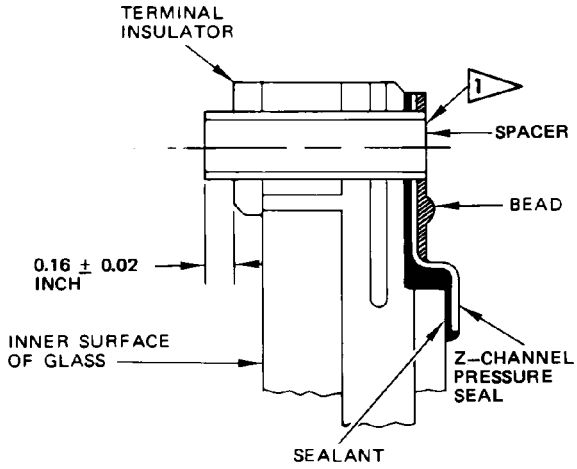


APPLICABLE TO SPACER
5-89354-3044 AND -3045

SECTION E-E



APPLICABLE TO SPACER 5-89354-43



APPLICABLE TO SPACER 5-89354-3043

NOTE: RETAINING BOLT AND WINDOW FRAME REMOVED FOR CLARITY

SECTION F-F

1. END OF SPACER SHALL BE FLUSH WITH SEAL SURFACE WHEN MEASURING PROJECTION OF OPPOSITE END.
2. WINDOWS WITHOUT Z-CHANNEL STRIP
3. WINDOWS WITH Z-CHANNEL STRIP
4. 3/16 NUTS 20 TO 25 POUND-INCHES
5. 72 TO 88 POUND-INCHES
6. LOWER 3/16 NUT 20 TO 25 POUND-INCHES
7. 1/4 NUTS IN DETAIL A AND D 50 TO 70 POUND-INCHES
8. 1/4 NUT UPPER DETAIL C 30 TO 45 POUND-INCHES

Window No. 1 Installation
Figure 401 (Sheet 4)

D. Replacement windows are supplied with necessary parts for installation and with both sides of pane covered with a protective coating.

2. Equipment and Materials

A. Protective covering for windows not already protected - Polyester Transparent Tape, No. 850 (AMM 20-30-51)
B. Masking Tape - No. 221 (AMM 20-30-51)
C. Window Frame Fairing Compound - EC-3587-1/4 or EC-3587-1 (AMM 20-30-11)
D. Aliphatic Naphtha - TT-N-95A, Type II (AMM 20-30-31)

NOTE: Freon-TF, or equivalent, may be used in lieu of aliphatic naphtha, TT-N-95A, Type II, for general cleaning of windows.

E. Corrosion-Preventive Compound - MIL-C-11796, Class 3 (AMM 20-30-21)
F. Nylon Cord - MIL-C-5040, Type 1A, or Nylon Thread - V-T-295A, Type I, Class 2, No. 9 (AMM 20-30-51)
G. Aerodynamic Smoother - PR 1425, Alternate BMS 5-45 or BMS 5-95, Class B (AMM 20-30-11)
H. Sealant - PR 1826, Class B-1/2 and Class B-1/4 (with primer) (dark grey) (Alternate)
I. Sealant - PR 1828, Class B-1/2 and Class B-1/4 (white) (Alternative)
J. Spatula or Flow Gun
K. Cheesecloth - lint- and oil-free
L. Nonmetallic block to support bumper strip
M. Aluminum Tubular Wire Mesh - Knitted Mesh Tecknit 20-21112, Technical Wire Products, Inc., 427 Olive St., Santa Barbara, CA 93101

NOTE: Tubular wire mesh is required for PPG and Sierracin windows only. It is not required for Triplex windows.

N. Compound, Electrical Insulating Coating - BMS 5-37 (AMM 20-30-11)

3. Prepare Window No. 1 for Removal

A. Make sure that power is OFF in window heating circuit.

WARNING: OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGES FROM 250 TO 350 VOLTS. BE CAREFUL WHEN WORKING ON CONTROL CABIN WINDOWS TO AVOID ELECTRICAL SHOCK AND INJURY TO PERSONNEL.

B. Remove trim panels and crash padding where necessary (AMM 25-16-41/401).
C. Remove seat adjustment sight guide (AMM 25-11-31/401).
D. Remove lightshield (glareshield) (AMM 25-11-21).
E. Remove lightshield (glareshield) brackets or clips, as required.
F. Remove sunshade support rod above window, drain tube clamps at window post on airplane centerline, and drain pan.

NOTE: Drain tube must be pushed aside to allow window removal.

G. Disconnect power leads at window bus bar terminals.

H. Strip aerodynamic smoother from gap around outside edge of window (Fig. 402). Uncover free end of nylon cord and pull steadily. On windows without Z-channel, use a nonmetallic block to support edge of adjacent bumper strip until cord and smoother are removed.

NOTE: Free end of nylon cord is located in upper aft corner of window.

4. Remove Window No. 1

A. Remove window fasteners.

(1) Remove self-locking nuts (7, Fig. 401) and hexnuts (19 and 18).

(2) Remove wire clamp (6), aluminum flat washer (5) and O-ring (4).

(3) Remove aluminum washer (17) and silicone rubber seal washer (16).

(4) Remove retaining bolt (3) from window assembly (1) and window frame (8).

NOTE: At aft edge of window, a row of bolts attach a retaining angle to frame. Access to these bolts is obtained by opening adjacent sliding window.

B. Remove retaining angle bolt (14) from doubler (13), retaining angle (15) and window frame post (12).

C. Apply hand pressure to outside of window to break seal, and remove window. Always apply pressure to a wide area. Bumping with a rubber mallet and a nonmetallic block may be necessary if window is particularly difficult to remove. The spacers (2) and the silicone rubber molded-in-place pressure seal (10) with bumper strip (11) and bead (9) are removed with the window assembly.

D. Remove any remaining aerodynamic smoother from window frame (AMM 51-31-0/201).

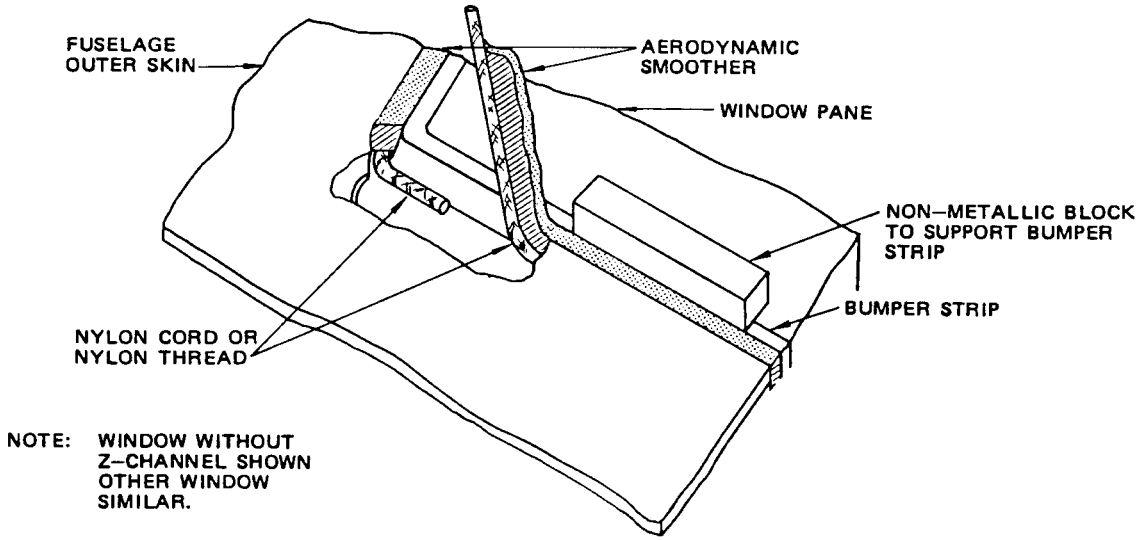
CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE AERODYNAMIC SMOOTHER. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

5. Prepare Window No. 1 for Installation

A. The new bolts, nuts, etc., that come with the windshield should be presorted for installation.

B. Make sure that power is OFF in window heating circuit.

WARNING: OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGES FROM 250 TO 350 VOLTS. BE CAREFUL WHEN WORKING ON CONTROL CABIN WINDOWS.



Removal of Window Gap Filler
Figure 402

C. Examine window frame (8, Fig. 401), to determine if fairing compound requires repair.

NOTE: Spacer (2) will crush the fairing compound on structure locally around end of the spacer. The compound should not be repaired on subsequent window installations.

(1) Except for the area that comes into contact with the end of the spacer (2), if the fairing compound is cracked, chipped, broken away, or damaged in any way, repair it (AMM 56-11-0/801).

D. Do a visual check of the window post and sill for cracks and corrosion.

E. Check window resistance (AMM 30-41-21/501).

F. Apply protective tape cover to both window surfaces, aligning tape with edges of glass panes.

G. Clean faying surfaces of pressure seal, faying surfaces of window frame, and window frame post, with aliphatic naphtha. Use a clean cheesecloth to apply naphtha and a clean cheesecloth to wipe it off. Do not allow naphtha to dry on surface. Repeat cleaning until surfaces are free of residual film, taking care not to damage or deform either faying surface.

WARNING: NAPHTHA IS FLAMMABLE AND HAZARDOUS. USE IN A WELL-VENTILATED AREA. AVOID PROLONGED BREATHING OF VAPORS. AVOID EYE AND SKIN CONTACT. KEEP AWAY FROM SPARKS AND FLAMES.

H. Position window (1) in window frame (8) and window frame post (12) and check that a uniform gap exists between outside edge of the window and fuselage outer skin.

(1) On windows without Z-channel strip, examine that bumper strip on beaded silicone rubber molded-in-place pressure seal (10) is properly positioned in window frame (Fig. 401).

(2) Examine that aluminum spacers (2) are inserted in boltholes of window assembly (1).

NOTE: Retain spacers in boltholes by friction or other means until retaining bolts and attaching nuts are installed. Do not bond spacers. Spacers must be free to move on bolts and within boltholes in window.

(3) Treat bolt shanks with a corrosion preventive compound just prior to installation.

6. Install Window No. 1

A. Equipment and Materials

(1) Tape - Scotch Cal No. 639 (AMM 20-30-51)

(2) Corrosion-Preventive Compound - MIL-C-11796, Class 3 (AMM 20-30-21)

B. Install window in frame.

CAUTION: MAGNETIC OR HIGH PERMEABILITY MATERIALS SHALL NOT BE INSTALLED WITHIN A 20-INCH RADIUS FROM THE CENTER OF THE MAGNETIC COMPASS, NOR SHALL THEY BE INSTALLED NEARBY IF, AFTER MAINTENANCE REMOVAL, THEY MIGHT BE INSTALLED WITHIN THE 20-INCH RADIUS.

(1) Apply corrosion preventive compound to the fasteners.
(2) Install retaining bolts (3) into position (AIPC 56-10-00-0-1).

CAUTION: USE ONLY NONMAGNETIC BOLTS (HEAT TREATED TO 140,000 PSI) ALONG TOP, BOTTOM, AND FORWARD EDGES BECAUSE OF PROXIMITY OF STANDBY COMPASS. BOLTS ATTACHING WINDOW RETAINING ANGLE AT AFT EDGE ARE NOT STANDARD AND MUST BE REPLACED ONLY BY IDENTICAL BOLT. OBSERVE SPECIFIED TORQUE FOR BOLTS ON EACH WINDOW INSTALLATION AS DAMAGE CAN RESULT IF TORQUE IS EXCEEDED.

(3) Install silicone rubber seal washer (16), aluminum washer (17), hexnut (18) and self-locking nut (7), finger-tight at this time.
(4) Install O-rings (4), flat washers (5) and wire clamps (6).
(5) Install self-locking hex head nuts (7), finger-tight at this time.

NOTE: NAS679C(-)W nuts are low permeability (nonmagnetic).

(6) Install retaining angle bolts (14). Maintain minimum gap requirements between bolts and windshield (Fig. 401). Tighten nuts 72 to 88 pound-inches.

CAUTION: NUMBER 1 WINDOW INNER PANE CAN BE CRACKED IF MINIMUM GAP BETWEEN RETAINING ANGLE BOLT AND WINDOWPANE IS NOT MAINTAINED.

NOTE: Adjacent sliding window must be open to permit insertion of special retaining angle bolts (14, Fig. 401) attaching window retaining angle (15) and doubler (13) along aft edge of window (1) to window frame post (12). These bolts should be installed while window is retained by one finger-tight bolt in each remote corner, thus allowing some shift for proper alignment and easy installation of remaining bolts.

(7) Tighten attaching nuts up finger-tight at first and then, using a staggered sequence (diagonally back and forth across window in a criss-cross pattern), tighten each nut to correct torque value (see Fig. 403 for typical nut torque sequence and Fig. 401 for torque values).

(8) Install checknut (19, Fig. 401).

NOTE: Pressurized flight tends to bed any newly installed fixed window down in frame. As a result, after initial pressurization if leakage occurs, attaching nuts should be checked. Any loose nut should be retightened to a torque of not more than 5 pound-inches with checknuts removed. Damage can result if this torque is exceeded. Replace and tighten checknuts, while attaching nuts are being held. After this occasion, no further retightening should ever be done unless water or air leaks occur, in which case, retightening of attaching nuts should again be limited to a torque of 5 pound-inches. For self-locking attaching nuts, 5 pound-inches is the torque above run-on torque for nut.

C. Apply masking tape over outside gap between window and skins to prevent contamination prior to filling with nylon cord and smoother.

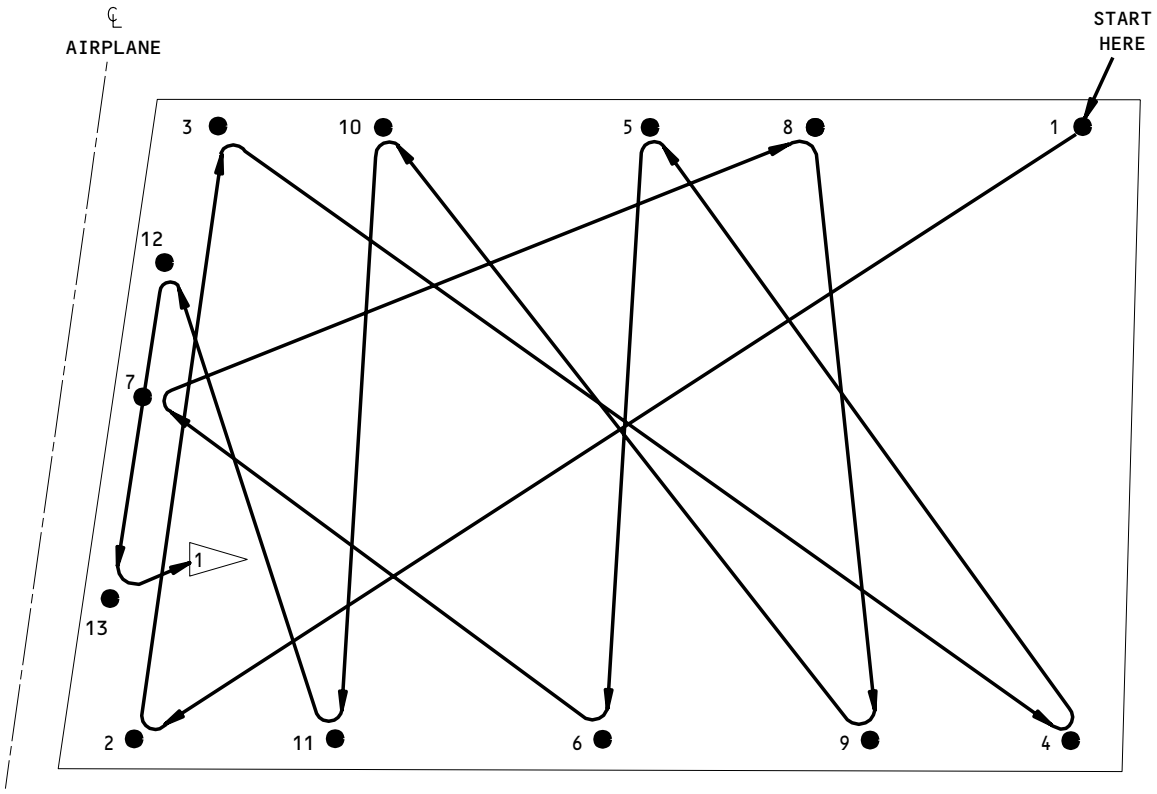
D. Remove strip of masking tape immediately over gap at outside edge of window. This can be done with a sharp knife so as to leave strips of masking tape protecting the edges of the gap.

E. Insert a clean, dry nylon cord, slightly longer than window perimeter, in bottom of gap at outside edge of window. The two ends should meet in the upper aft corner of the window frame and overlap approximately 0.5 inch.

NOTE: To ease insertion of cord, stretch it slightly and tamp down into gap with a spatula if necessary.

F. On PPG and Sierracin windows with Z-channel strip, check resistance between Z-channel and structure. If resistance is greater than 1 ohm, install wire mesh between Z-channel and structure. Wire mesh may be added to all airplanes in lieu of the resistance check.

(1) Remove paint from edge of frame structure where wire mesh contacts (four places, one in middle of each side).



NO. 1 WINDSHIELD
VIEWED FROM OUTSIDE
(LEFT SHOWN, RIGHT OPPOSITE)

NOTE: THIS IS A SAMPLE PATTERN. ANY SIMILAR PATTERN WITH THE AIM OF TYING DOWN THE WINDOW PERIPHERY AT AS MANY WIDELY DISPERSED POINTS AS POSSIBLE AS EARLY IN FASTENER INSTALLATION AS POSSIBLE WILL SUFFICE.

1 CONTINUE IN THIS MANNER, ALWAYS PROCEEDING TO A FASTENER WHICH IS MIDWAY BETWEEN TWO INSTALLED FASTENERS.

Window No. 1 Retaining Bolt Torque Sequence
Figure 403

(2) Refinish with chemical film treatment (alodine or Iredite).
(3) Install 2 to 3-inch length of aluminum wire mesh near middle of each side of window in gap between Z-channel and structure.

G. Inject aerodynamic smoother into the gap by means of a flow gun or with a spatula until the gap is completely filled. Do not trap air under the smoother. Apply smoother over bumper strip or Z-channel to overlap glass surface 0.15 ±0.03 inch.
(1) If airplane must be dispatched prior to sealant cure completion, cover sealant with Scotch Cal tape. Remove tape when cure is complete.

CAUTION: SMOOTHER IS AVAILABLE WITH SEVERAL WORK LIVES TO SUIT A VARIETY OF JOBS. STEPS F., G., AND H., MUST BE COMPLETED DURING WORK LIFE SELECTED.

H. Remove excess filler, while still wet, until just level with the masking tape (AMM 51-31-0/201).

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE EXCESS FILLER. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

I. Remove masking tape from edges of gap and protective cover from outside surface of window. Smoother material lifting at edges of the gap can be smoothed over with a tool.

7. Restore Airplane to Normal Configuration
A. Connect power leads to window bus bar terminals.
(1) Make sure that the transformer taps connected to the leads match the window resistance (AMM 30-41-21/501).

CAUTION: MAKE SURE THAT THE TRANSFORMER TAPS CONNECTED TO THE LEADS MATCH THE WINDOW RESISTANCE. INCORRECT CONNECTION CAN CAUSE DAMAGE TO WINDOW OR HEATING CIRCUIT.

(2) Remove all paint or primer from electrical contacts prior to wire installation.
(3) If ethylene propylene O-rings are used on fasteners adjacent to the bus bar terminals, trim O-ring as shown in Fig. 401 to provide minimum gap. This step unnecessary if nonconductive rubber O-rings are installed on adjacent windshield fasteners.

(4) Brush terminals with a single coat of insulating coating compound, BMS 5-37.
(5) Install insulating boot over terminal connection.

B. Install drain pan, drain tube clamps at window post on airplane centerline, and sunshade support rod above window.
C. Install lightshield (glareshield) brackets or clips, if previously removed.
D. Install lightshield (glareshield) (AMM 25-11-21).
E. Install trim panels and crash padding where necessary (AMM 25-16-41).
F. Install seat adjustment sight gage (AMM 25-11-31).
G. Remove protective cover from inside surface of window.
H. Test window heating system (AMM 30-41-0/501).
I. Rerig windshield wiper blade as required (AMM 30-42-11/401).

WINDOW NO. 1 - INSPECTION/CHECK

1. General
   A. The inspection/check of window No. 1 should be in accordance with established window damage criteria in addition to the following (Ref 56-11-0, Control Cabin Windows - Damage Criteria).
2. Window No. 1 Inspection
   A. Examine and replace the No. 1 window if any of the following is found:

      NOTE: You may find 0.08 inch diameter tong marks at the upper and lower inboard corners of the window. Tong marks are acceptable on the inner and outer glass pane provided the tong marks do not extend more than 0.50 inch (maximum) from the edge of the outer glass pane. Tong marks on the window occur during the fabrication of the window when it is hung to cool after tempering.

      (1) Outer Glass Pane:
          (a) Cracks, chips, delamination which decrease the visual capacity.
          (b) Cracks, chips, delamination or an intermittent operation which cause the No. 1 window heat system to not operate.
          (c) Arcing, electrical discontinuity or cracks rendering main window heating system inoperative.

              NOTE: Refer to limitation section, Boeing 737 Flight Manual for control cabin window heat requirements. Outer pane is not a structural member. No. 1 window replacement due to outer pane damage should be based upon window heat and visibility requirements and can be delayed to the nearest maintenance interval. Window heat leads should be disconnected and secured if replacement is delayed.

      (2) Inner Glass Pane:
          (a) Cracks of any kind.
          (b) Scratches deeper than 0.015 inch.
          (c) Conchoidal chips in either surface, deeper than 0.015 inch.
          (d) V-shaped chips of any kind.

(3) Middle Vinyl Pane
(a) Cracks of any kind.

B. Examine Window No. 1 For Delamination
(1) Delamination is the separation of glass pane from adjacent vinyl inner layer. Affected area may be clear but will be cloudy if penetrated by moisture. Electrical heating system may be affected. Since delamination has no affect on the structural integrity of the windshield, the following limits are to be used as approximate guidelines for window replacement. Minor variations from these limits are acceptable providing flight personnel have not indicated that visibility is affected.
(a) Isolated delamination areas (island delamination) with diameter of 3/4 inch or more and located more than 2 inches from nearest edge.
(b) Continuous edge delamination which extends 2-1/2 inches or more from the originating edge (top or side), 3-1/2 inches or more top corner radius, 2 inches or more from the bottom edge or 3 inches or more from a lower corner toward the center of the panel.
(c) Any dalamination that is cloudy (indicating moisture between the vinyl and glass).

C. Examine and replace aerodynamic smoother (sealant) (AMM 51-31-0/201) if any of the following are found:

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO APPLY THE AERODYNAMIC SMOOTHER. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

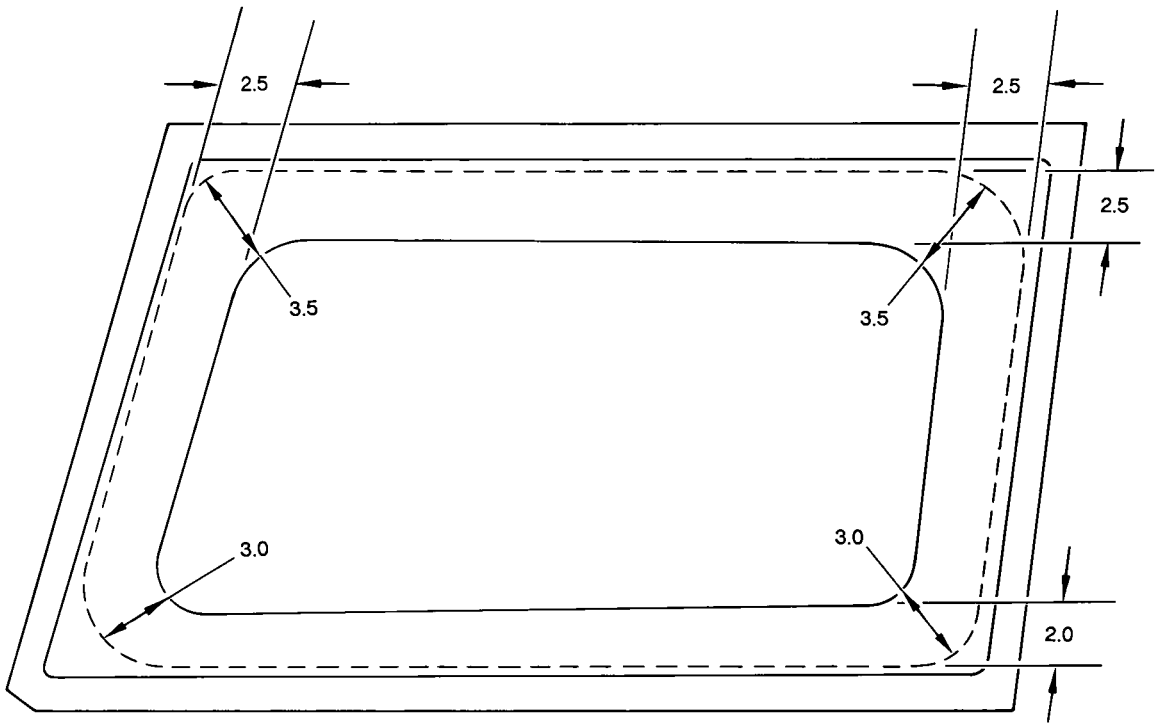
(1) Erosion
(2) Gaps or voids
(3) Does not overlap the glass
(4) Is not bonded to the glass

NOTE: An unsharpened pencil can be used in determining sealant adhesion. Depress wooden tip on sealant surface gently and push away from windshield with a very slight force. Do not apply too much pressure - i.e., not enough to penetrate surface of sealant or to break a good bond. If sealant is loose, a very small force will show a gap between glass and sealant.

3. Window No. 1 Check
A. Check for loose or missing fasteners in window frame.

CAUTION: TO REDUCE POSSIBILITY OF WINDOW BREAKING, LOOSE OR REPLACEMENT BOLTS SHOULD NOT BE TORQUED MORE THAN THE SPECIFIED TORQUE VALUE AND SPACERS SHOULD NOT BE TOO SHORT OR TOO TIGHT IN BOLT HOLES (REF WINDOW NO. 1 - REMOVAL/INSTALLATION).

B. Check window heating system for correct functioning (Ref Chapter 30, Control Cabin Window Anti-Icing System).



NOTE:
DOTTED LINE IS EDGE OF PARTING MEDIUM
ALL DIMENSIONS ARE IN INCHES

No. 1 Window Delamination Limits
Figure 601

WINDOW NO. 3 - REMOVAL/INSTALLATION

1. General
   A. The number 3 window is installed with a beaded silicone rubber molded-in-place pressure seal (Fig. 401). The beaded rubber seal is molded to the window mounting surface. A continuous bead molded in the rubber seal ensures an effective pressure seal around the window.
   B. Also shown on Fig. 401 are some items which are not components of the pressure seal. They are:
      (1) Aerodynamic Smoother. Aerodynamic Smoother is installed in the gap between the window frame and the edge of the window and pressure seal and provides aerodynamic flushness and protection against water entrapment. A nylon cord, or nylon thread, is installed under the aerodynamic smoother to facilitate its removal when required.
      (2) Rubber Cushion Strip and Metal Backing Plate. The rubber cushion strip is bonded to the metal backing plate. The rubber cushion strip is allowed to compress predetermined amount thereby transmitting sufficient compression load into the window assembly to compress the seal bead to make a weather seal.
   C. Replacement windows are supplied complete with the necessary parts for installation and with both sides of the pane covered with a plastic coating.
2. Equipment and Materials
   A. Protective covering for windows not already protected: Polyester Transparent Tape No. 850 (Ref 20-30-51)
   B. Masking Tape - No. 221 (Ref 20-30-51)
   C. Aliphatic Naphtha - TT-N-95A, Type II (Ref 20-30-31)
   D. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
   E. Nylon Cord - MIL-C-5040, Type 1A or Nylon Thread, V-T-295a, Type I, Class 2, No. 9 (Ref 20-30-51)
   F. Aerodynamic Smoother - BMS 5-95, Class B, or PRO SEAL 860 Class B (Ref 20-30-11)
   G. Spatula or flow gun
   H. Cheesecloth, lint and oil free
3. Prepare Window No. 3 for Removal
   A. Remove trim panels and crash padding where necessary (Refer Chapter 25, Control Cabin Equipment).
   B. Strip aerodynamic smoother from gap around outside edge of window.

      NOTE: A nylon cord, or nylon thread, is provided to facilitate this step. The free end of the cord, or thread, is located in the upper aft corner of the window. Uncover the free end and pull steadily until cord, or thread, and smoother are removed (Fig. 402).

4. Remove Window No. 3
   A. Remove self-locking nuts (7, detail A, Fig. 403), support clip (6), metal backing plate (5), rubber cushion strip (4), and window retaining bolts (3) from the window assembly (1) and the window frame (10).
   B. Apply hand pressure to outside of window (1) to break seal, and remove the window (1) from the window frame (10). Always apply pressure to a wide area. Bumping with a rubber mallet and a nonmetallic block may be necessary if window is particularly difficult to remove. The insert bushings (2) and the silicone rubber molded in place pressure seal (8) with the bead (9) are removed with the window.
   C. Remove any remaining aerodynamic smoother from window frame (AMM 51-31-0/201).

      CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE AERODYNAMIC SMOOTHER. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

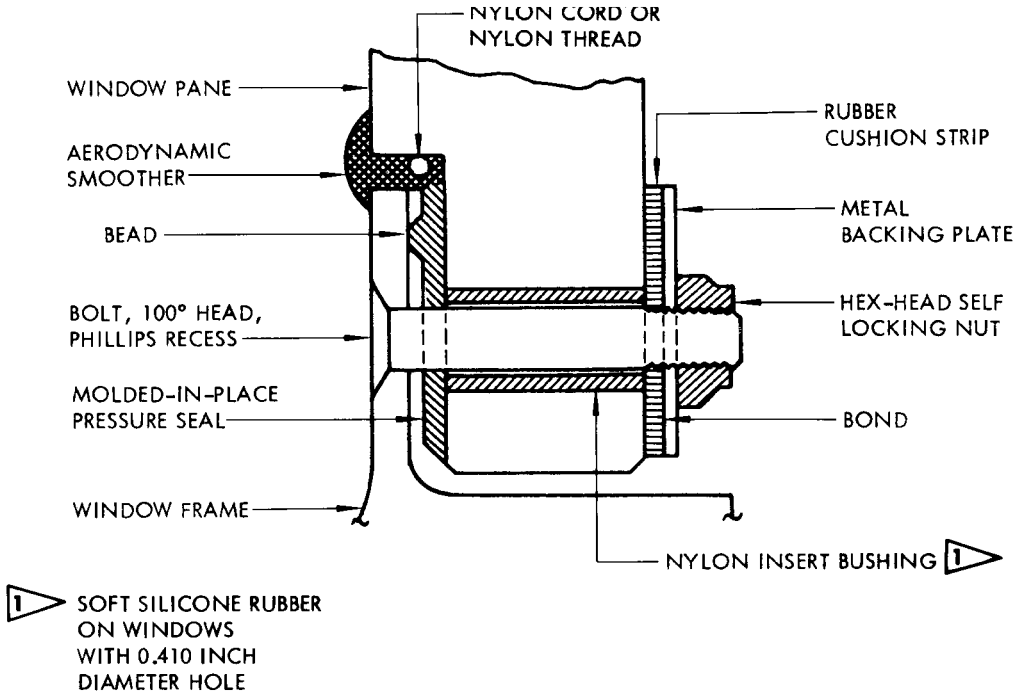
5. Prepare Window No. 3 for Installation
   A. Apply protective tape cover to both window surfaces, aligning tape with edges of glass panes.
   B. Clean faying surface of the seal (8, detail A, figure 403) and outside gap edge of both window assembly (1), and window frame (10) thoroughly with aliphatic naphtha. Use a clean cheesecloth to apply naphtha and a clean cheesecloth to wipe it off. Do not apply naphtha to dry on the surface. Repeat cleaning until surfaces are free of residual film, taking care not to damage or deform faying surfaces.

      WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

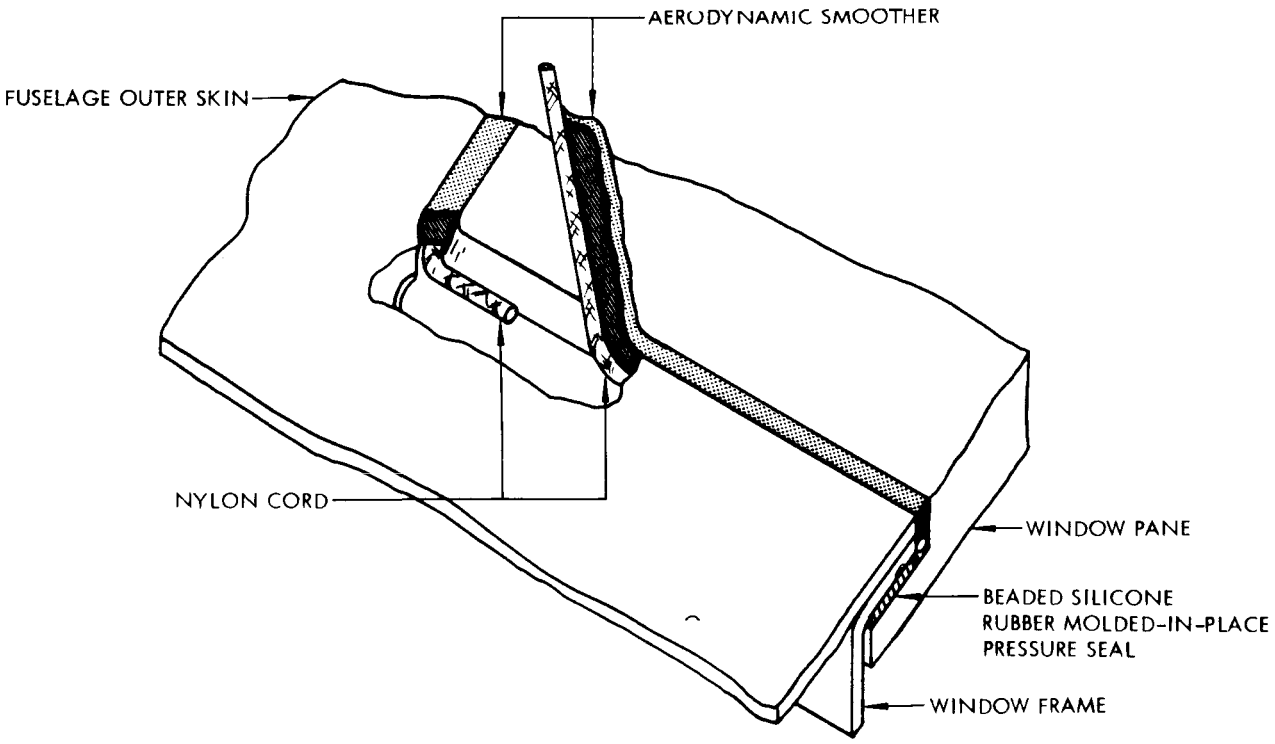
   C. Position window assembly (1) in window frame (10) and check that a uniform gap exists between outside edge of window and fuselage outer skin.
      (1) On windows with 0.250-inch diameter mounting holes, check that nylon insert bushings (2) are insert in the boltholes in the window assembly (1).

         NOTE: Retain the bushings by friction or other means until the retaining bolts and attaching nuts are installed. Do not bond the bushings. The bushings must be free to move on the bolts and within the boltholes in the window.

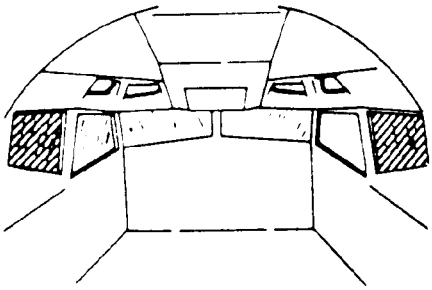
      (2) On windows with 0.410-inch diameter mounting holes, check that silicone rubber insert bushings (2) are inserted i n the bolt holes in the window assembly (1).
      (3) Treat the bolt shanks with a corrosion preventive compound just prior to installation.
6. Install Window No. 3
   A. Install window in frame.
      (1) Install retaining bolts (3, Fig. 403).
      (2) Install rubber cushion strip (4), metal backing plate (5) and support clip (6).

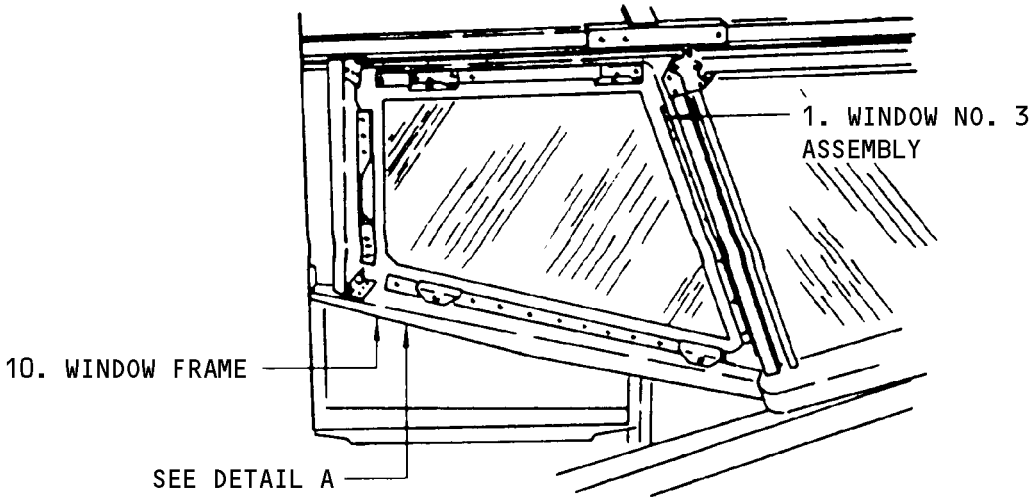


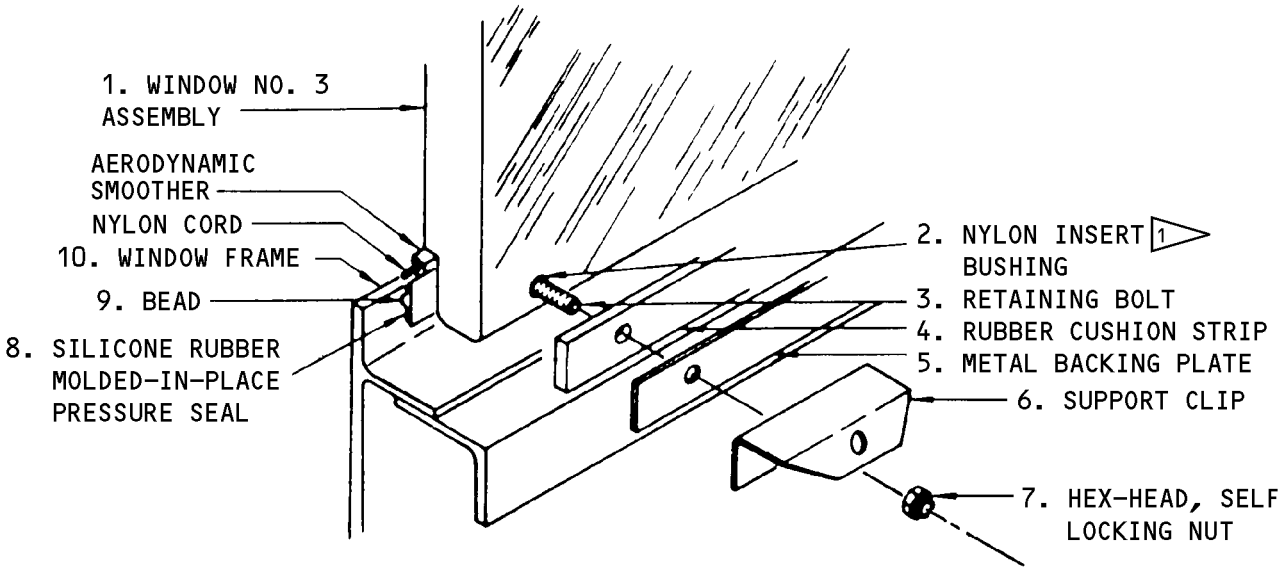
Window No. 3 Seal Details
Figure 401



Removal of Window Gap Filler
Figure 402







TYPICAL FASTENER INSTALLATION
ON EACH EDGE OF WINDOW NO. 3

DETAIL A

1 SOFT SILICONE RUBBER ON WINDOWS WITH 0.410 INCH DIAMETER HOLE

Window No. 3 Installation
Figure 403

(3) Install self-locking hex head nuts (7), finger-tight at this time.
(4) Torque each nut 2 0 to 25 pound-inches only using a staggered sequence, diagonally back and forth across window in a criss-cross pattern. (See Fig. 404 for typical nut torque sequence.)

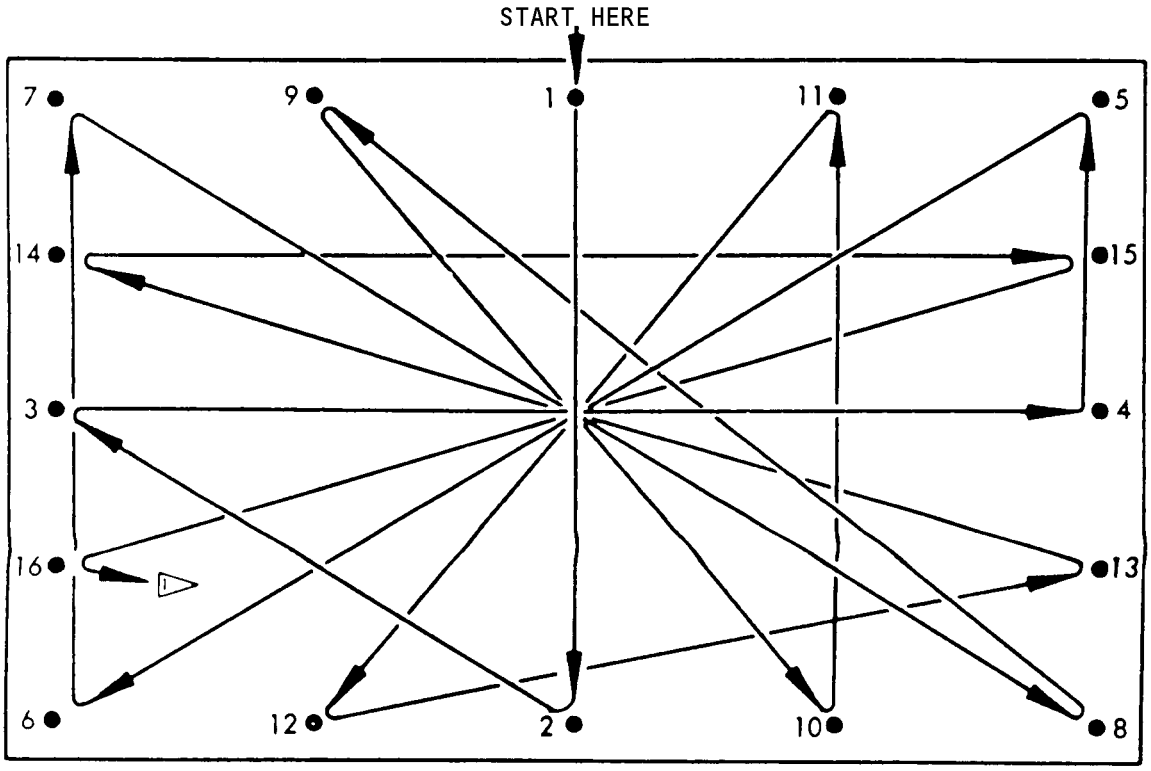
CAUTION: OBSERVE THE SPECIFIED TORQUE FOR BOLTS AS DAMAGE CAN RESULT IF THE TORQUE IS EXCEEDED.

NOTE: Rubber cushion strip causes a torque drop. Recheck torque until a stable reading is obtained. Pressurized flight tends to bed any newly installed fixed window down in its frame. As a result, after initial pressurization if leakage occurs the attaching nuts should be checked. Any loose nut should be retightened to a torque of not more than 5 pound-inches, with the checknuts removed. Damage can result if this torque is exceeded. Replace and tighten the checknuts, while the attaching nuts are being held. After this occasion no further retightening should ever be done unless water or air leaks occur, in which case, retightening of attaching nuts should again be limited to a torque of 5 pound-inches. For self-locking attaching nuts, the 5 pound-inches is the torque above the run-on torque for the nut.

CONTINUE IN THIS MANNER, ALWAYS PROCEEDING TO A FASTENER WHICH IS MIDWAY BETWEEN TWO INSTALLED FASTENERS AND ON A SIDE OTHER THAN THAT IN WHICH THE LAST ONE WAS INSTALLED

NOTE: This is a sample pattern, Any similar pattern with the aim of tying down the window periphery at as many widely dispersed points as possible as early in fastener installation as possible will suffice.

B. Apply masking tape over outside gap between window and skins to prevent contamination prior to filling with nylon cord and smoother.
C. Remove strip of masking tape immediately over gap at outside edge of window. This can be done with a sharp knife or equivalent so as to leave strips of masking tape protecting the edges of the gap.



Pattern for Typical Window Fastener Installation
Figure 404

D. Insert a clean dry nylon cord, slightly longer than window perimeter, in bottom of gap at outside edge of window. The two ends should meet in the upper aft corner of the window frame and overlap at approximately 0.5 inch.

NOTE: To ease insertion of cord, stretch it slightly and tamp down into gap with a spatula if necessary.

E. Inject aerodynamic smoother into the gap by means of a flow gun or with a spatula until the gap is completely filled. (See figure 405.) Do not trap air under the smoother.

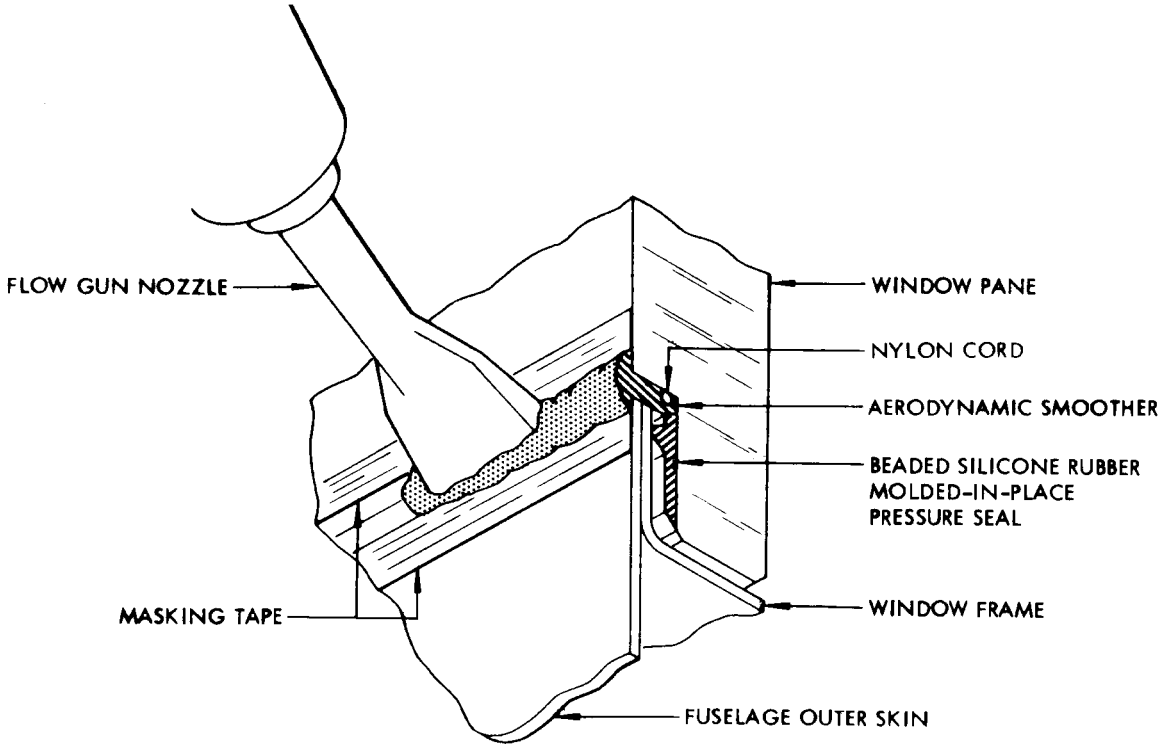
CAUTION: SMOOTHER IS AVAILABLE WITH SEVERAL WORK LIVES TO SUIT A VARIETY OF JOBS. STEPS E, F, AND G MUST BE COMPLETED DURING WORK LIFE SELECTED.

F. Remove excess filler, while still wet, until just level with the masking tape (AMM 51-31-0/201).

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE EXCESS FILLER. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

G. Remove masking tape from edges of gap and protective cover from outside surface of window. Smoother material lifting at edges of the gap can be smoothed over with a tool.

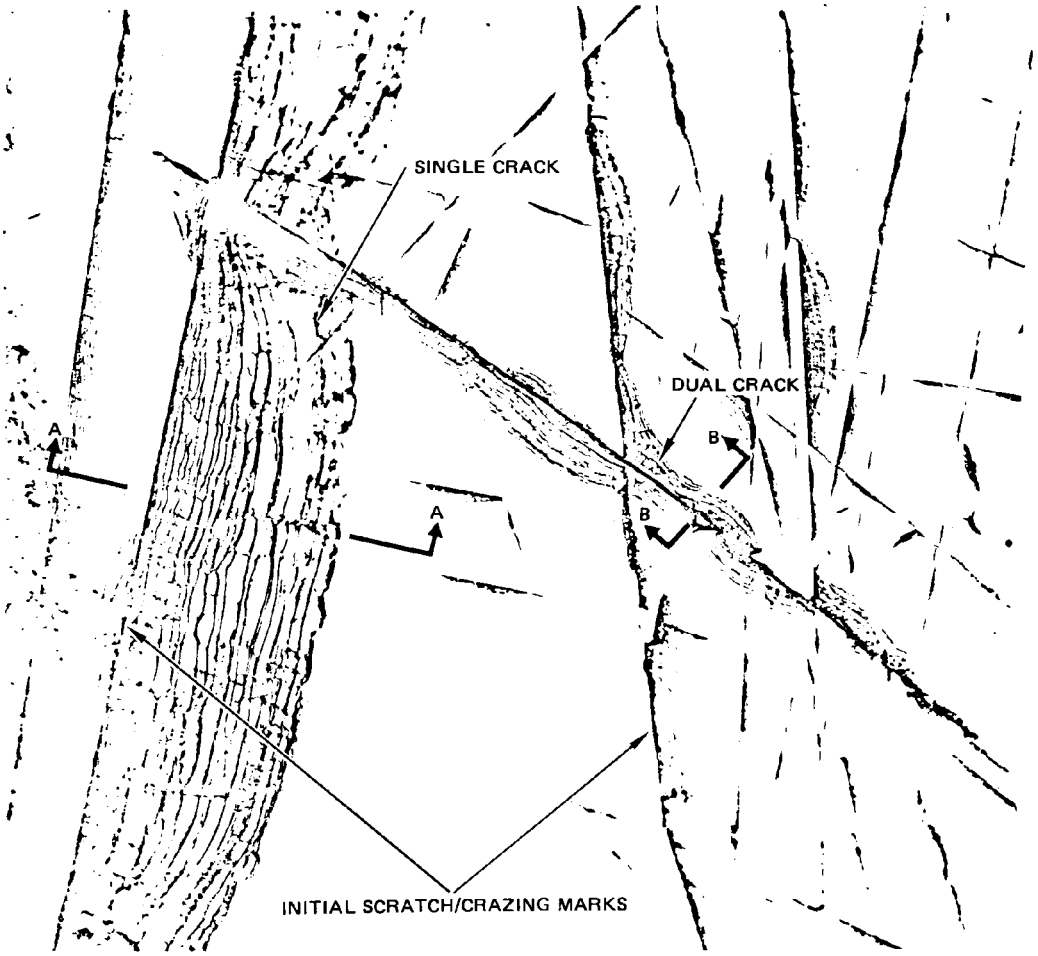
7. Restore Airplane to Normal Configuration
   A. Install trim panels and crash padding where necessary. Refer to Chapter 25, Control Cabin Equipment.
   B. Remove protective cover from inside surface of window.



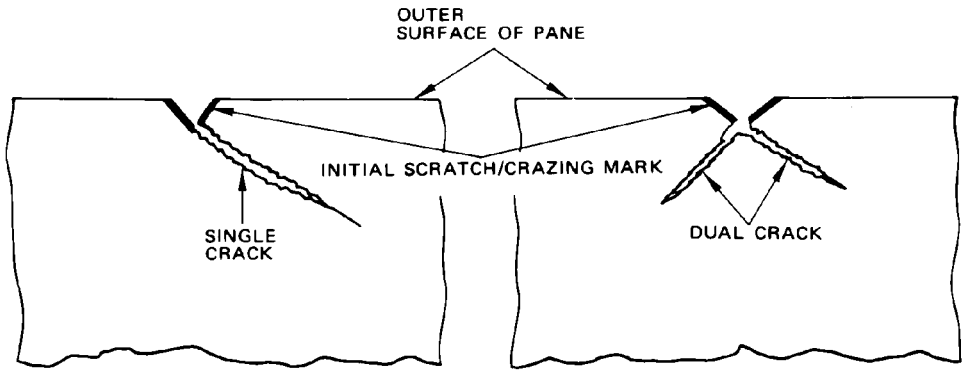
Application of Gap Filler
Figure 405

WINDOW NO. 3 - INSPECTION/CHECK

1. General
   A. The optical qualities of any window are of prime importance. Any window whose condition impairs visibility requires replacement.
      (1) Definitions of various types of damage are as follows:
         (a) Crazing:
            1) Series of very fine fissures perpendicular to surface of plastic. Due to extremely narrow width of fissures, crazing is very difficult to detect when viewed normal to surface. It can be seen by reflection from smooth surfaces of fissures when viewed at varying angles to the incident light.
         (b) Crack:
            1) A fissure which has visible width when viewed parallel to the faces of the fissure. A crack may propagate at any angle to surface of a plastic pane depending on direction of the driving force. Cracks in stretched acrylic may have a chevron or clamshell growth lines (Fig. 601). A crack will propagate from a stress riser such as a scratch or craze.
         (c) Scratch:
            1) The removal or displacement of material from the surface of a pane along a line. The ratio of depth to width is usually quite small.
         (d) Chips:
            1) Spall (shell type) chips have circular or curved periphery with many fine hairlines or ridges that follow the outline of outer edge and degenerate toward the center or deepest point of chip, similar to a clamshell.
            2) Vee-shaped chips have sharp narrow "V" shape and appear to propagate toward the interior of plastic.
         (e) Delamination also identified as in-plane cracking:
            1) A smooth surfaced fissure, or series of fissures, parallel to pane surfaces. In-plane cracking can occur in stretched acrylic and starts at edges of pane or at deep penetrations of the surface. It is most readily detected by the reflection of light from the smooth surfaces of the fissure.
         (f) Crackling:
            1) A series of cracks in the urethane layer that propagate around the window circumference adjacent to the frame toward the center of the window. These cracks may be accompanied by a slight yellowing or blurring of vision while looking through this area of the window (Fig. 603).
2. Equipment and Materials
   A. Optical Micrometer - Model 966A1, Edwards Aerospace Company, 1841 Business Pkwy, Ontario, CA 91761, Telephone (714) 923-3533, Fax (714) 923-6781



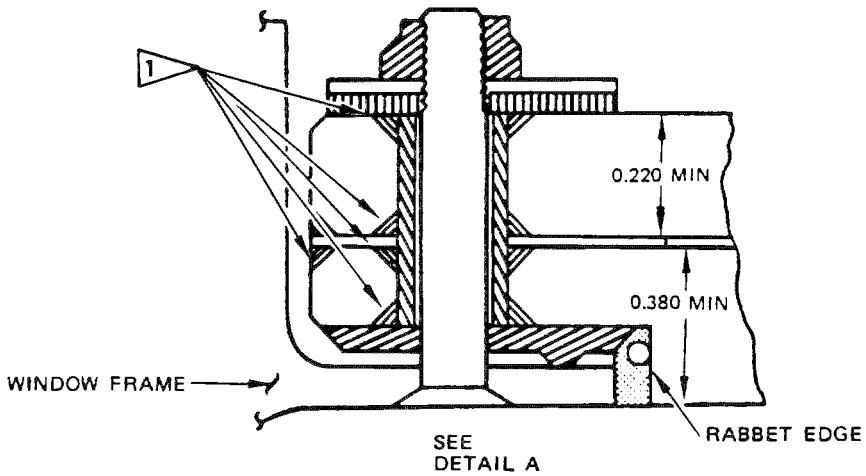
VIEW OF WINDOW SURFACE

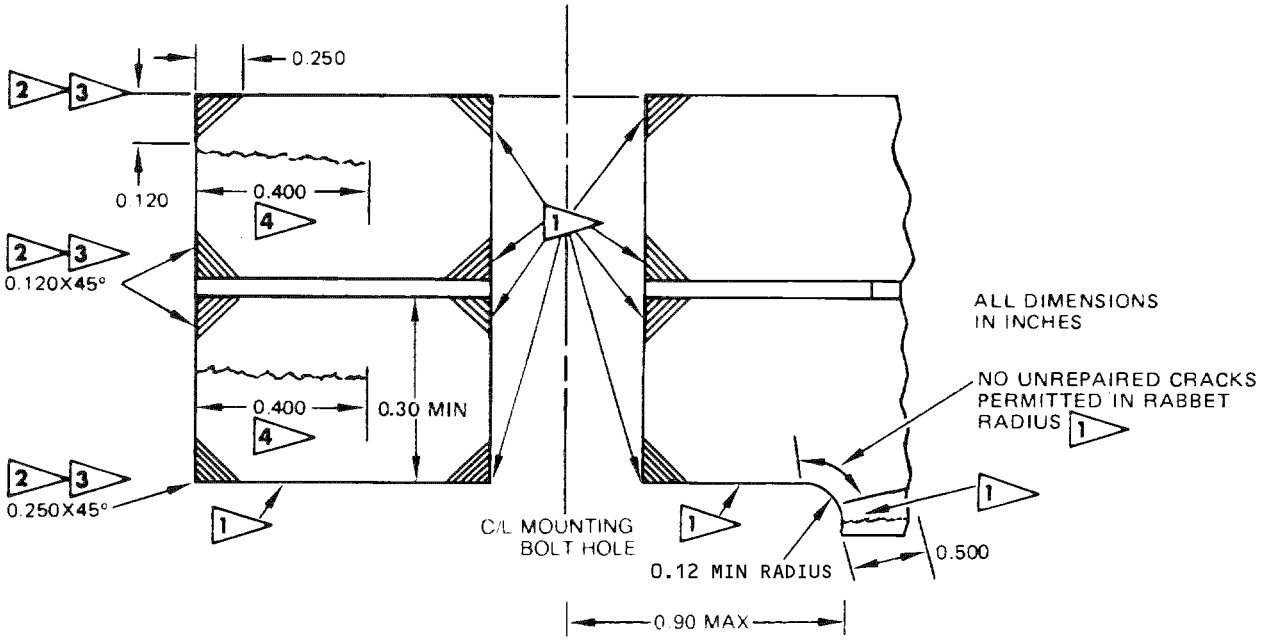


SECTION A–A SECTION B–B

NOTE: NOT TO SCALE – SECTIONS AND ILLUSTRATIONS DEPICTING CRACKS GREATLY ENLARGED TO EMPHASIZE CHARACTERISTICS OF CRACK DEVELOPMENT

Window Surface Crack Development – Typical (Outer Pane Stretched Acrylic)
Figure 601





DETAIL A

1. DAMAGE THIS AREA TO BE REPAIRED PER OVERHAUL MANUAL
2. MAY BE SMOOTHED TO 62RMS FINISH
3. ONLY ONE DEFECT PERMITTED WITHIN ANY CROSS SECTION OF THE INNER OR OUTER PANE WHEN DEFECT IS WITHIN ONE INCH OF MOUNTING HOLE CENTER LINE. THIS LIMITATION DOES NOT APPLY TO DEFECTS MORE THAN ONE INCH FROM MOUNTING BOLT HOLE CENTER LINE.
4. EDGE CRANKS (INPLANE CRANKS) PARALLEL TO THE PANE FACE PERMITTED UNREPAIRED TO LIMITS SHOWN.

Limits - Acylic Edge Cracking
Figure 602

3. Examine The No. 3 Window (Fig. 601)
   A. Examine the window for cracks on the inner or outer panes.

      NOTE: Cracks which occur between the bolt and the window edge are permitted.

      (1) If you see cracks on the two panes, do not pressurize the airplane until you repair or replace the window.
      (2) If you see cracks on only one of the two panes, you can pressurize the airplane before you replace the window.

   B. Visually examine the outer pane opposite the vent hole in the top forward corner of the inner pane.

      NOTE: Stains at this location show that the outer pane does not hold pressure. Replace the window (AMM 56-11-21/401).

   C. Examine and replace the No. 3 window if you find these conditions:
      (1) Scratches:
         (a) Scratches on outer stretched acrylic panes if the following limits are exceeded:

Scratch Depth (in.)	Max Length of Each Scratch (in.)	Max Cumulative Length of All Scratches (in.)
0.050	Min. Detectable	2.0
0.020	1.0	5.0
0.01	3.0	9.0
0.005	4.0	10.0

(b) Minor scratches 0.001 or less (barely felt with fingernail) are not critical and do not require polishing.
(c) Scratches may be polished out. For procedure refer to Approved Repairs. Polishing panes to less than the following indicated thickness is not permitted.
(d) Scratches on inner pane are not allowed if they exceed 0.005 inch deep, 1 inch maximum length of any one scratch, or 5 inches maximum total length of all scratches.

(2) Inner and outer pane damage/repair limits are presented below. Panes cannot be reduced below these thicknesses under any circumstances.

CONTROL CABIN WINDOW NO. 3 MINIMUM THICKNESS	
Inner Pane *[1]	0.220 inch
Outer Pane	0.380 inch

*[1] Ref Component Maintenance Manual for Repairs

(3) Crazing:
(a) Crazing in inner stretched acrylic pane.
(b) Surface crazing in the outer stretched acrylic pane, other than at the routed edge, if following limits are exceeded:

MAX DEPTH (IN.)	MAX LOCAL AREA
0.050	2.0 inch dia
0.030	Over entire surface

(4) Chipping:
(a) Chipping of the outer stretched acrylic pane when following limits are exceeded:

MAX CHIP DEPTH (INCH)	MAX SIZE OF DELAMINATION DUE TO CHIP	MIN DISTANCE BETWEEN SHIPS (INCHES)
0.05	0.50 DIA	1.00

(b) Any chip on the surface of the inner stretched acrylic pane and chips along edge that exceed 0.06 inch in depth. Edge chips and delaminations may be removed by chamfering edge of pane (Ref Overhaul Manual).

(5) Delaminations (In-plane cracking):
(a) Delaminations if visibility is impaired or if the following limits are exceeded:

EDGE *[1]	MAX EXTENSIION IN FROM EDGE	MAX LENGTH AT EDGE	MIN DISTANCE BETWEEN DEFECTS	MAX NO. PER EDGE	MAX NO. PER PANE
Extreme edge outer pane	0.400	0.900	2.0	2	4
Rabbet edge	0.050	0.50		2	8
	0.020	Continuous			
Bolthole edges	0.025	All around hole circum	Must not be consecutive holes	2 holes	8

*[1] Refer to Overhaul Manual for Repair

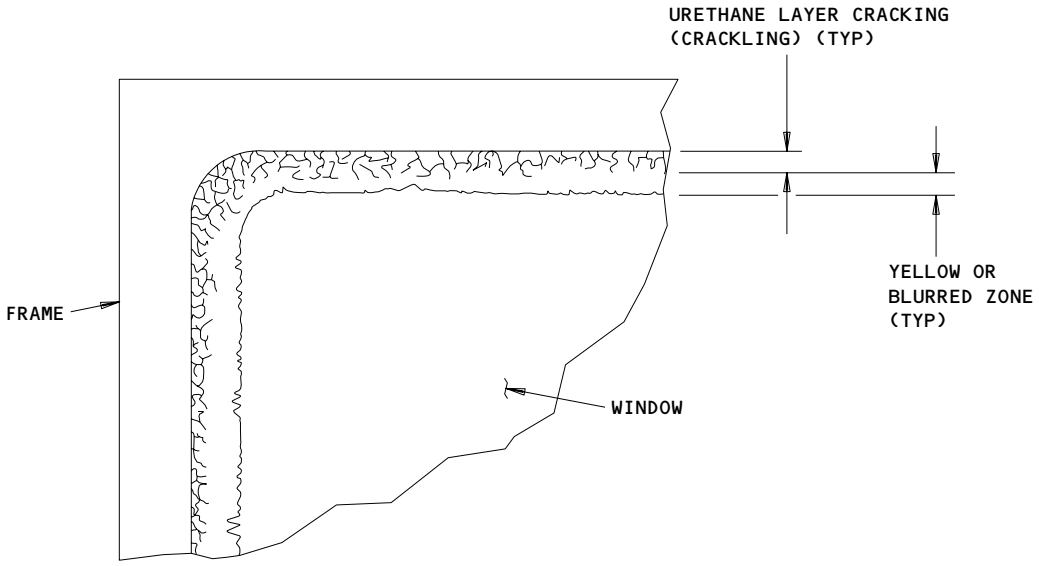
4. Window No. 3 Check
A. Check for loose or missing fasteners in window frame.

CAUTION: TO REDUCE POSSIBILITY OF WINDOW BREAKING, LOOSE OR REPLACEMENT BOLTS SHOULD NOT BE TIGHTENED MORE THAN THE SPECIFIED TORQUE (REF REMOVAL/INSTALLATION).

EDGE *[1]	MAX EXTENSION IN FROM EDGE	MAX LENGTH AT EDGE	MIN DISTANCE BETWEEN DEFECTS	MAX NO. PER EDGE	MAX NO. PER PANE
Extreme edge outer pane	0.400	0.900	2.00	2	4
Rabbet edge	0.050	0.50		2	8
	0.020	Continuous			
Bolt hole edges	0.025	All around hole circum	Must not be consecutive holes	2 holes	8

*[1] Ref Overhaul Manual for Repair

Window No. 3 - Inspection/Check
Figure 603



No. 3 Window Urethane Layer Crack Identification
Figure 604

WINDOW NO. 3 - APPROVED REPAIRS

1. Repair Window No. 3
   A. General
      (1) Scratches and surface crazing in the No. 3 windows may be removed by sanding, polishing, or buffing. Outer panes must not be reduced in thickness below 0.38 inch under any circumstances. Repairs to inner pane should be made per Overhaul Manual.
      (2) Scratches are divided into three types: superficial, minor, and major. Superficial scratches are those which may be caused by careless removal of traffic film or by rubbing dry cheesecloth over the pane; depth is under 0.001 inch. Minor scratches do not have a buildup on the sides and are from 0.001 to 0.004 inch in depth. Major scratches are over 0.004 inch in depth and usually have a buildup on both sides of crevice.
      (3) Crazing appears on the window outer surface and takes the form of many tiny cracks which reflect and disperse light. It causes a sparkling appearance which results in loss of optical quality. Crazing becomes evident at a depth of 0.001 inch and optical impairment occurs at a depth of 0.004 inch. Crazing may center at minor scratch sites and can obscure detection of cracks. Cracks become structurally critical at a depth of 0.050 inch.
      (4) Use care when handling window panes to avoid additional damage.
         (a) Cover unscratched areas with protective coating or tape.
         (b) Handle polished panes only when wearing clean cotton gloves.
         (c) Do not use unapproved materials
         (d) Take care not to scratch the window surface with finger rings or other sharp objects.
   B. Equipment and Materials
      (1) Protective Coating, Spraylot SC-1071 (Ref 20-30-51)
      (2) Protective Tape, Gizard Protex 20V (Ref 20-30-51)
      (3) Speed Tape, 3M# Y9162A (Ref 20-30-51)
      (4) Canton (Cotton) Flannel Cloth, Clean and Oil-Free, Any Source
      (5) Chamois, KK-C-300 (Ref 20-30-51)
      (6) Sander, Vibrating, Air-Driven with rubber band
      (7) Sanding Block: Rubber Block, Shore "A" Durometer Hardness; or Wood Block With Several Layers of Flannel
      (8) Learock No. 888 Buffing Compound (Ref 20-30-31)
      (9) Learock No. S-30 Buffing Compound (Ref 20-30-31)
      (10) Simoniz Polish (Ref 20-30-31)
      (11) Plex-I-Glow Cleaner and Polish (Ref 20-30-31)
      (12) Wet-or-Dry Sandpaper No. 600-A to 100-A
      (13) Isopropyl Alcohol-TT-I-735 (Ref 20-30-31)
   C. Repair Scratched or Crazed No. 3 Windows
      (1) Inspect chip carefully to ensure no cracks propogate from chip.

(2) Chips determined to be in mounting bolt holes and large chips in window surface should be repaired per Overhaul Manual.
   (a) Use optical micrometer to check that window thickness permits rework. Outer panes 0.380 inch minimum after rework.
   (b) Mask window frame and exposed seal with tape.
   (c) Provide water spray.
   (d) Remove loose dirt with water spray and hand.
   (e) Remove minor clamshell surface chips, scratches and/or surface crazing with an abrasive paper or cloth appropriate to the surface starting condition (generally not coarser than 100 grit for gouges, deep scratches and severe crazing). Use ample water to keep the window surface cool and to flush away grit and acrylic material removed. A vibrating sander (approx. 8000 cpm) stroked with alternating 100% horizontal coverage, followed by 100% vertical coverage over the entire window surface works well. Two to five minutes of coarse grit sanding will remove approximately 0.005 inches of acrylic from a typical cockpit window. Change abrasive paper frequently, flush well with water, and continue until all surface damage is removed and the surface appearance is uniform. Then continue for approximately two more minutes to ensure complete removal of craze/cracks.

      NOTE: If the condition requiring repair is minor, start with finer abrasive to reduce subsequent polishing time. Do not attempt to rework only a local part of the surface area as this will result in optical distortion.

   (f) Polish the window with a graduated series of abrasive materials. Use 100 - 600 grit paper and micromesh cloths of 1600 - 8000. Continue each step until the polishing marks of the previous step are removed (normally 2 - 3 minutes). Use alternating horizontal and vertical strokes with the vibrating sander and make sure the water flow is continuous.
   (g) Check finished window dimensions. Minimum outer pane thickness permitted after repair is 0.380 inch. This thickness can apply uniformly to the whole surface.
   (h) Remove water spray.
   (i) Finish polish the window with buffing compound and a clean muslin or wool pad. If necessary, use coarse and fine compounds to obtain a high gloss. If a rotary buffer is used, wheel surface speed should be 3200 fpm for coarse compound and 4200 fpm for fine compound.
   (j) Check window visually for optical quality. If distortion exists, repeat the procedure provided outer pane thickness will meet 0.380 inch minimum after rework.

(k) Wax window surface (Ref Maintenance Practices).

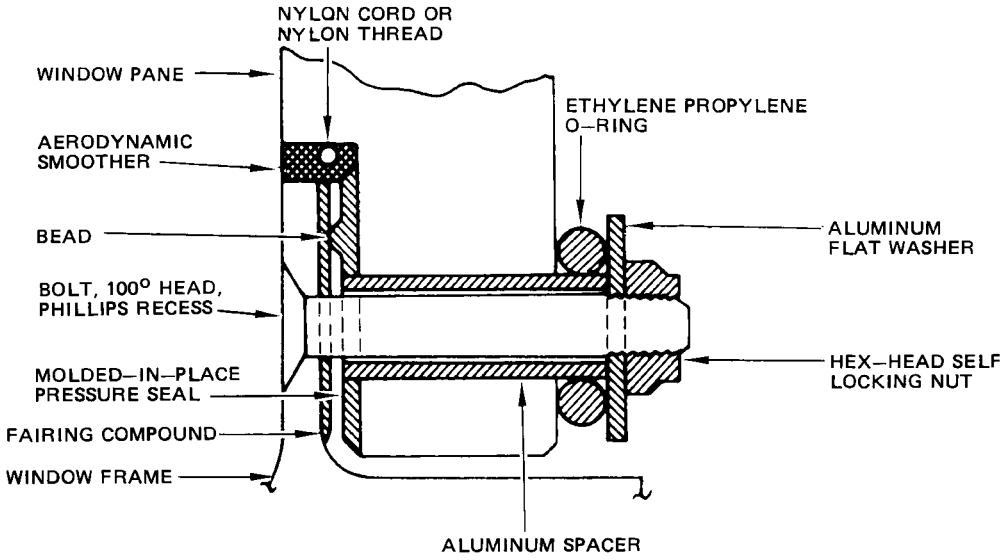
2. Repair of Chipped No. 3 Windows

A. Clamshell chips on the pane edge may be sanded to a 62 RHS finish, provided limits in Inspection/Check are not exceeded.

WINDOWS NO. 4 AND 5 - REMOVAL/INSTALLATION

1. General
   A. Windows No. 4 and 5 are pressure sealed on installation by means of a beaded silicone rubber molded-in-place pressure seal (Fig 401). The beaded rubber seal is molded to the window mounting surface. A continuous bead molded in the rubber seal ensures an effective pressure seal around the window.
   B. Fairing compound is applied to the window frame and its purpose is to accommodate the irregularities in the frame surface, ensuring that a perfectly flat surface is presented to the windowpane. The thickness of the compound varies: at high spots on the window frame there is no compound.
   C. Also shown on Fig. 401 are some items which are not components of the pressure seal. They are:
      (1) Aerodynamic Smoother. Aerodynamic smoother is installed in the gap between the window frame and the edge of the pressure seal and windowpane and provides aerodynamic flushness and protection against water entrapment. A nylon cord, or nylon thread, is installed under the aerodynamic smoother to facilitate its removal when required.
      (2) O-rings. Ethylene propylene O-rings are installed under the nut washers. The O-rings are allowed to compress a predetermined amount thereby transmitting sufficient compression load into the window assembly to compress the seal bead to make a weather seal.
   D. Replacement windows are supplied complete with the necessary parts for installation and with both sides of the pane covered with a protective plastic coating.
2. Equipment and Materials
   A. Protective covering for windows not already protected: Polyester Transparent Tape, No. 850 (Ref 20-30-51)
   B. Masking Tape, 33M No. 221 (Ref 20-30-51)
   C. Window frame fairing compound - EC-3587-1/4 or EC-3587-1 (20-30-11)
   D. Aliphatic Naphtha, TT-N-95A, Type II (Ref 20-30-31)
   E. Corrosion preventive compound - MIL-C-11796, Class 3 (Ref. 20-30-21)
   F. Nylon cord - MIL-C-5040, Type 1A, or Nylon Thread, V-T-295a, Type I, Class 2, No. 9 (Ref 20-30-51)
   G. Aerodynamic smoother - Pro Seal 860 Class B or RTV 174 (BAC 5010 Type 60) (Ref 20-30-11)
   H. Spatula or flow gun
   I. Cheesecloth, lint or oil-free
3. Prepare Window No. 4 or No. 5 for Removal
   A. Check that power is OFF in window heating circuit.

      WARNING: OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGES FROM 250 TO 350 VOLTS. BE CAREFUL WHEN WORKING ON CONTROL CABIN WINDOWS.



Window No. 4 and 5 Seal Details
Figure 401

B. Remove trim panels and crash padding where necessary. Refer to Chapter 25, Control Cabin Equipment.
C. Disconnect power leads at window bus bar terminals.
D. Remove thermal switch and bracket (11, Fig. 403B) from window frame (10) (Ref 30-41-31 - Window No. 5 only)
E. Strip aerodynamic smoother from gap around outside edge of window.

NOTE: A nylon cord is provided to facilitate this step. The free end of this cord is located in the upper aft corner of the window. Uncover the cord end and pull steadily until cord and smoother are removed. (Fig. 402.)

4. Remove Window No. 4 or No. 5 (Fig. 403A or 403B)
A. Remove self-locking nuts (2, detail A) flat washer (6, if installed), flat washer (5), O-ring (4), and retaining bolt (3) from window assembly (1) and window frame (10).

NOTE: This step may be simplified in area of map light by snapping off map light housing and removing lamp.

B. Apply hand pressure to outside of window assembly (1) to break seal, and remove window from window frame (10). Always apply pressure to a wide area. Bumping with a rubber mallet and a nonmetallic block may be necessary if window is particularly difficult to remove. The aluminum spacer (2) and beaded silicone molded-in-place pressure seal (9) are removed with the window.
C. Remove any remaining aerodynamic smoother from window frame (10), carefully, without damaging the fairing compound (8) (AMM 51-31-0/201).

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE AERODYNAMIC SMOOTHER. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

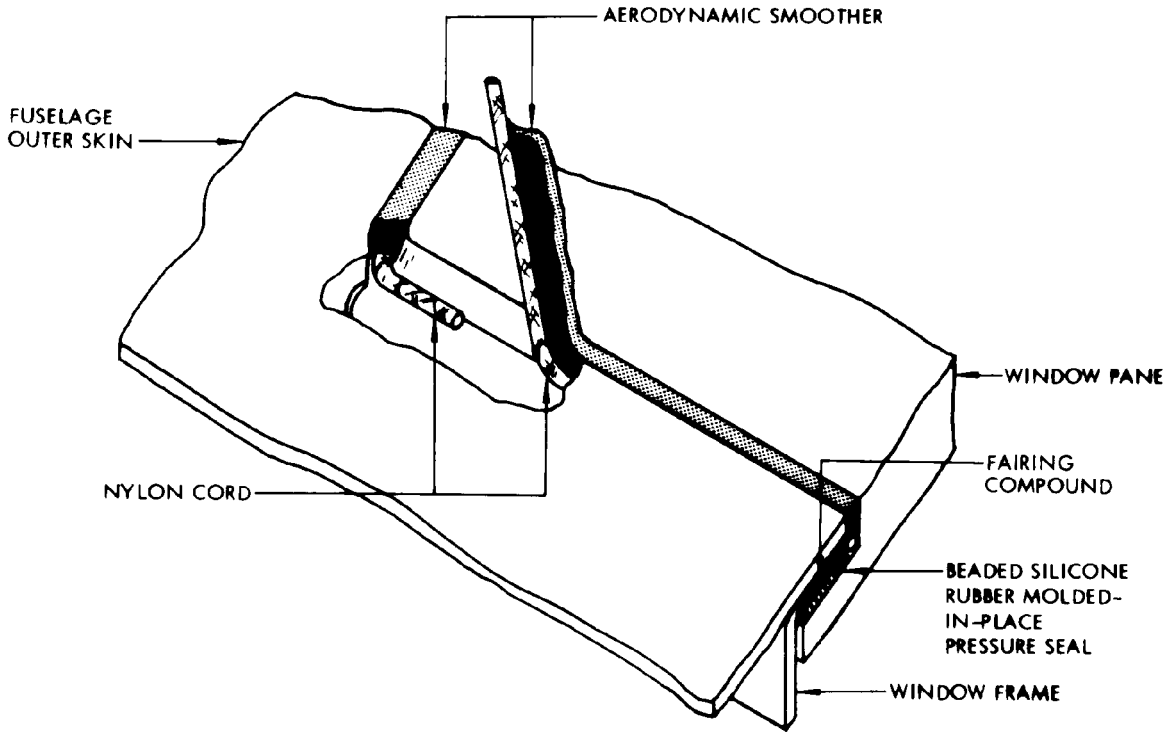
CAUTION: TAKE CARE NOT TO DAMAGE METAL OR THE FAIRING COMPOUND WHICH IS ON INBOARD FACE OF THE WINDOW FRAME.

5. Prepare Window No. 4 or No. 5 for Installation (Fig. 403A or 403B)
A. Check that power is OFF in window heating circuit.

WARNING: OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGES FROM 250 TO 350 VOLTS. BE CAREFUL WHEN WORKING ON CONTROL CABIN WINDOWS.

B. Examine window frame (10), Detail A to determine if fairing compound (8) requires repair or to replace the beaded silicone rubber molded-in-place pressure seal (9).

NOTE: Spacer (2) will crush fairing compound (8) on structure locally around end of spacer. Compound should not be repaired on subsequent window installations.



Removal of Window Gap Filler
Figure 402

(1) Except for the area that comes into contact with the end of the spacer (2), if fairing compound (8) is cracked, chipped, broken away, or damaged in any way, repair it as described in Fairing Compound - Approved Repairs (Ref 56-11-0).

NOTE: Replacement windows are provided complete for installation with the beaded silicone rubber molded-in-place pressure seal (9) and aluminum spacers (2).

C. Apply protective tape cover to both window surfaces, aligning tape with edges of glass panes.

D. Clean faying surfaces of the seal (9) and outside gap edge of both window (1) and window frame (10) thoroughly with aliphatic naphtha. Use a clean cheesecloth to apply naphtha and a clean cheesecloth to wipe it off. Do not allow naphtha to dry on the surface. Repeat cleaning until surfaces are free of residual film, taking care not to damage or deform either faying surface.

WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

E. Position window assembly (1) in window frame (10) and check that a uniform gap exists between outside edge of window and fuselage outer skin.

(1) Examine that aluminum spacers (2) are inserted in the bolt holes in the window assembly (1).

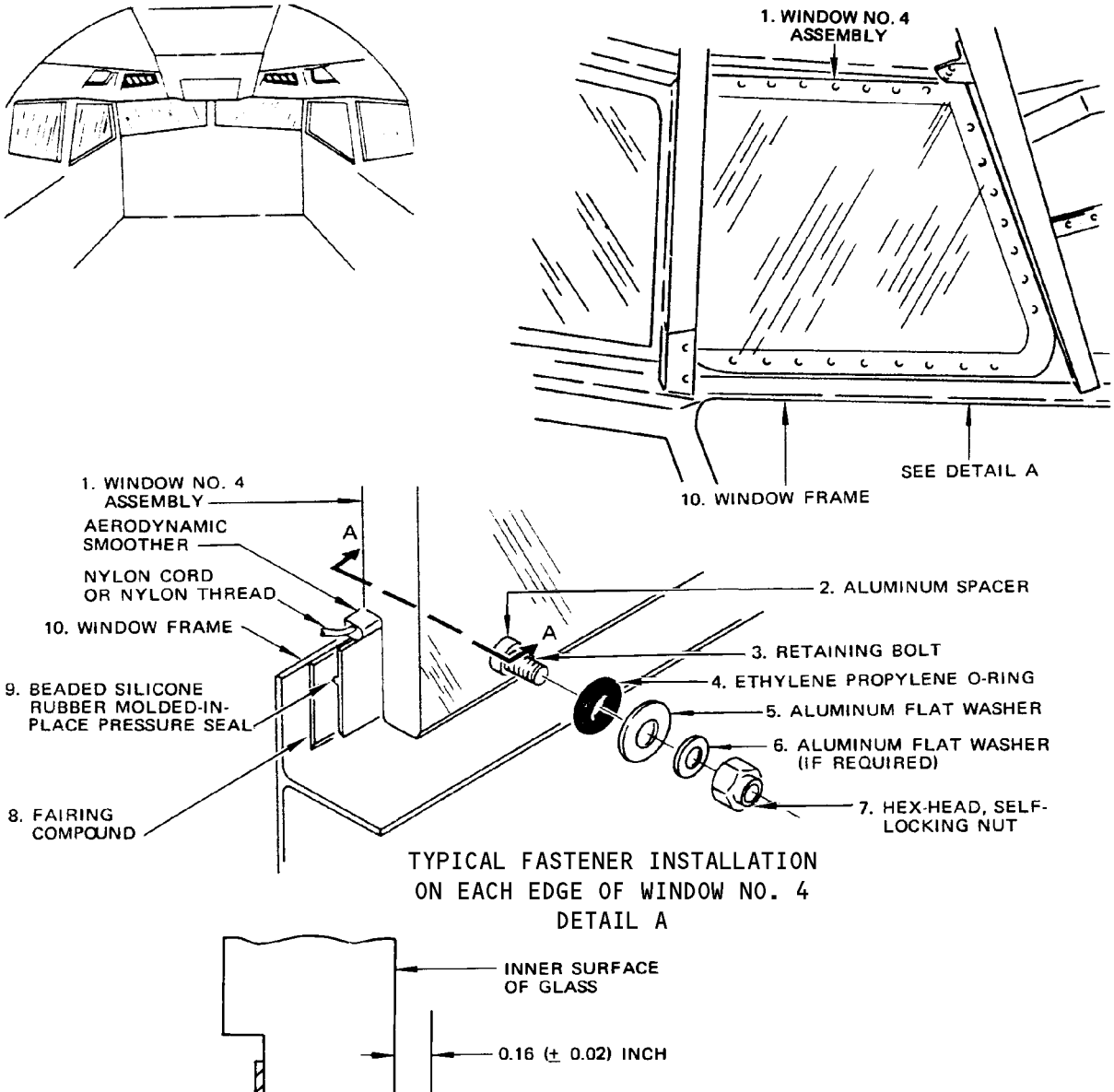
NOTE: Retain the spacers by friction or other means until the retaining bolts and attaching nuts are installed. Do not bond the spacers. The spacers must be free to move on the bolts and within the bolt holes in the window.

(2) Treat the bolt shanks with a corrosion preventive compound just prior to installation.

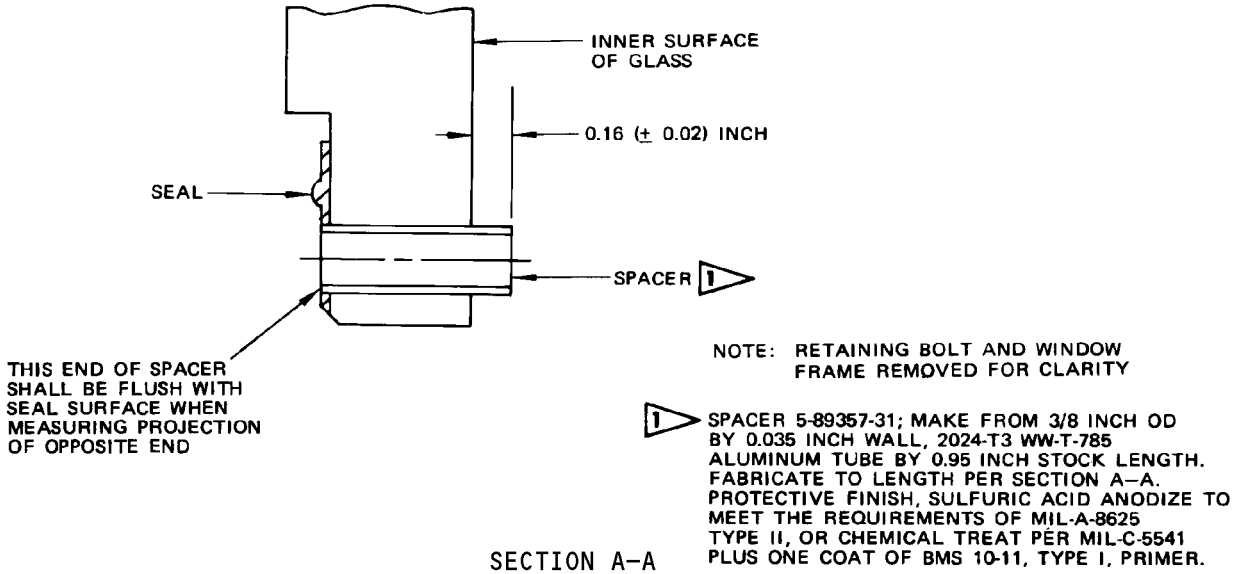
6. Install Window No. 4 or No. 5 (Fig. 403A or 403B)

A. Install window in frame.

CAUTION: MAGNETIC OR HIGH PERMEABILITY MATERIALS SHALL NOT BE INSTALLED WITHIN A 20-INCH RADIUS FROM THE CENTER OF THE MAGNETIC COMPASS, NOR SHALL THEY BE INSTALLED NEARBY IF, AFTER MAINTENANCE REMOVAL, THEY MIGHT BE INSTALLED WITHIN THE 20-INCH RADIUS.

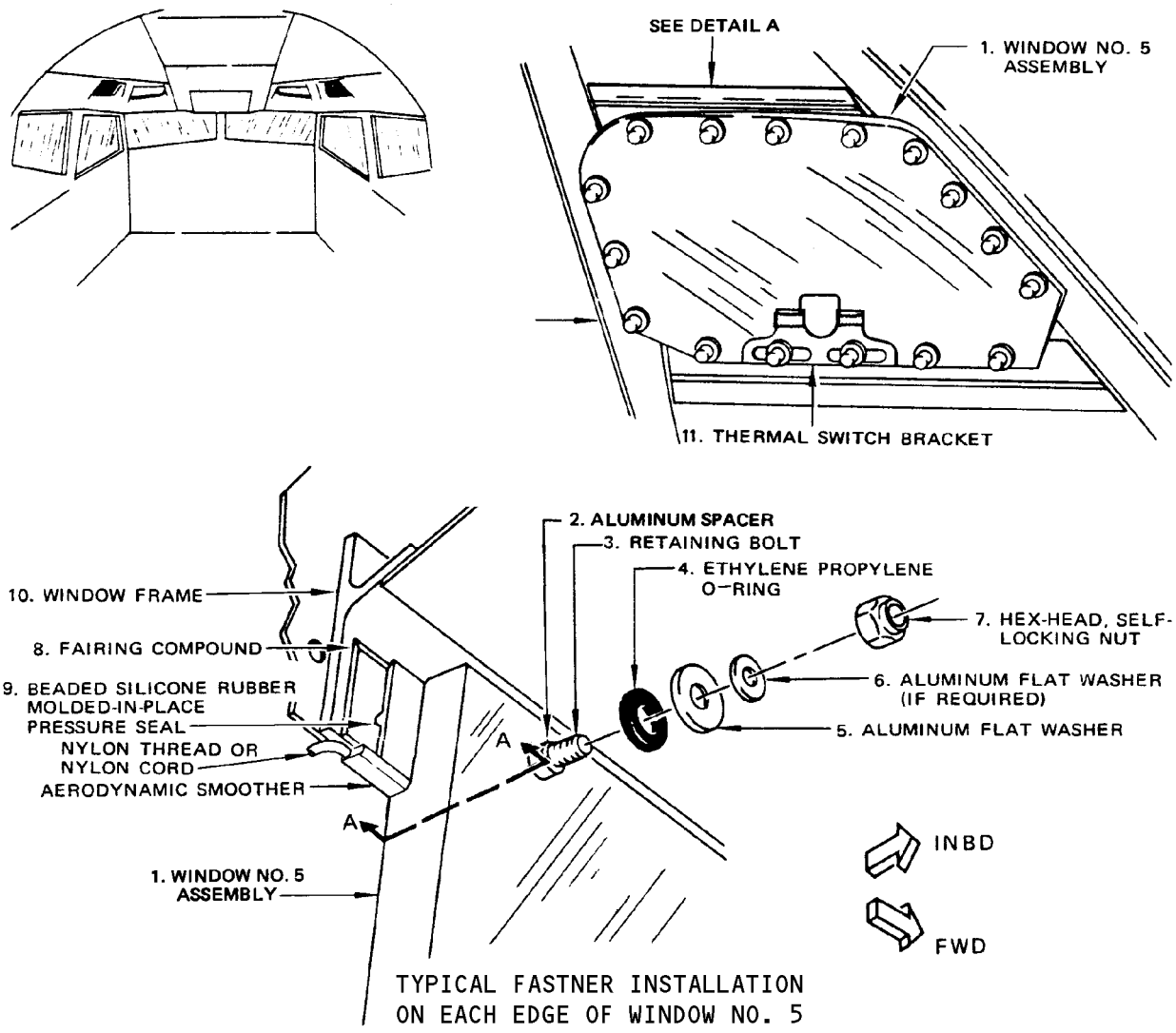


TYPICAL FASTENER INSTALLATION
ON EACH EDGE OF WINDOW NO. 4
DETAIL A

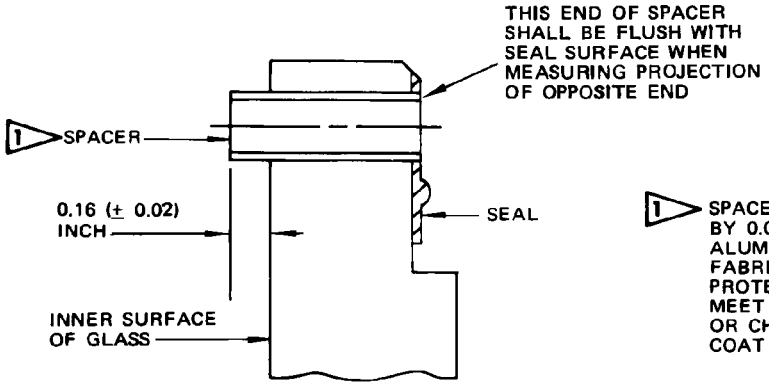


SECTION A–A

Window No. 4 Installation
Figure 403



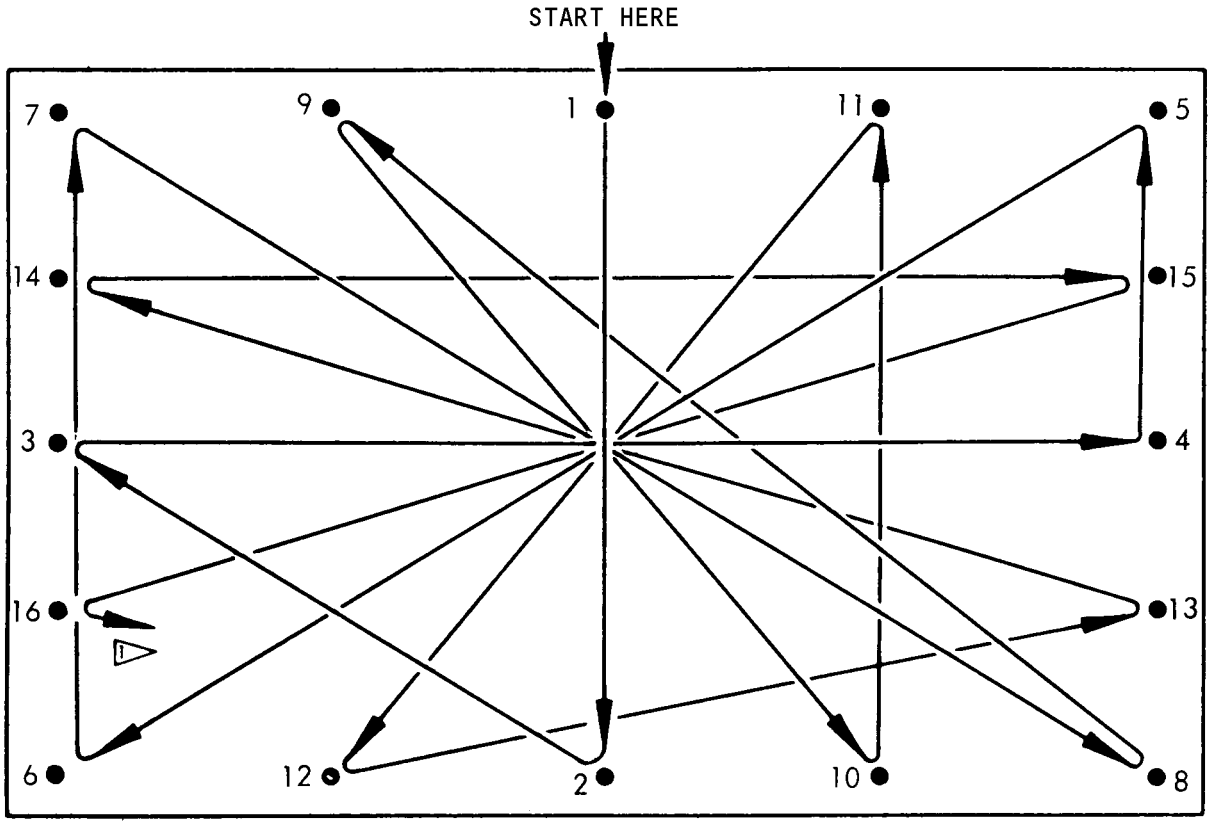
TYPICAL FASTNER INSTALLATION
ON EACH EDGE OF WINDOW NO. 5
DETAIL A



1 SPACER 5-89358-25; MAKE FROM 5/16 INCH OD BY 0.035 INCH WALL, 2024-T3 WW-T-785 ALUMINUM TUBE BY 0.75 STOCK LENGTH. FABRICATE TO LENGTH PER SECTION A-A. PROTECTIVE FINISH, SULFURIC ACID ANODIZE TO MEET THE REQUIREMENTS OF MIL-A-8625, TYPE II, OR CHEMICAL TREAT PER MIL-C-5541 PLUS ONE COAT OF BMS 10-11, TYPE I, PRIMER.

NOTE: RETAINING BOLT AND WINDOW FRAME REMOVED FOR CLARITY

Window No. 5 Installation
Figure 404



1 CONTINUE IN THIS MANNER, ALWAYS PROCEEDING TO A FASTENER WHICH IS MIDWAY BETWEEN TWO INSTALLED FASTENERS AND ON A SIDE OTHER THAN THAT IN WHICH THE LAST ONE WAS INSTALLED.

NOTE: THIS IS A SAMPLE PATTERN, ANY SIMILAR PATTERN WITH THE AIM OF TYING DOWN THE WINDOW PERIPHERY AT AS MANY WIDELY DISPERSED POINTS AS POSSIBLE AS EARLY IN FASTENER INSTALLATION AS POSSIBLE WILL SUFFICE.

Pattern for Typical Window Fastener Installation
Figure 405

(1) Install retaining bolts (3). Install window No. 4 with non-magnetic fasteners within 20-inch radius of magnetic compass. Outside of 20-inch radius on window No. 4 alloy steel fasteners may be used. Install window No. 5 with alloy steel fasteners.

CAUTION: USE ONLY NONMAGNETIC BOLTS (HEAT TREATED TO 140,000 PSI) ALONG TOP, BOTTOM, AND FORWARD EDGES BECAUSE OF PROXIMITY OF STANDBY COMPASS. BOLTS ATTACHING WINDOW RETAINING ANGLE AT AFT EDGE ARE NOT STANDARD AND MUST BE REPLACED ONLY BY IDENTICAL BOLT. OBSERVE SPECIFIED TORQUE FOR BOLTS ON EACH WINDOW INSTALLATION AS DAMAGE CAN RESULT IF TORQUE IS EXCEEDED.

(2) Install O-rings (4) and flat washers (5).

NOTE: On thin window assemblies an additional nut washer (AN960-D416) (6), can be used to prevent engaging incomplete bolt threads.

(3) Install self-locking hex head nuts (7), finger-tight at this time.
(4) Torque each bolt 55 to 60 pound-inches on window No. 4 and 20 to 25 pound-inches on window No. 5, using a staggered sequence, diagonally back and forth across window in a criss-cross pattern. (See Fig. 404 for typical torque sequence.)

CAUTION: OBSERVE THE SPECIFIED TORQUE FOR BOLTS AS DAMAGE CAN RESULT IF THE TORQUE IS EXCEEDED.

NOTE: Pressurized flight tends to bed any newly installed fixed window down in its frame. As a result, after initial pressurization if leakage occurs the attaching nuts should be checked. Any loose nut should be retightened to a torque of not more than 5 pound-inches above the run-on torque for the nut. Damage can result if this torque is exceeded. After this occasion no further retightening should ever be done unless water or air leaks occur, in which case, retightening of attaching nuts should again be limited to a torque of 5 pound-inches above the run-on torque for the nut.

B. Apply masking tape over outside gap between window and skins to prevent contamination prior to filling with nylon cord and smoother.
C. Remove strip of masking tape immediately over gap at outside edge of window. This can be done with a sharp knife or equivalent so as to leave strips of masking tape protecting the edges of the gap.

D. Insert a clean dry nylon cord, slightly longer than window perimeter, in bottom of gap at outside edge of window. The two ends should meet in the upper aft corner of the window frame and overlap at approximately 0.5 inch.

NOTE: To ease insertion of cord, stretch it slightly and tamp down into gap with a spatula if necessary.

E. Inject aerodynamic smoother into the gap by means of a flow gun or with a spatula until the gap is completely filled (Fig. 405). Do not trap air under the smoother (Ref 56-11-0).

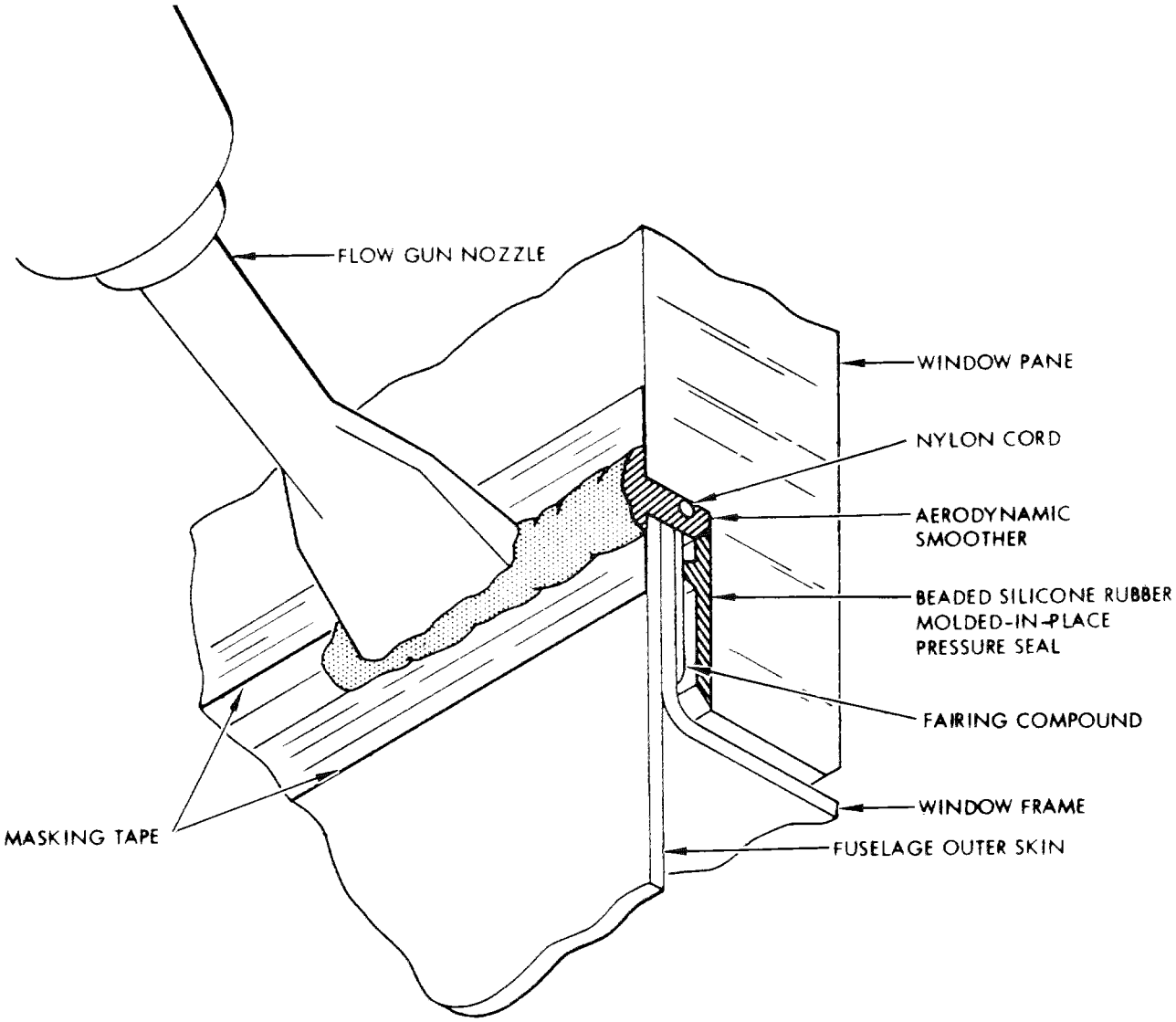
CAUTION: SMOOTHER IS AVAILABLE WITH SEVERAL WORK LIVES TO SUIT A VARIETY OF JOBS. STEPS E., F., AND G. MUST BE COMPLETED DURING WORK LIFE SELECTED.

F. Remove excess filler, while still wet, until just level with the masking tape (AMM 51-31-0/201).

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE EXCESS FILLER. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR

G. Remove masking tape from edges of gap and protective cover from outside surface of window. Smoother material lifting at edges of the gap can be smoothed over with a tool.

7. Restore Airplane to Normal Configuration
   A. Install map light lamp and housing on No. 4 window frame, if it was removed; on No. 5 window frame, install thermal switch and bracket (11, Fig. 403B).
   B. Connect power leads to window bus bar terminals.
   C. Install trim panels and crash padding where necessary (Ref Chapter 25, Control Cabin Equipment)
   D. Remove protective cover from inside surface of window.
   E. Test window heating system (Ref Chapter 30, Control Cabin Window Anti-Icing System).



Application of Gap Filler
Figure 406

WINDOWS NO. 4 AND 5 - INSPECTION/CHECK

1. General
   A. Inspection/check should be in accordance with established window damage criteria in addition to the following (AMM 56-11-0, Control Cabin Windows - Damage Criteria).
2. Window Inspection - Window No. 4
   A. Examine and replace window if center glass pane has any of the following defects:

      NOTE: When examining center glass pane, care should be taken to avoid confusion with adjacent inner vinyl layers and inner cast acrylic pane, the condition of which is not critical.

      (1) Cracks of any kind.
      (2) Conchoidal chips in either surface, deeper than 0.015 inch.
      (3) V-shaped chips of any kind.
      (4) Arcing, chips, delaminations or electrical discontinuity rendering window heating system inoperable or which impair visibility.

   B. If condition of outer glass pane impairs visibility, window must be replaced. Delaminations of outer pane extending more than 1 inch from edge toward pane center or any crack or delamination of outer pane that affects crew visibility must be replaced.

      NOTE: The outer pane is not a structural member. Number 4 window replacement due to outer pane damage should be based upon window heat and visibility requirements.

      (1) The decision to replace the window immediately or at the nearest maintenance interval (defects 2.B.) can only be made by the appropriate airline personnel based on their opinion of the severity of the condition.

   C. Examine and replace window if outer vinyl layer has cracks or tears of any kind.
3. Window Inspection - Window No. 5
   A. Examine and replace window if inner glass pane has any of the following defects:

      NOTE: When examining inner glass pane, care should be taken to avoid confusion with adjacent vinyl layer.

      (1) Cracks of any kind.
      (2) Conchoidal chips in either surface, deeper than 0.015 inch.
      (3) V-shaped chips of any kind.
      (4) Arcing, chips, delaminations or electrical discontinuity rendering window heating system inoperable or which impair visibility.

B. If condition of outer glass pane impairs visibility, window must be replaced. Delaminations of outer pane extending more than 1 inch from edge toward pane center, or any crack or delamination of outer pane that affects crew visibility must be replaced.

NOTE: The outer pane is not a structural member. Number 5 window replacement due to outer pane damage should be based upon window heat and visibility requirements.

(1) The decision to replace the window immediately or at the nearest maintenance interval (defects 3.B.) can only be made by the appropriate airline personnel based on their opinion of the severity of the condition.

C. Examine and replace window if middle vinyl layer has cracks or tears of any kind.

4. Window Check

A. Check for loose or missing fasteners in window frame.

CAUTION: TO REDUCE POSSIBILITY OF WINDOW BREAKING, LOOSE OR REPLACEMENT BOLTS SHOULD NOT BE TORQUED MORE THAN SPECIFIED TORQUE VALUE AND SPACERS SHOULD NOT BE TOO SHORT OR TOO TIGHT IN BOLTHOLES (REF WINDOWS NO. 4 AND 5 - R/I).

B. Check window heating system for correct functioning (AMM Chapter 30, Control Cabin Window Anti-Icing System).

SLIDING CONTROL CABIN WINDOWS - DESCRIPTION AND OPERATION

1. Window No. 2 (Pilots' Sliding Windows)

A. Purpose

(1) The left No. 2 window is the pilot's side window. The right No. 2 window is the co-pilot's side window. The left and right windows are opposite assemblies and installations. The No. 2 window is openable as an emergency exit.

(2) You can operate the right window from outside of the airplane as an emergency exit.

B. General

(1) The windows have laminated transparent layers, a metal insert, and weigh approximately 30 pounds (14 kg). The window is clamped into a movable frame that forms the openable window assembly that slides fore and aft in a track. Because the side windows are plugs, internal cabin pressure holds the windows to the fuselage frame.

(2) Each window is a laminated assembly of layers of glass and vinyl or urethane. The structural inner glass pane carries pressure loads. The vinyl interlayer is structural for bird impact resistance and fail-safe pressure loads.

(3) The current window manufactured by PPG has these layers: an non-structural outer glass pane, a non-structural urethane interlayer, a structural vinyl (polyvinyl butyral or PVB) interlayer, a non-structural urethane interlayer and an structural inner glass pane.

(4) Prior window manufactured by Triplex (XXX) has these layers: an non-strutural outer glass pane, a structural vinyl (polyvinyl butyral or PVB) interlayer and an structural inner glass pane

(5) Prior window manufactured by Sierracin has these layers: an non-structural outer glass pane, a structural vinyl (polyvinyl butyral or PVB) interlayer and an structural inner glass pane.

C. Window Heat

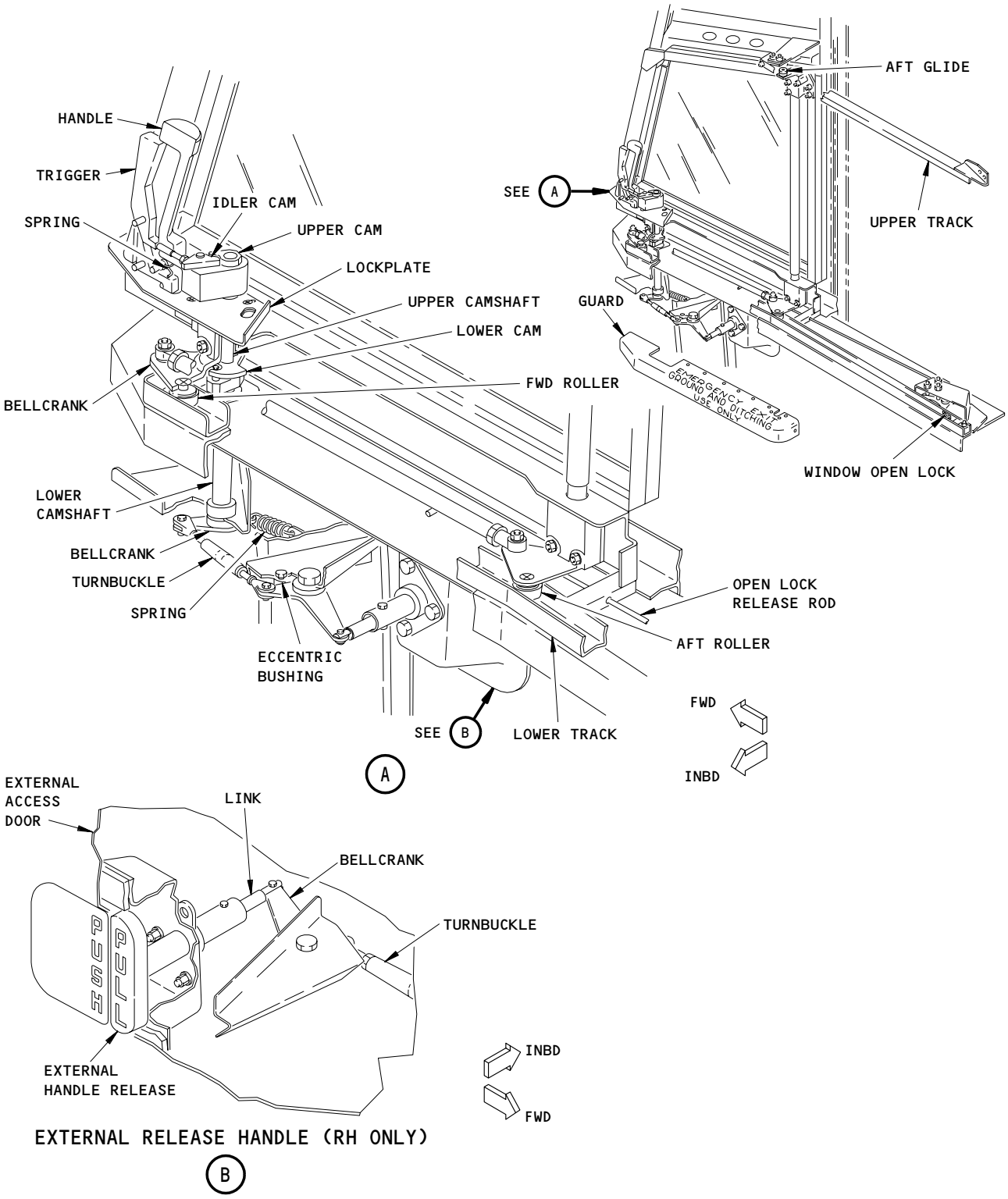
(1) A conductive film is located on the inner surface of the outer glass pane, which is a part of the window heat system that supplies the anti-fog and the anti-ice function. Bus bars, embedded in the window contact the conductive film near the forward and aft edges of the window. Along the edges of the window near the conductive film, there are two embedded temperature control sensors.

D. Functional Description
(1) To open the window, operate the handle. This turns a bellcrank, which is connected to other bellcranks at the rear, top, and bottom of the window. This moves the window inboard. The guide pin prevents backward movement of the window until there is sufficient clearance. This allows the window to move back to the latched open position. When the window is moved to the rear, the lower aft roller moves to the window open latch plate. The window open latch plate is spring-loaded to lock the window in the open position.
(2) The window is unlocked from its locked open position when you pull forward on the latch mechanism rod. This releases the window open latch plate and lets the window move forward. While the window moves forward, it resets the window open latch plate. Move the window forward by its handle until it touches the forward stops. As the handle is turned, the window is moved outboard, guided by the guide pin in the track, until the window is closed against the section 41 frame. When you release the handle, a trigger bolt latches the window closed.

E. Normal Operation
(1) To open the window, hold the trigger and turn the handle back and inboard. After the window moves inboard, move it back until it locks it in the open position.
(2) To close the window, pull forward on the latch mechanism rod to unlock the window. Hold the trigger and move the window forward until you can turn the handle forward and outboard. When you release the trigger, the window latches.

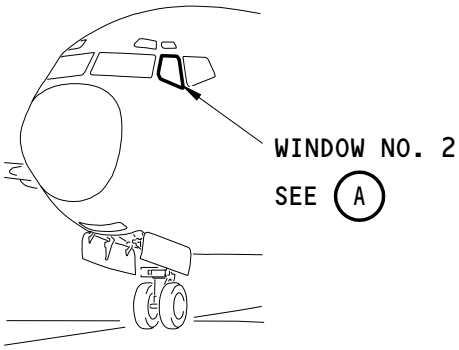
F. Emergency Operation
(1) To open the window, push the external access door, and pull the external release handle. This will unlatch the window and move the window inwards. Then move the window to the rear.

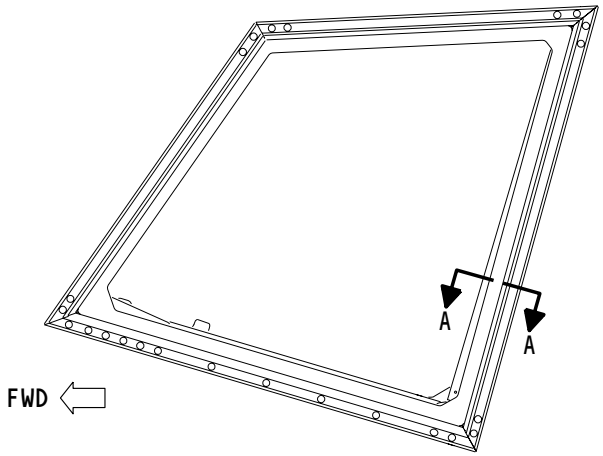
2. Window No. 2 (Pilots' Sliding Window) Emergency Exit Release Mechanism



EXTERNAL RELEASE HANDLE (RH ONLY)

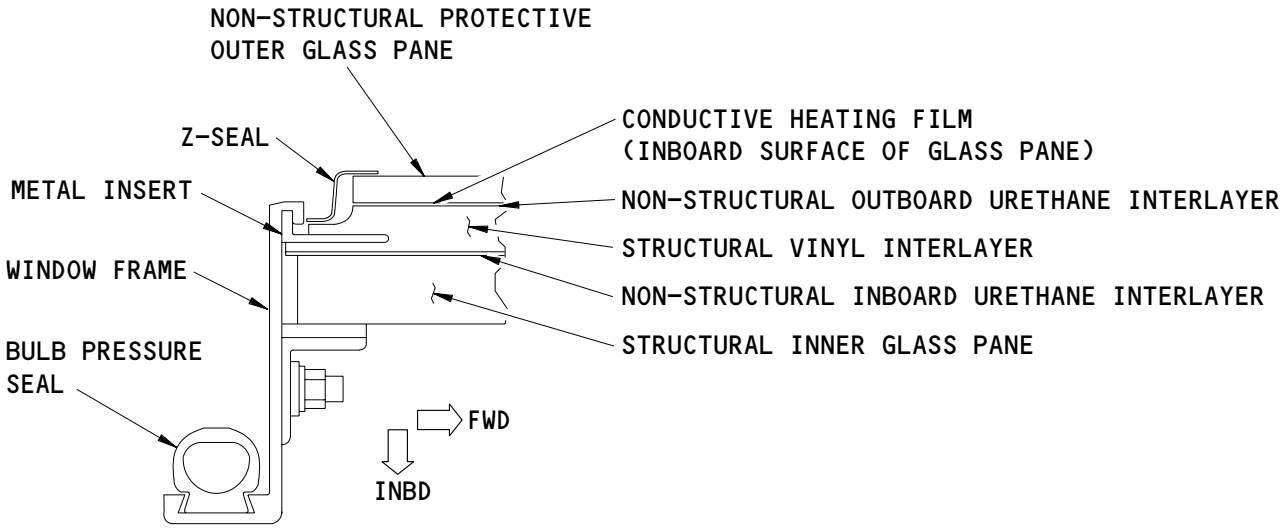
Right Window No. 2 External Release Mechanism
Figure 1





WINDOW NO. 2

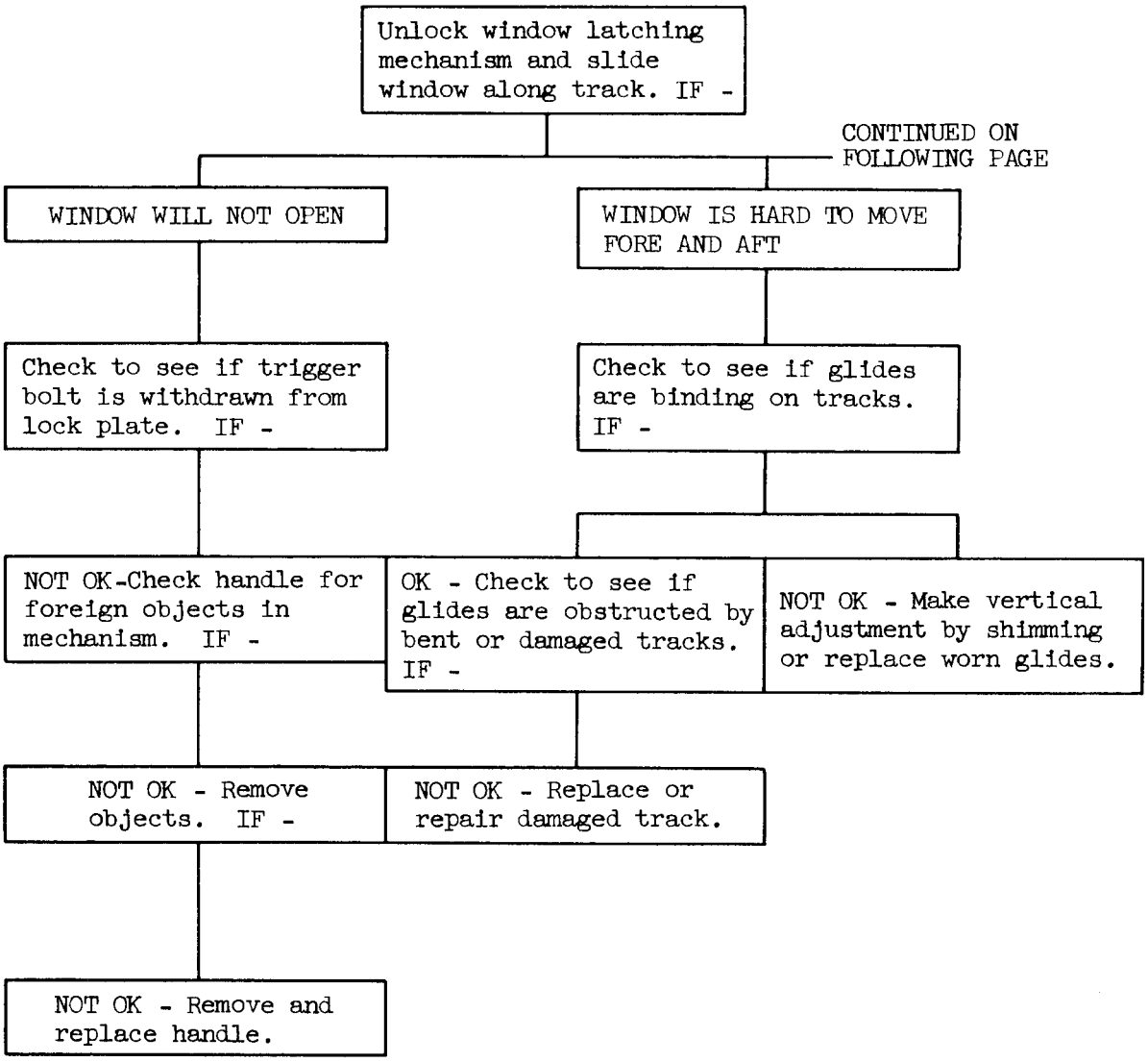
(A)



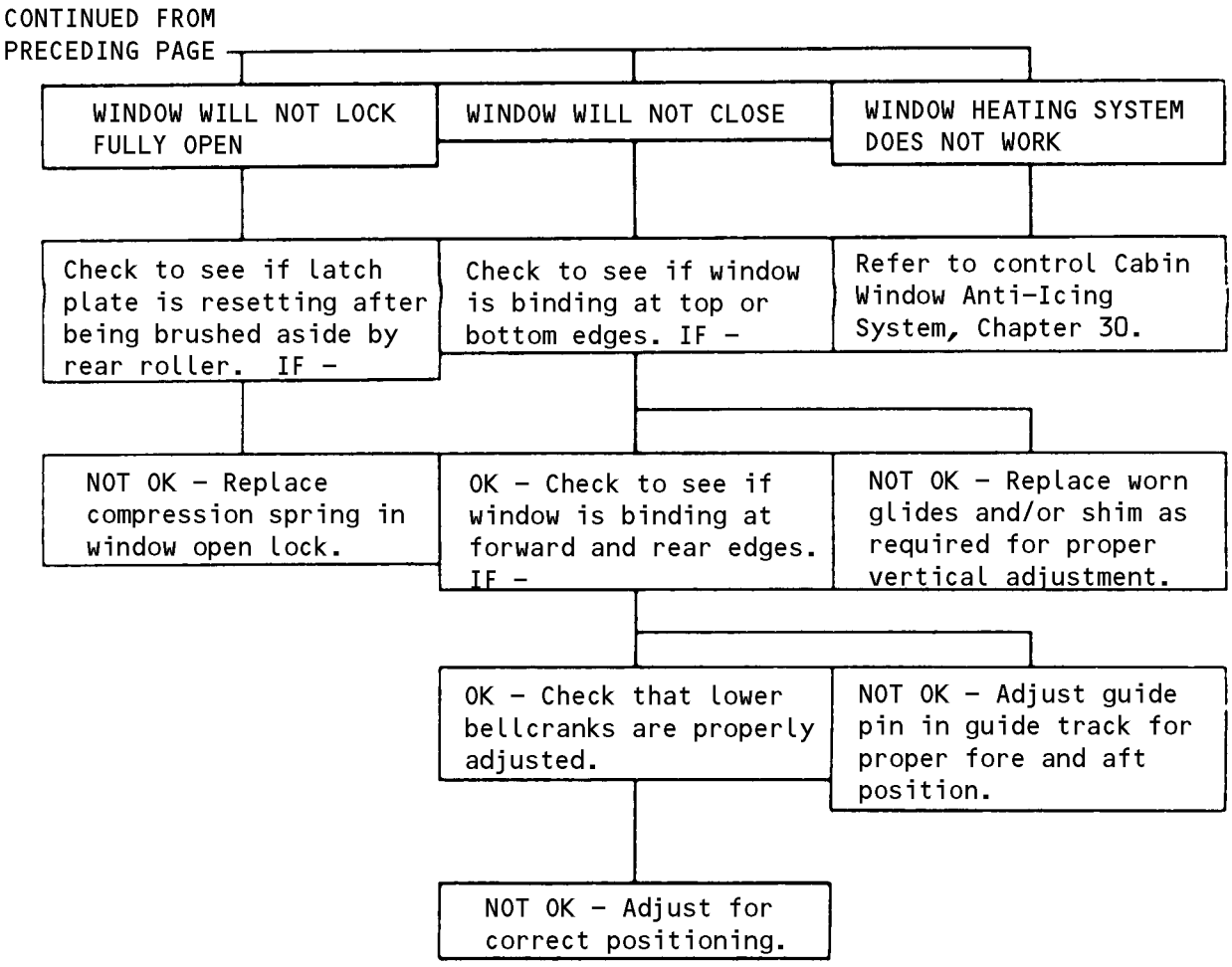
Windows - Control Cabin Sliding Windows - No. 2 Openable Window
Figure 2

WINDOW NO. 2 (PILOTS' SLIDING WINDOW) - TROUBLESHOOTING

1. Window No. 2 (Pilots' Sliding Window) Troubleshooting Chart



Window No. 2 (Pilots' Sliding Window)
Figure 101 (Sheet 1)



Window No. 2 (Pilots' Sliding Window)
Figure 101 (Sheet 2)

WINDOW NO. 2 (PILOTS' SLIDING WINDOW) - REMOVAL/INSTALLATION

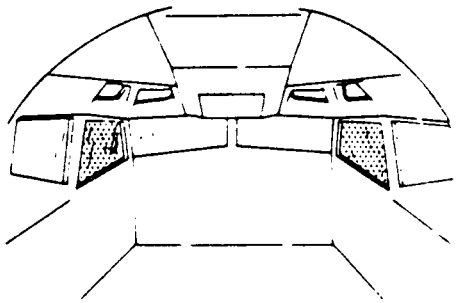
1. References
   A. AMM 30-41-21/501, Window Heat Conductive Coating and Sensor Test
2. Equipment and Materials
   A. Solvent, Kerosene - VV-K-11 or equivalent
   B. Oil - MIL-L-7870
3. Remove Window No. 2 (Pilots' Sliding Window) (See figure 401.)
   A. Check that power is off in window heating system.

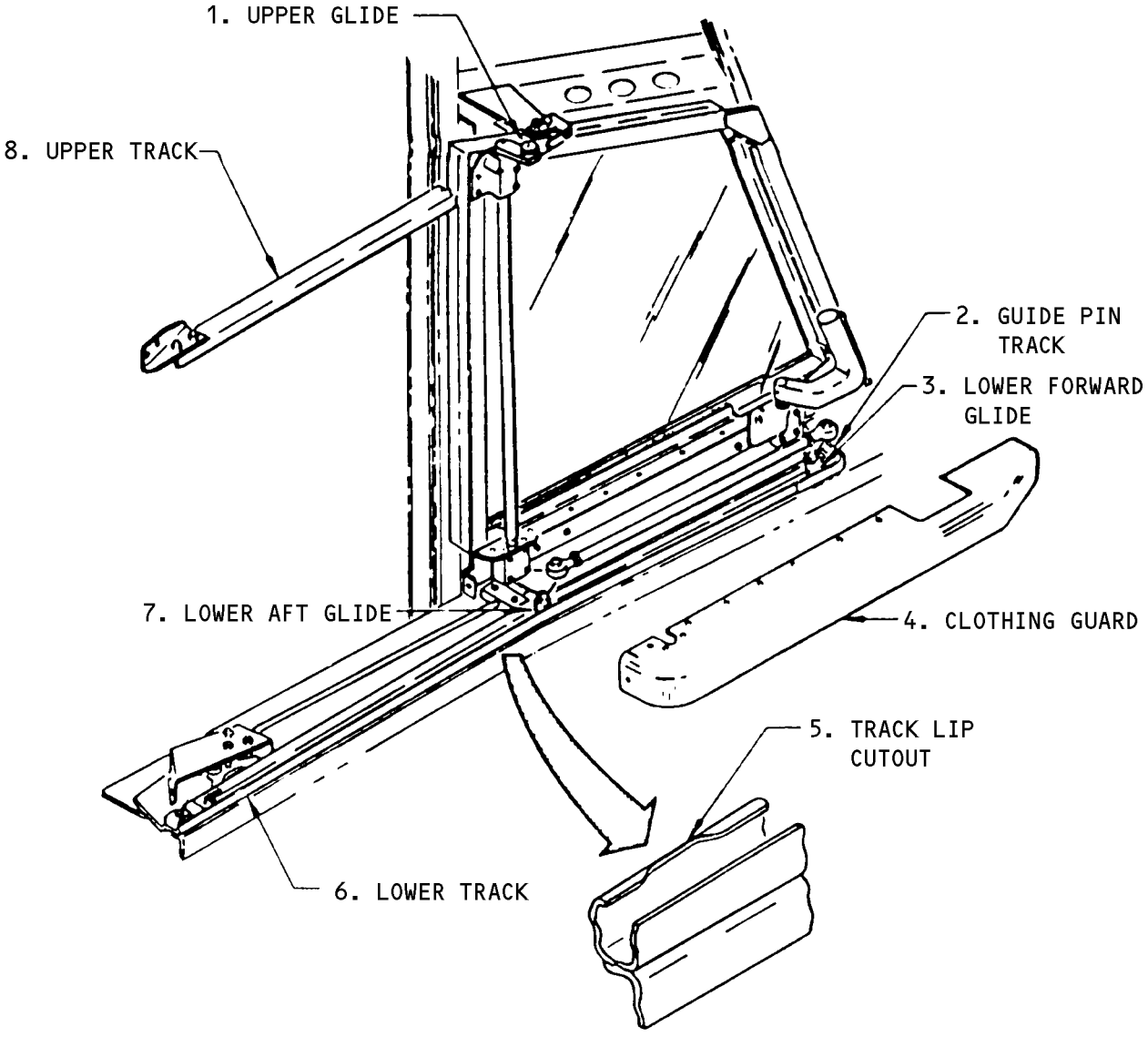
      WARNING: OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGES FROM 250 TO 350 VOLTS. BE CAREFUL WHEN WORKING ON SLIDING WINDOW.

   B. Open window to a position about 2-1/2 inches short of locked open stop. Lift the window assembly at the lower front corner and, by sliding it gently back and forth over an inch or so, locate the cut out in the lower track lip (5, figure 401). When the lower forward glide (3) is opposite the cut out, lifting the lower front corner of the window will bring the glide through the slot.
   C. With lower forward glide outside the track, slide window assembly forward until lower aft glide (7) lines up with cut out (5). In this position, front edge of clothing guard (4) will be approximately in line with guide pin track (2). Rotate window so that top edge goes aft and clears upper glide (1) from its track.
   D. Remove window by lifting so that lower aft glide comes through cut out (5) in lower track.
   E. Invert window and position it on a suitable support so that terminal strip in clothing guard is accessible.
   F. Tag and disconnect deicing electrical leads at the terminal strip.
4. Prepare Window No. 2 (Pilots' Sliding Window) for Installation
   A. Check that power is off in window heating system.

      CAUTION: OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGES FROM 250 TO 350 VOLTS. BE CAREFUL WHEN WORKING ON SLIDING WINDOW.

   B. Clean tracks, glides and surrounding areas with a rag moistened with solvent.
   C. Apply a light film of oil, to tracks and to surfaces of glides and mechanism that contact tracks.





Window No. 2 (Pilots' Sliding Window) Installation
Figure 401

5. Install Window No. 2 (Pilots' Sliding Window)
   A. Connect deicing electrical leads to terminal strip on clothing guard.

      CAUTION: TO ENSURE SAFE AND SATISFACTORY OPERATION OF WINDOW HEATING SYSTEM, SEE THAT WINDOW LEAD TAPS TRANSFORMER AT A POINT WHERE CODE CONFORMS WITH THAT OF THE WINDOW RESISTANCE. REFER TO CONTROL CABIN WINDOW ANTI-ICING SYSTEM, CHAPTER 30. NOTE: Window resistance code is usually etched in red near one of the bus bar terminals.

   B. Hold window with front of clothing guard (4, figure 401) level with guide pin track (2) and insert lower aft glide (7), through cut out (5), into lower track. This can be accomplished by resting lower aft glide on top of track and sliding gently back and forth to locate cut out.
   C. Access the window heat control unit (WHCU) and set the transformer tap (AMM 30-41-21/501).
   D. Lift lower front corner of window assembly so that upper glide (1) goes aft and can be slipped into its track.
   E. Slide window aft, with lower forward glide (3), resting on top of track, until glide drops through cut out in track lip.
   F. Test and adjust window if required. See Window No. 2 (Pilots' Sliding Window) - Adjustment/Test.

WINDOW NO. 2 (PILOT'S SLIDING WINDOW) - ADJUSTMENT/TEST

1. Window No. 2 (Pilots' Sliding Window) Adjustment
   A. Prepare for Adjustment
      (1) With the window in closed and lock position determine the adjustments required to obtain proper positioning of the window, as follows:
         (a) Determine adjustment required to center window in fore and aft position for a gap of 0.06 ±0.03 inch between forward outer surface of window and outer skin.
         (b) Determining that window closing force does not exceed 45 ±15 pounds.
      (2) Unlatch window and check for smooth operation.
      (3) Remove window No. 2 from track and place on a suitable support (Ref Window No. 2 [Pilots' Sliding Window] - Removal/Installation).
   B. Adjust Window (Fig. 501)
      (1) Adjust vertical position of window.

         NOTE: Minor vertical adjustments can be made by varying number of shim washers between mechanism bellcranks and glide bearings as required to obtain smooth operation of window.

         (a) Remove special bolt from through glide track roller.
         (b) Remove or add shim washers as required.

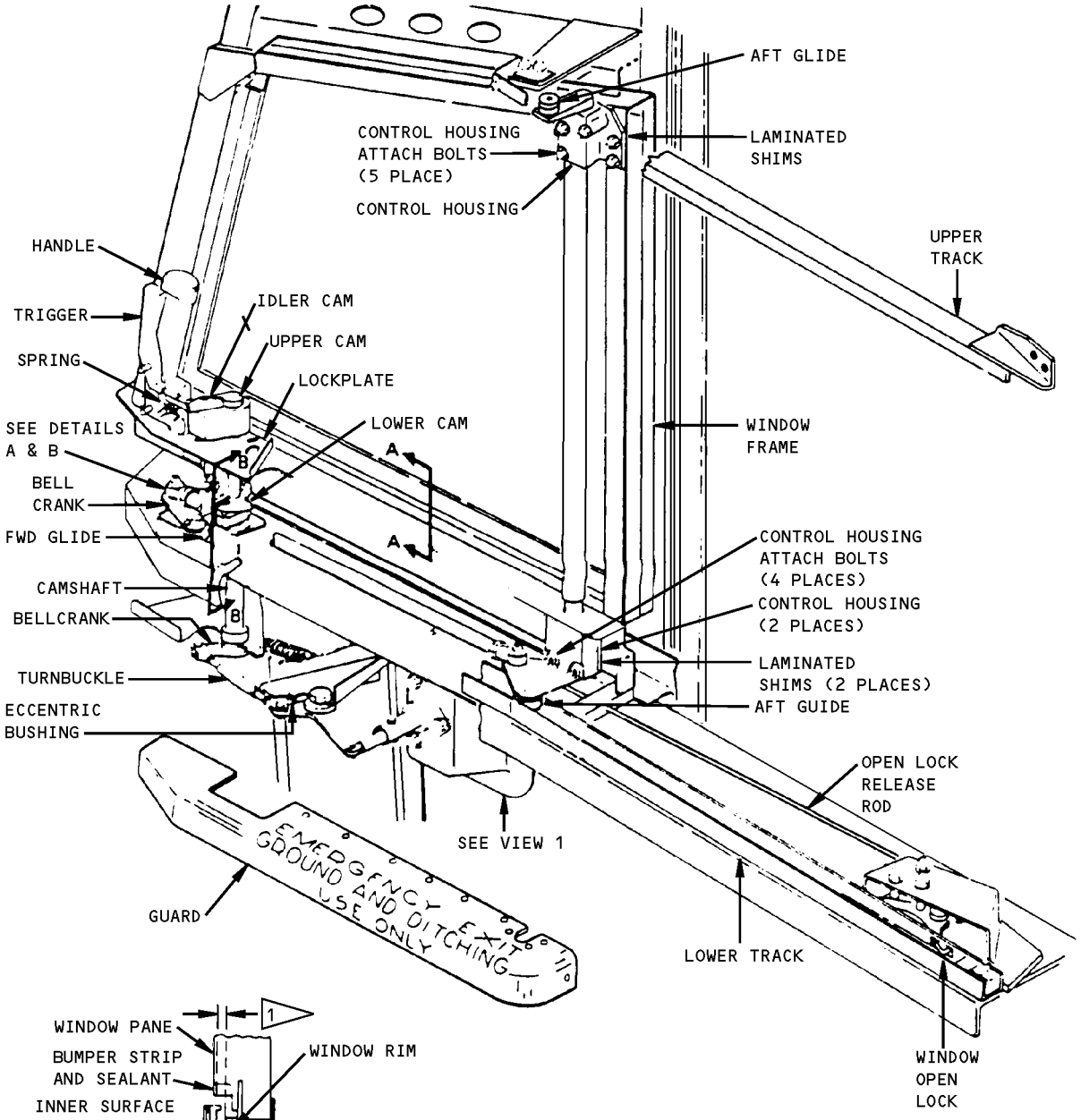
            NOTE: If shim washer is removed from lower glides, one will probably have to be installed at upper glide to maintain original dimensions between glide faces and to prevent window tilt. If adjustment is being made to correct a binding condition, removal of shims from upper glide only will be necessary.

         (c) Install special bolt.

            NOTE: Make sure you tighten the lock screw (6) securely.

      (2) Adjust fore and aft position of window.
         (a) Adjust position of guide pin on serrated plate (Detail A).
            1) Slack off two screws attaching guide pin to serrated plate.

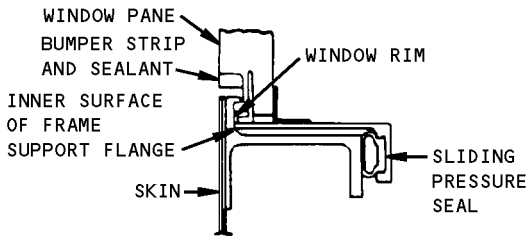
               NOTE: Access to countersunk screw is gained by lifting seal out of groove in area of screw head.



WINDOW FAIR NOT PRESSURIZED: WINDOW RIM MAY RECLINE INWARD FROM INNER SURFACE OF FRAME SUPPORT FLANGE AS SHOWN

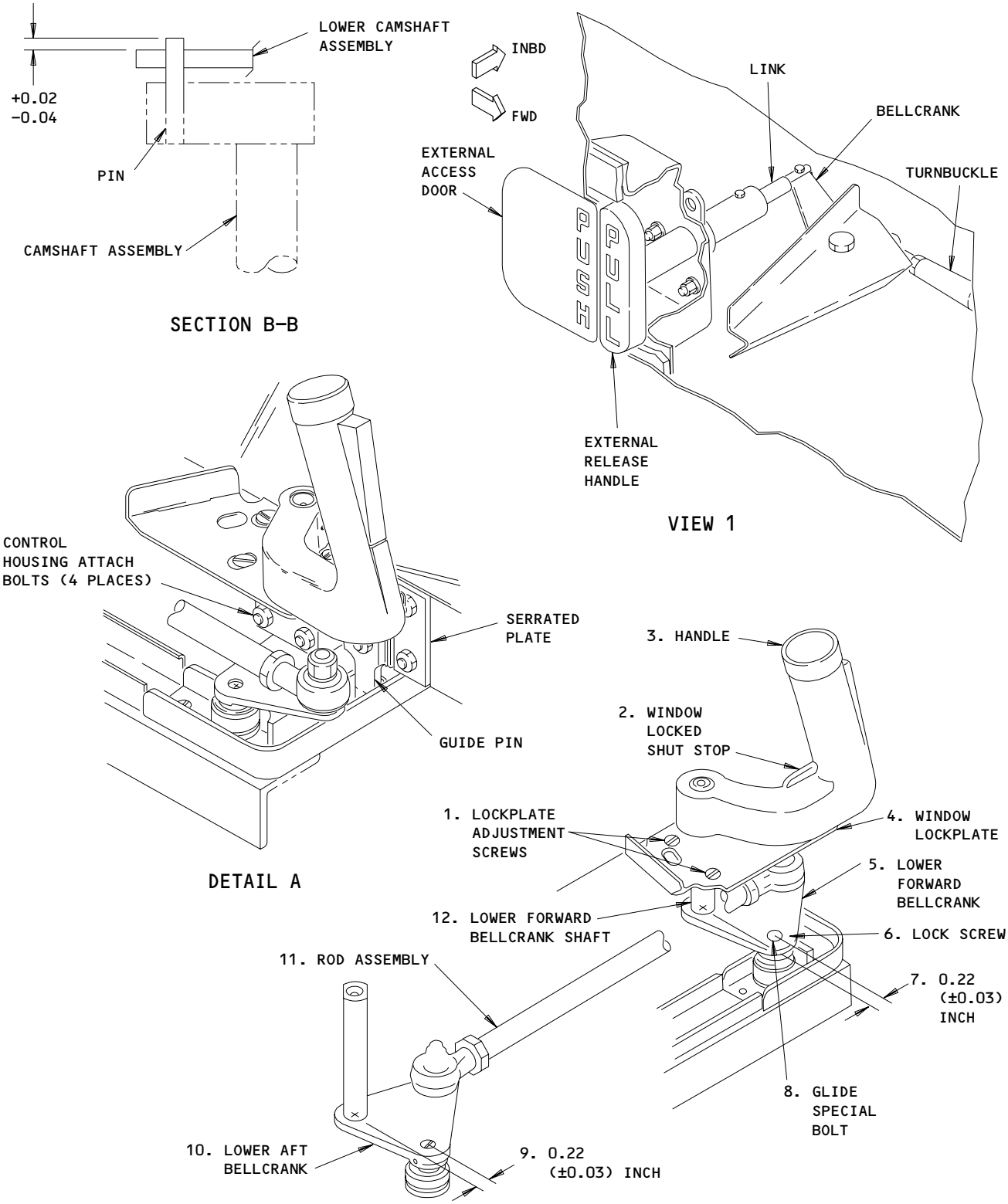
1 (TOLERANCE: 0.00 TO 0.08 INCH OF EACH CORNER EXCEPT AT UPPER FORWARD CORNER 0.00 TO 0.15 INCH)

SECTION A-A



WINDOW FAIR PRESSURIZED: WINDOW PANE SURFACE TO BE FLUSH TO SKIN. (TOLERANCE: 0.14 INCH INSIDE, 0.03 INCH OUTSIDE)

Window No. 2 Adjustment
Figure 501 (Sheet 1)



Window No. 2 Adjustment
Figure 501 (Sheet 2)

2) Reposition guide pin.

NOTE: Vee slots are 28 to the inch or approximately 0.036 inch per slot.

3) Tighten screws.

(3) Adjust window lockplate and bellcranks.
   (a) Adjust window lockplate (Detail B) so that, with handle (3) against window locked shut stop (2), center of glide special bolt (8) in lower forward bellcrank (5) is 0.22 ±0.03 inch forward of center of lower forward bellcrank shaft (12). Make adjustment by loosening the three lockplate adjustment screws (1) which secure lockplate to stiffening angle and move lockplate in or out as needed. Tighten adjusting screws. Serrated tie plate secures lockplate in place.
   (b) With handle still held against window locked shut stop, adjust length of rod assembly (11) so that center of glide special bolt on lower aft bellcrank (10) is 0.22 ±0.03 inch forward of center of lower aft bellcrank shaft. Make adjustment by slackening locknuts at ends of rod, rotate rod to adjust length and tighten locknuts.
(4) Adjust force required to close sliding window.
   (a) Unscrew nuts attaching window control housings to window frame and remove three control housings at window corners.
   (b) Add or remove shims as required to increase or decrease force necessary to close the window.

NOTE: Changing number of shims at one control housing will necessitate a similar change at the other control housing unless adjustment is being made to correct a binding condition.

   (c) Install window control housings on window frame.
(5) Install window No. 2 (Ref Window No. 2 [Pilots's Sliding Window] - Removal/Installation).
(6) Check fair of installed window (Fig. 501, Sheet 1).
(7) Adjust emergency exit release mechanism exterior handle (right-hand window on standard passenger airplanes, both on passenger/cargo convertible airplanes, both on passenger/cargo convertible airplanes) to fit flush with outside contour of skin when in stowed position (View 1), by adjusting turnbuckle and eccentric bushing.
(8) Test sliding window per par. 2.

(9) With windows closed and latched, verify engagement of camshaft assembly pin with lower cam assembly (Fig. 501, Section B-B).
(a) Look between lower edge of guide and cockpit trim panel. Check that pin is no more than 0.02 inch above or 0.04 inch below upper surface of lower cam assembly.
(b) If pin is too high, disassemble mechanism and shorten by grinding. Do not move pin in camshaft assembly.
(c) If lower end of pin is below camshaft assembly cam, replace camshaft assembly. If lower end of pin is flush with lower surface of cam but upper end of pin is not within 0.04 inch of lower cam assembly upper surface, readjust window to lower it within window frame.

2. Window No. 2 (Pilots' Sliding Window) Test
A. Test Sliding Window Operation
(1) Check opening and closing operations of window.
(2) Check that the window unlocks, and that the handle can be rotated freely when trigger is depressed.
(3) Check for freedom from binding or obstructions throughout opening cycle.
(4) Check that window open lock securely holds window in open position.
(5) Check that the window can be unlocked from the open position.
(6) Check for freedom from binding or obstructions throughout closing cycle.
(7) Check that window locks shut when the handle is fully forward with trigger released.
(8) Check that the force required to close the window does not exceed 45 (± 15) pounds.
B. Test Window Emergency Exit Release Mechanism (Right Window on Standard Passenger Airplanes, both passenger/cargo convertible airplanes
(1) Check that sliding window handle unlocks when handle is manually pulled 3.50 inches with a maximum force of 90 pounds.
(2) Check that when exterior handle is in stowed position, the handle fits flush with outside contour of skin.

WINDOW NO. 2 (PILOTS' SLIDING WINDOW) - INSPECTION/CHECK

1. General
   A. The inspection/check of window No. 2 (pilots' sliding window) should be in accordance with established window damage criteria (AMM 56-11-00/601).

TASK 56-12-11-206-001

2. Window No. 2 Inspection
   A. General
      (1) General No. 2 Window Vocabulary
         (a) Window Components
            1) Fail-Safe Interlayer: Interlayer that will hold the pressure loads if there is a failure of a structural pane.
            2) Interlayer: A flexible transparent layer that bonds glass panes together. It can be a structural component for pressure fail-safety and bird impact resistance.
            3) Laminate: Assembly of interlayer materials and glass panes bonded together by application of heat and pressure.
            4) Pane: One layer of glass or acrylic in a window.
            5) Pressure Seal: A rubber gasket that makesa pressure seal between the window and the fuselage.
            6) Slip planes or Release Tape: Transparent material embedded in the interlayer around the periphery of some Triplex (XXX) or Sierracin made windows. The internal tape is almost transparent, but can include visible wrinkles, usually in the corners of the windows. The internal tape does not in the PPG made windows.
            7) Structural Pane: A glass pane that holds the pressure loads of the window.
            8) Urethane: A type of interlayer material.
            9) Vinyl (Polyvinyl Butyral or PVB): A type of interlayer material.
            10) Z Seal: A Z-shaped piece of metal that is bonded to the window edge. The seal is a barrier used to prevent external moisture penetration into the window laminate.
         (b) Window Vision Terms
            1) Clear View Area (Daylight Opening or DLO): The transparent area of the window for external vision.
            2) Critical Vision Area: The area of primary vision through the window thatdoes not include the Non-Critical Vision Area.
            3) Decreased Visual Quality: A reduction of vision through the clear view area, which can cause interference with the flight crew visual operations of the aircraft in the air or on the ground. Damage to the window can result in decreased visual quality.
            4) Non-Critical Vision Area: A 2.0 in. (5.1 cm) band around the periphery of the window measured into the clear view area.

5) Tong Marks: Small dimples or indentations that are sometimes on the surface of the window non-structural outer glass panes and cause local distortion in the clear view area. These are a by-product of the manufacturing procedure.
6) Visual Quality: The property of the window that allows visual operation of the aircraft in the air or on the ground.

(c) Electrical Componenets
1) Bus Bar: Two thin electrical conductors put on opposite edges of the window, and used to transmit electrical current from the power wires to the conductive heating film.
2) Conductive Heating Film (Coating): A transparent metallic film located on a glass pane used to heat the window when electrical current is applied.
3) Power Terminal: The location where the wire bundle that supplies power for the window heat is connected to the window.
4) Power Wire: A braided wire in the window laminate that connects the power terminals for the window heat to the bus bars.
5) Sensor Terminal: The location where the wire bundle that supplies temperature sensor input is connected to the window.
6) Sensor Wires: Thin solid or braided wire in the window laminate that connects thesensor terminals for the window heat to the temperature sensors embedded in the window.
7) Temperature Sensor: A sensor embedded in the window that has resistance that changes with temperature. The WHCU uses the embedded sensor to control power to the window and regulate temperature.
8) Thermal Switch (Hockey Puck Sensor): A Bi-metallic switch that removes or applies electrical power to control the window temperature.
9) Window Heat Control Unit (WHCU): A device that constantly monitors window temperature through the temperature sensors and controls the power to the window.

(2) Flight Deck Windows Damage Description
(a) Arcing: An electrical arc is a discharge or short circuit across a discontinuity in a wire, bus bar, conductive heating film, or other internal window components. Arcs usually occur near the window bus bars, and are typically the resultof moisture ingress. The heat from an arc can cause darkbrown or black burn marks on the bus bar and in the interlayer or the fracture of a glass pane. It is also possible to see small bubbles in the interlayer at the location of an arc. Arcs in the heating film away from the bus bar can occur as a jagged line (Example: Figure 610) ("lightning bolt pattern").

(b) Crazing (Acrylic Panes): Crazing is a series of very small cracks or fissures that can occur on the surface of acrylic windows. Crazing is not easy to find, it is easier tosee when a light is shown at different angles through the window.

(c) Crack: A crack is a break or discontinuity of the material. A list of descriptions of cracks by material follows.

1) Glass Panes: Cracks in a glass pane will always grow to an edge or adjacent crackin the window. (A line arc can be confused with a crack but one end typically stops in the center area of the window.)

a) Non-Structural Pane: Cracks will look equivalent to smooth fissures perpendicularto the surface and through the entire thickness of the pane. There are usually many cracks across the glass surface (spider web pattern) of the pane. Cracks will not significantly decrease visual quality. (Example: Fig 604).

b) Structural Pane: The pane will break into many small irregularly shaped pieces, typically no larger than 0.5 in. (12.7 mm) maximum dimension. Visual quality is significantly decreased. (Example: Fig 604).

(d) Interlayers:

1) Urethane: Cracks can occur in urethane interlayer around the outboard edge of the window and at bolt hole locations. The cracks are usually in a network that does not run parallel to the edges of the window and are usually in random directions (also referred to as crackling). Urethane interlayer cracks frequentlyoccur with white or yellow discoloration. See also moisture ingression. (Examples: Fig 608).

2) Vinyl: Cracks that can occur in the vinyl interlayer around the perimeter of thewindow and usually follow or extend from the edges of internal features, for example, the metal inserts, bolt holes or slip tapes. The cracks usually appear thick or broken lines perpendicular to the window panes. It is possible in some extreme conditions to see the vinyl interlayer as stretched or separated from the metal insert. (Examples: Fig 602)

(e) Scratch: The linear removal or displacement of material from the surface of a pane.

(f) Chips: The removal of material from the surface of a glass or acrylic pane, usually from the impact with a hard object. The descriptions that follow are a list of different types of chips.

1) External chips:

a) Shell type chips are in the surface or edge of the pane. These chips have a circular or curved shape with many fine lines or ridges that follow the outline of the edge of the chip that give it almost the same shape of a shell. The width of the chip is more than its depth.

b) ''V'' shaped chips have the shape of a sharp narrow "V". Depth of the chip is equal to or larger than the width.

2) Internal chips:

a) Peel Chips –Chips that occur on the internal surface of glass panes. Chipped areas have a curved, rough grained shape, and are easily seen in reflected light.The chipped area can have small glass flakes, usually white. The view through thewindow will distort through the rough surface of the chip. Usually the chips start very small but can continue to grow with the continued use of the airplane. (Example: Fig 606).

(g) Delamination: Delamination is the separation of a pane or panes from the interlayer internal to the window. Delamination looks like an air bubble that starts from the edge, is flat, smooth, and has a circular edge. Delaminations canhave an edge with smooth finger-like projections. The delamination will cause a reflection of light when you look at it from an angle to the surface of the window. A delamination can distort vision through the delaminated area.

(h) Moisture Ingression: A cloudy white or yellow haze internal to the window usuallyaround the periphery. It can follow wires internal to the window, along the bus bar and also in areas of delamination. Long term exposure to moisture can lead toelectrical arcing of the heating system internal to the window.

(i) Bubbles: Small isolated or irregular shaped voids in the interlayer internal to the window not at the window edge. Bubbles can be the result of a damaged window heat control system. Multiple bubbles together in a small group, or black or darkbrown bubbles are an indication of a damaged window heat control system.

(j) Metal Insert Corrosion: as an etching of the metal surface, and the result of a direct chemical attack (moisture ingression). Corrosion of the aluminum surface usually looks equivalent to whitish powdery contamination with dulling of the surface. While the corrosion attack continues, the surface will look mottled or etched possibly with pits.

B. Equipment

(1) Optical Micrometer - Model 966A or 966A1
Monocle Industries
Coppel Tx. USA 75019
tel (214) 393-9920
fax (214) 393-9926

C. References

(1) 30-41-00/501, Control Cabin Window Anti-Icing System

(2) 56-12-11/401, Window No. 2 (Pilots Sliding Window)

D. Access

(1) Location Zone

101/102 Control Cabin

E. No. 2 Window - Inspection/Check

(1) Set the window heat switches to the OFF positions.

S 866-014

WARNING: DO NOT TOUCH THE WINDOWS UNLESS THE CIRCUIT BREAKERS ARE OPEN AND THE WINDOW HEAT SWITCHES ARE OFF. FAILURE TO DO THIS CAN CAUSE AN ELECTRICAL SHOCK. CAUSE INJURY TO PERSONS.

(2) Open the window heat circuit breakers, and attach DO-NOT-CLOSE identifiers.

S 216-016

(3) Clean the windows if necessary: Flight Compartment Compartment (AMM 12-40-00/201).

NOTE: Clean windos are necessary to do the inspection.

S 216-017

(4) Identify the window manufacturer for each window, PPG or GKN (also Pilkington, Triplex or XXX).

(a) Look at the placard on the window inner surface along the outboard edge.

S 216-018

(5) Examine the window for chips in the glass panes (Example: Fig 605).

NOTE: Chips in structural glass panes can decrease structural capability. Chips can also decrease the visual quality of a window.

(a) Replace the window for one or more of the subsequent list of damages (AMM 56-12-11/401).

1) Chips: A chip or group of chips on the surface of a structural pane that are more than 0.015 in. (0.381 mm) in depth are a cause for the removal of the window.

2) AIRPLANES WITH SIERRACIN OR GKN WINDOWS;
Peel chips: A chip on a glass surfaces internal to the window laminate and is a cause for the removal of the window.
3) A chip or group of chips that decreases the visual quality on a pane of the window is a cause for the removal of the window.
4) The outer glass pane is non-structural. Unless chips decrease the visual quality, they are permitted.

S 216-019
(6) Examine the window for delamination:
(a) Replace the window if the delamination decreases the visual quality (AMM 56-12-11/401).

NOTE: Delamination can result in moisture ingress which can cause arcing and ply cracks. The recommended limit for windows with a delamination is 2.0 in. (50.8 mm) from the edge of the window frame.

S 216-020
(7) Examine the window for arcing (Example: Fig 607).
(a) Examine the window for signs of arcing near the bus bar.
(b) Examine the window for line arcs.
(c) Replace the window if there are indications of arcing (AMM 56-12-11/401).

S 216-021
(8) Examine the window for bubbles:
(a) Multiple bubbles together in a small group, or black or dark brown bubbles are a typical indication of a damaged window heat control system.
1) Do a check of the heater control system for that window, if necessary. (AMM 30-41-00/501).
(b) Replace the window if the bubbles decrease the visual quality or bubbles are black or dark brown in color (AMM 56-12-11/401).

NOTE: Tong Marks can be found on non-structural outer glass panes are not cause for removal.

S 216-022
(9) Examine window for scratches:
(a) The inner glass pane is structural. Replace the window if the inner glass pane has a scratch with a depth more than 0.015 in. (0.381 mm).
1) Use an optical micrometer (accuracy +/- 0.0002 in.) to measure the depth of the scratches.

(b) A scratch or group of scratches that decreases the visual quality on a pane of the window is a cause for the removal of the window.
(c) The outer glass pane is non-structural. Unless scratches decrease the visual quality, they are permitted.

S 216-023
(10) Examine the window for cracks in the vinyl interlayer (Example: Fig 602):
(a) AIRPLANES WITH SIERRACIN OR GKN WINDOWS;
Replace the window if you find cracks along the slip panes.

NOTE: Cracks in the urethane interlayer do not decrease the window structural capacity and are not a cause for a window removal unless they decrease the visual quality.

(b) Replace the window if you find cracks that follow the long edges of the metal insert.

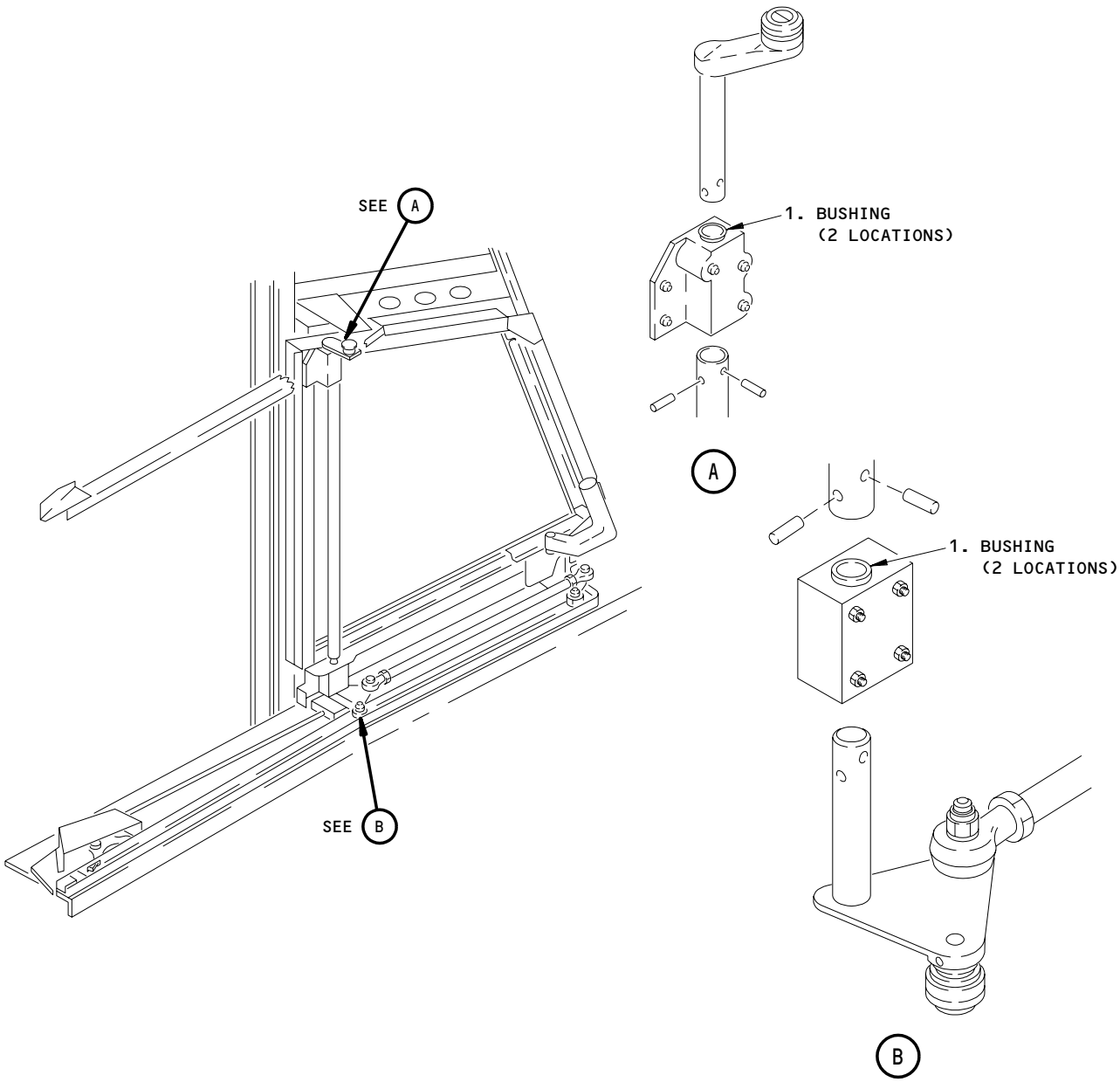
NOTE: Cracks in the urethane interlayer do not decrease the window structural capacity and are not a cause for a window removal unless they decrease the visual quality.

(c) Vinyl interlayer cracks in the forward upper corner are permitted as defined below.
1) The maximum permitted length of the crack is 0.5 in. (12.7 mm) into the ''daylight opening'' or 0.45 in. (11.43 mm) from the nearest edge of the metal insert

S 216-024
(11) Examine the window for cracks (Example: Fig 604).
(a) Replace the window if cracks are found in a glass pane (AMM 56-12-11/401).

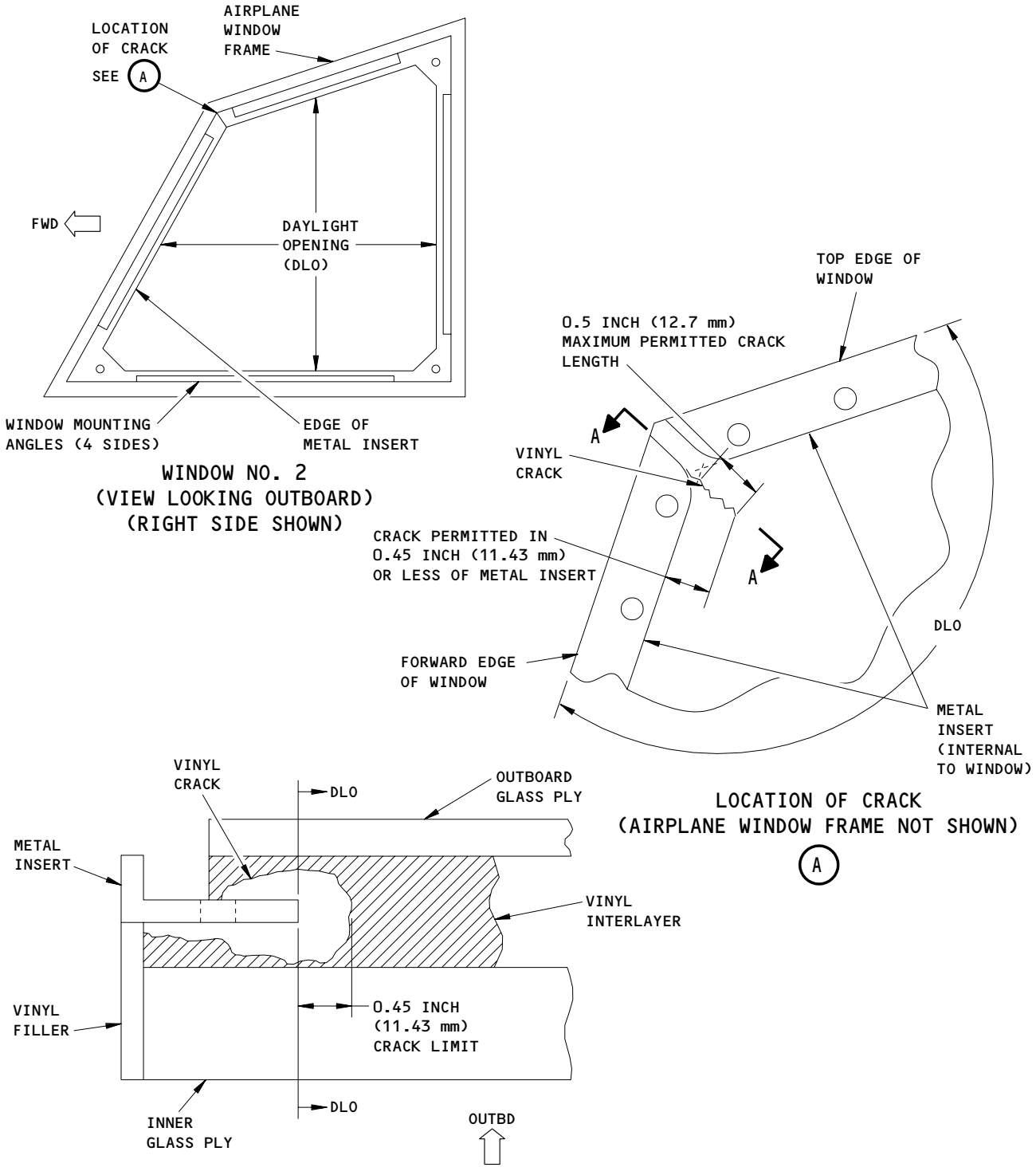
S 216-025
(12) Close the window heat circuit breakers and remove DO-NOT-CLOSE tags.

S 866-026
(13) Put the Airplane Back to Its Usual Condition.

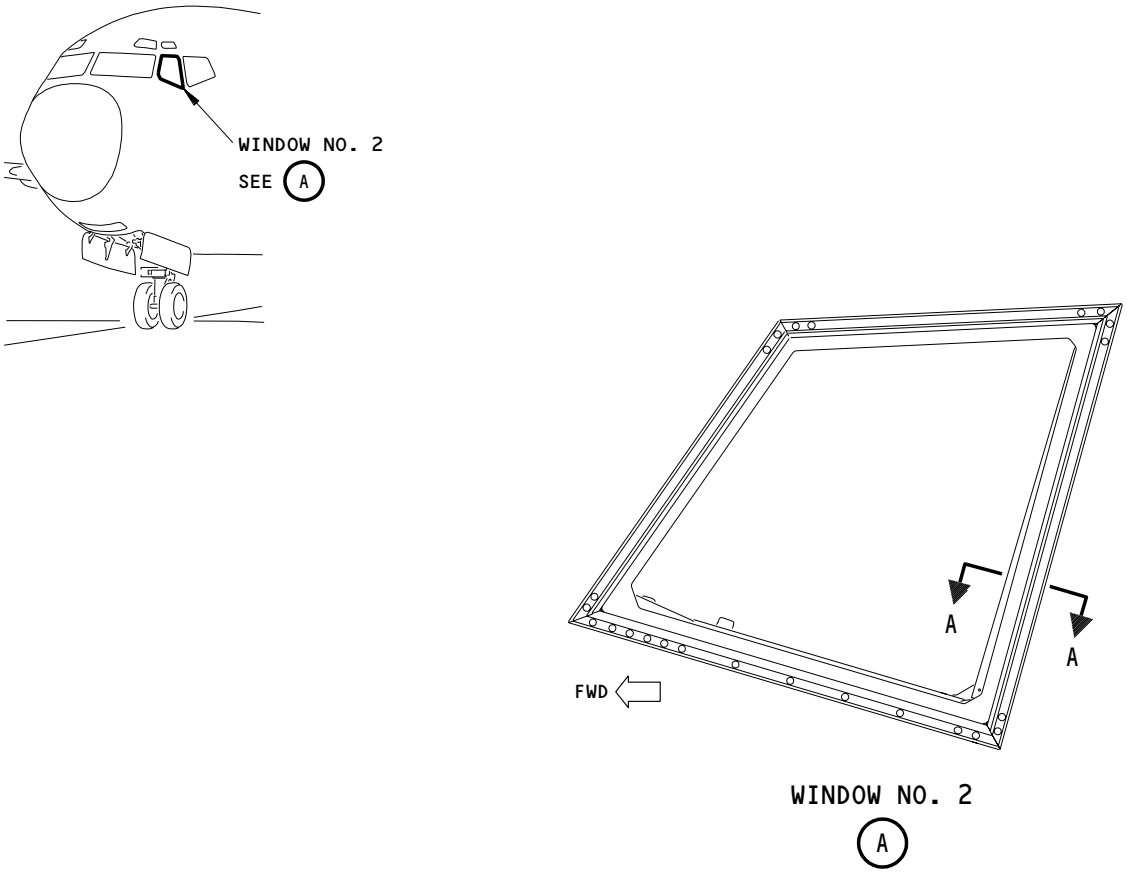


		DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
INDEX NO.	DIM	DIAMETER		MAX WEAR DIM	MAX DIAM CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTER-FERENCE	
		MIN	MAX			YES	NO	MTL		MIN	MAX
1. BUSHING	I/D	0.500	0.501	0.510	0.033			REPLACE			

Window No. 2 Mechanism Wear Limits
Figure 601



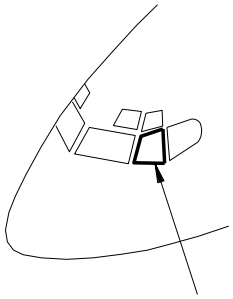
Window No. 2 Vinyl Interlayer Crack Limits
Figure 602



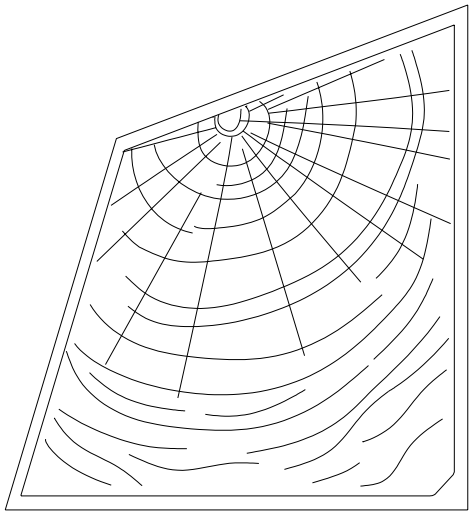
WINDOW NO. 2
A

A–A

Windows – Control Cabin Sliding Windows – No. 2 Openable Window
Figure 603

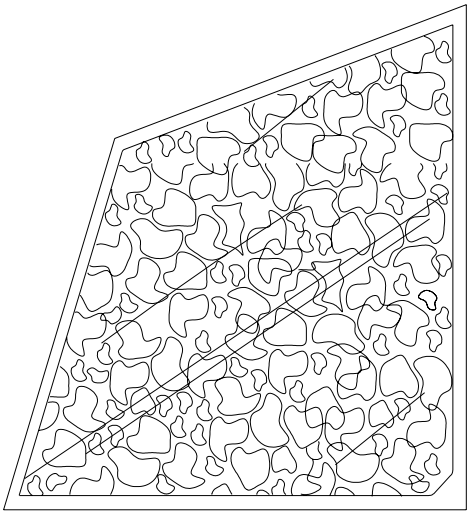


GLASS PANE CRACKS
WINDOW NO. 2
SEE (A)



FWD

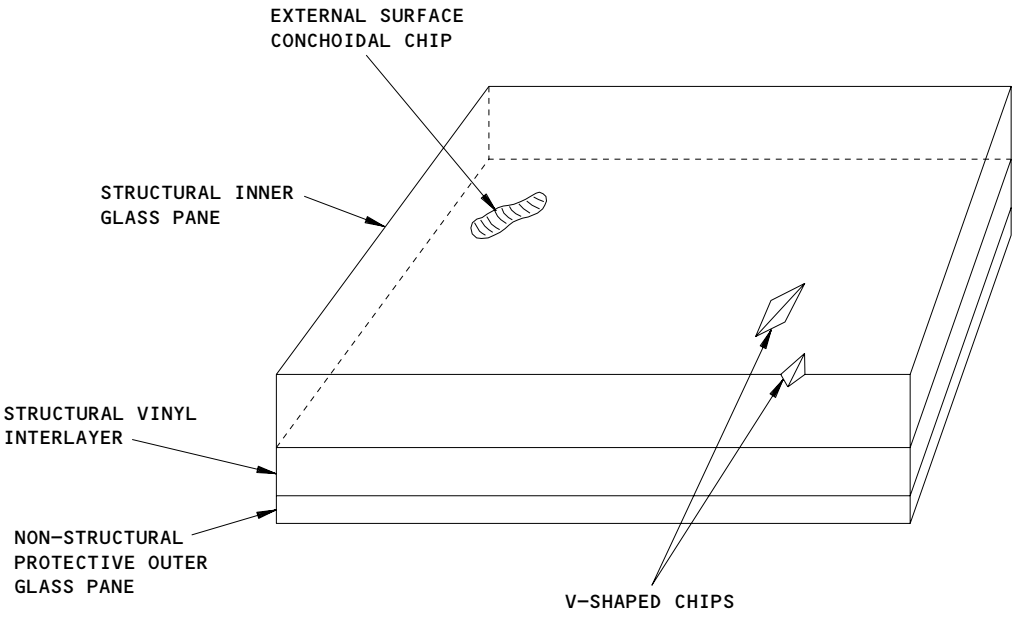
GLASS PANE CRACKS
(NON-STRUCTURAL)
(A)



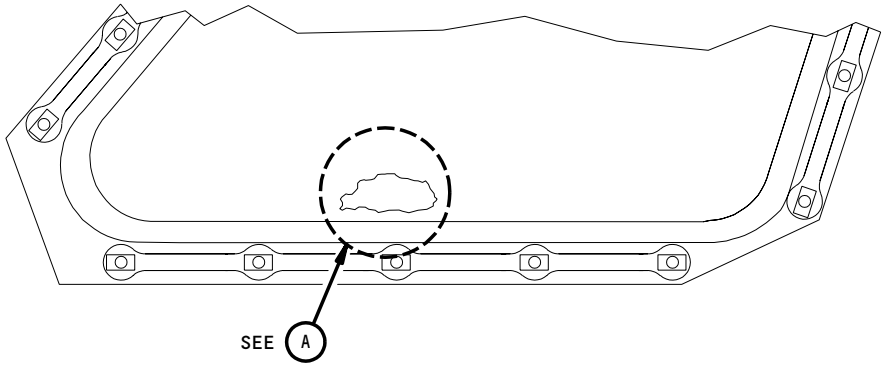
FWD

GLASS PANE CRACKS
(STRUCTURAL)
(A)

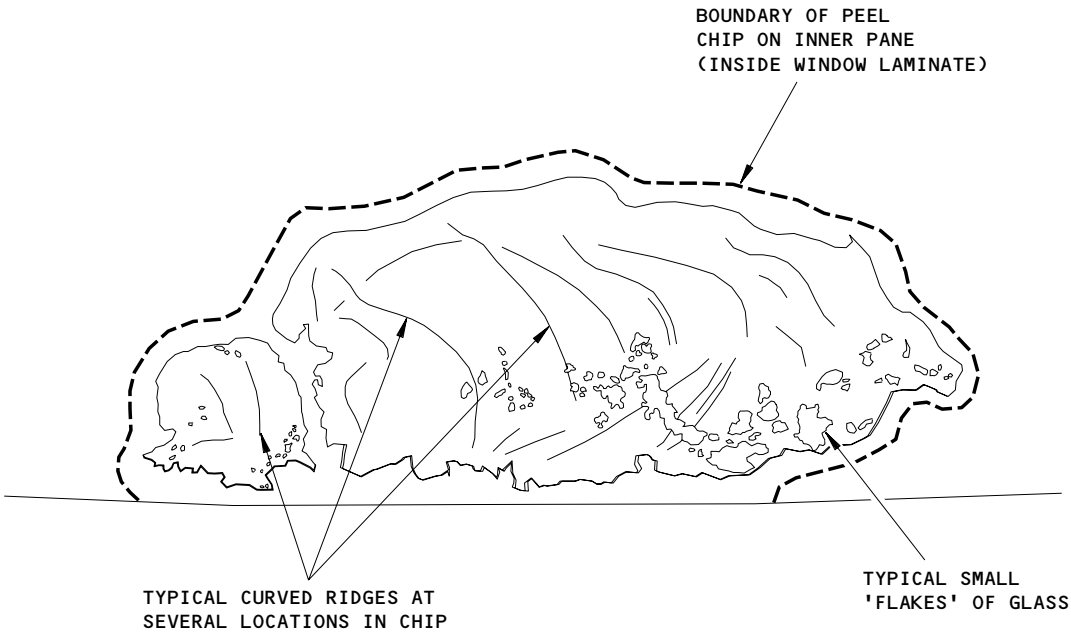
Glass Pane Cracks (Typical)
Figure 604



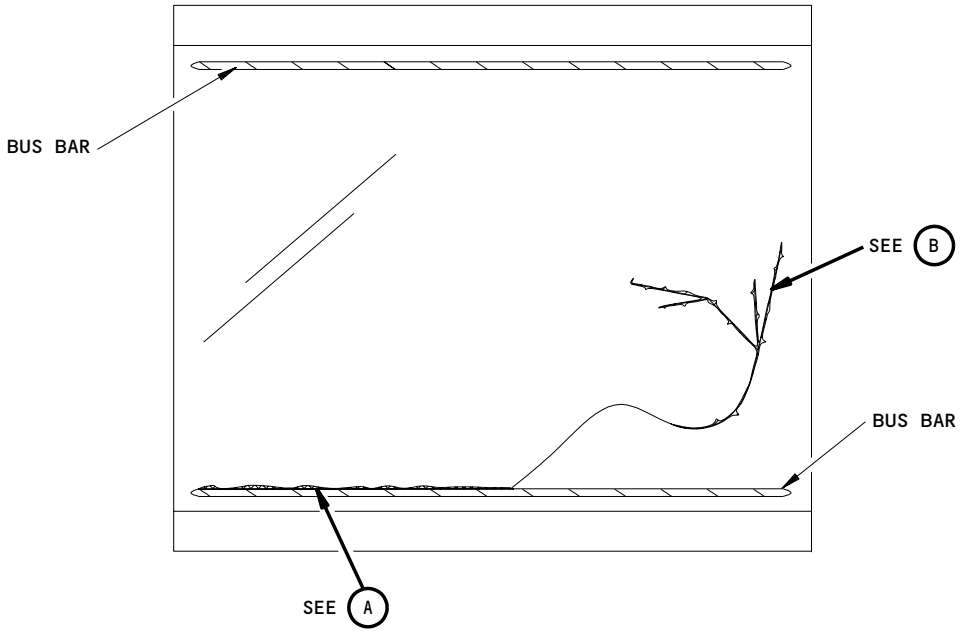
Control Cabin Window Inner Pane Chip Identificaion
Figure 605



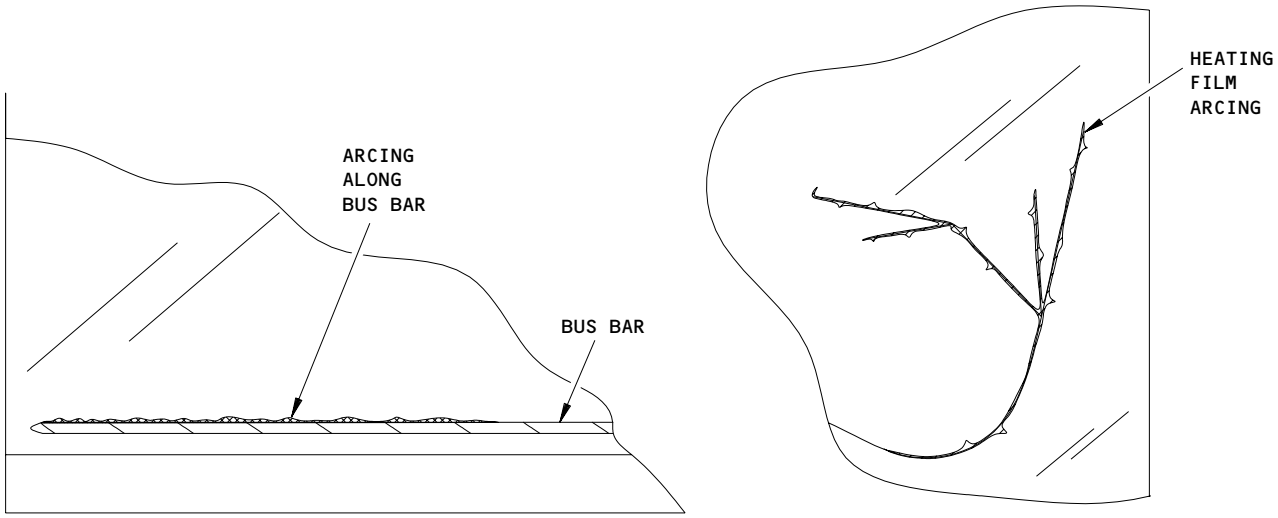
(TYPICAL)



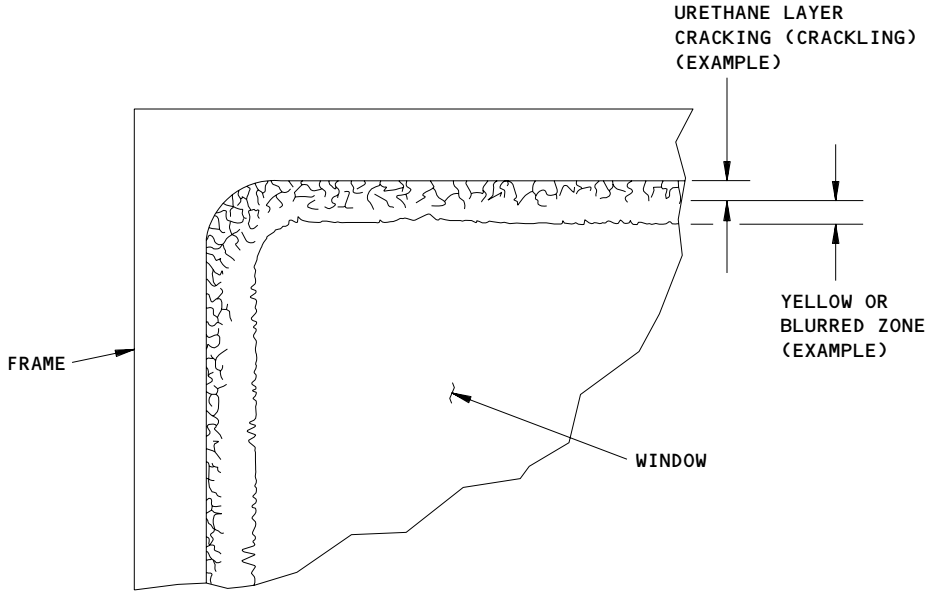
Peel Chips
Figure 606



WINDOW HEAT ARCING



Window Heat Arcing
Figure 607



URETHANE INTERLAYER CRACKS

Urethane Interlayer Cracks
Figure 608

WINDOW NO. 2 (PILOTS' SLIDING WINDOW) - APPROVED REPAIRS

1. Repair Window No. 2 (Pilots' Sliding Window) Handle Trigger Return Spring (Left Window Only) (See figure 801.)
   A. Open window to take load induced by compressed bulb seal off spring pin through handle and bellcrank shaft.
   B. Remove handle from bellcrank shaft by driving out handle spring pin 0.187 inch diameter.
   C. Remove trigger bolt from handle by driving out lower spring pin 0.187 inch diameter.
   D. Remove trigger return spring from handle by driving out middle spring pin 0.187 inch diameter.
   E. Place new trigger return spring in position opposite middle spring pin hole and drive in spring pin.
   F. Place trigger bolt in position opposite lower spring pin hole and drive in spring pin.
   G. Check trigger for full return when released.
   H. Place handle on lower forward bellcrank shaft and drive in spring pin through handle and shaft.

      NOTE: This is most easily done with the window open.

2. Repair Window No. 2 (Pilot's Sliding Window) Bearing (Fig. 802)
   A. Remove window No. 2. See Window No. 2 (Pilot's Sliding Window) - Removal/Installation.
   B. Remove special bolt from bellcrank.

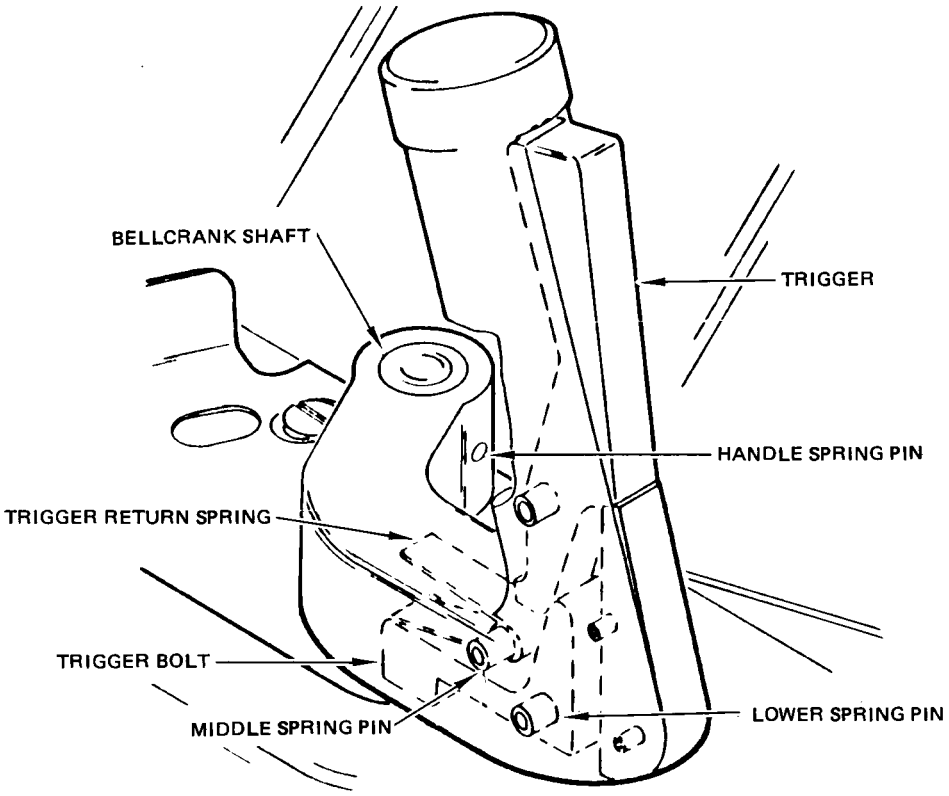
      NOTE: Be prepared to catch parts as screw is removed.

   C. Reinstall special bolt complete with shim washers and new glide track bearing.

      NOTE: It may be necessary to change the number of shim washers to give proper vertical window adjustment.

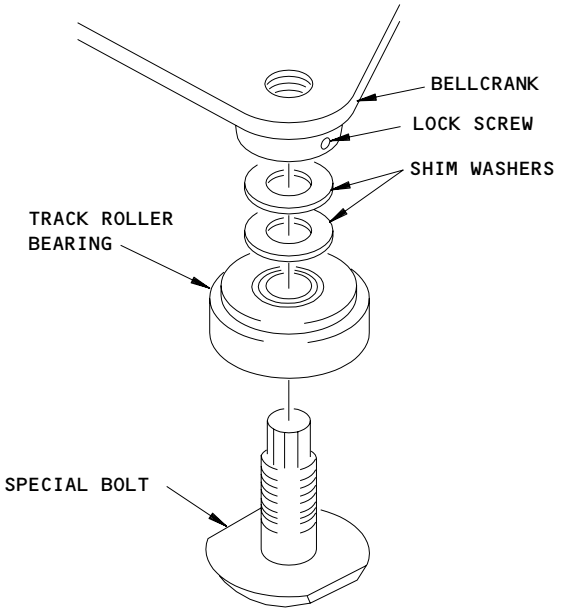
      NOTE: Make sure you tighten the lock screw securely.

   D. Reinstall window NO. 2. See Window No. 2 (Pilot's Sliding Window) - Removal/Installation.



LEFT SLIDING WINDOW SHOWN
(RIGHT SIDE SIMILAR)

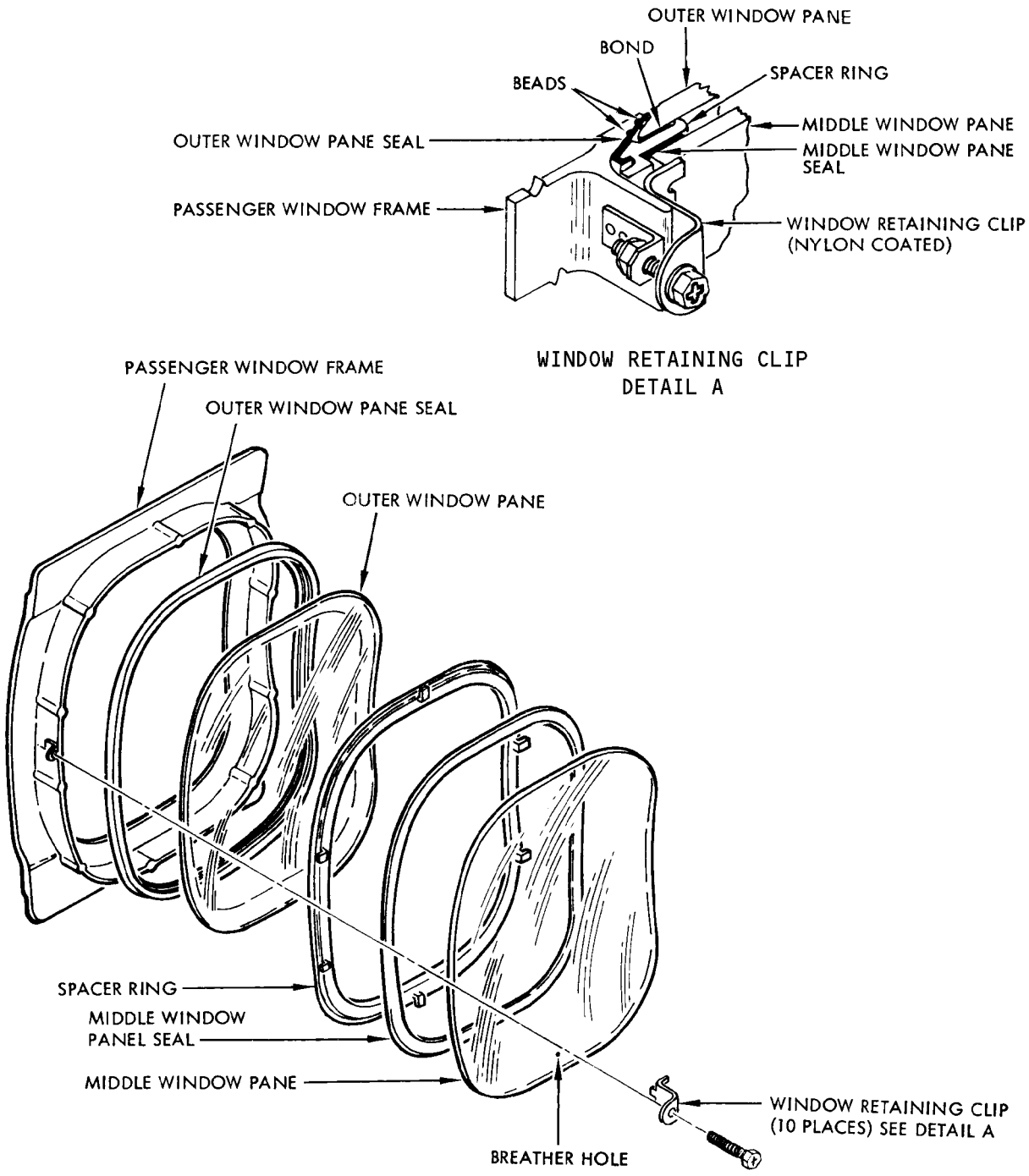
Window No. 2 (Pilots' Sliding Window) Handle Trigger Return Spring Replacement
Figure 801



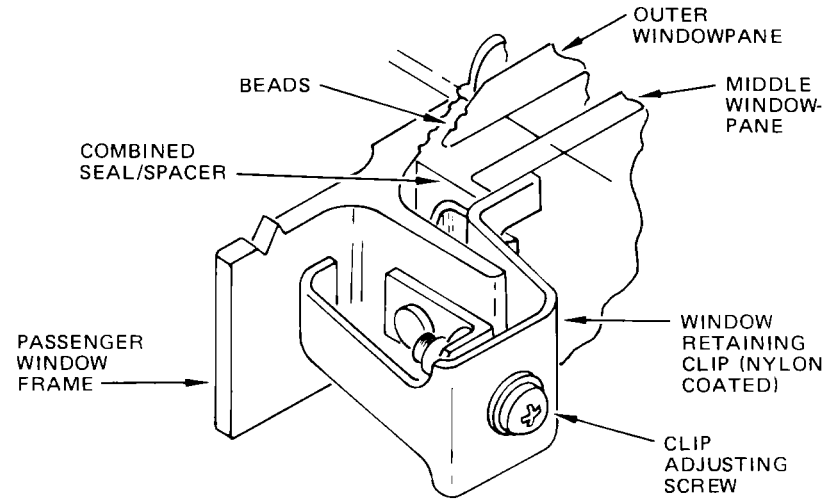
Window No. 2 (Pilots' Sliding Window) Bearing Installation
Figure 802

PASSENGER CABIN WINDOWS - DESCRIPTION AND OPERATION

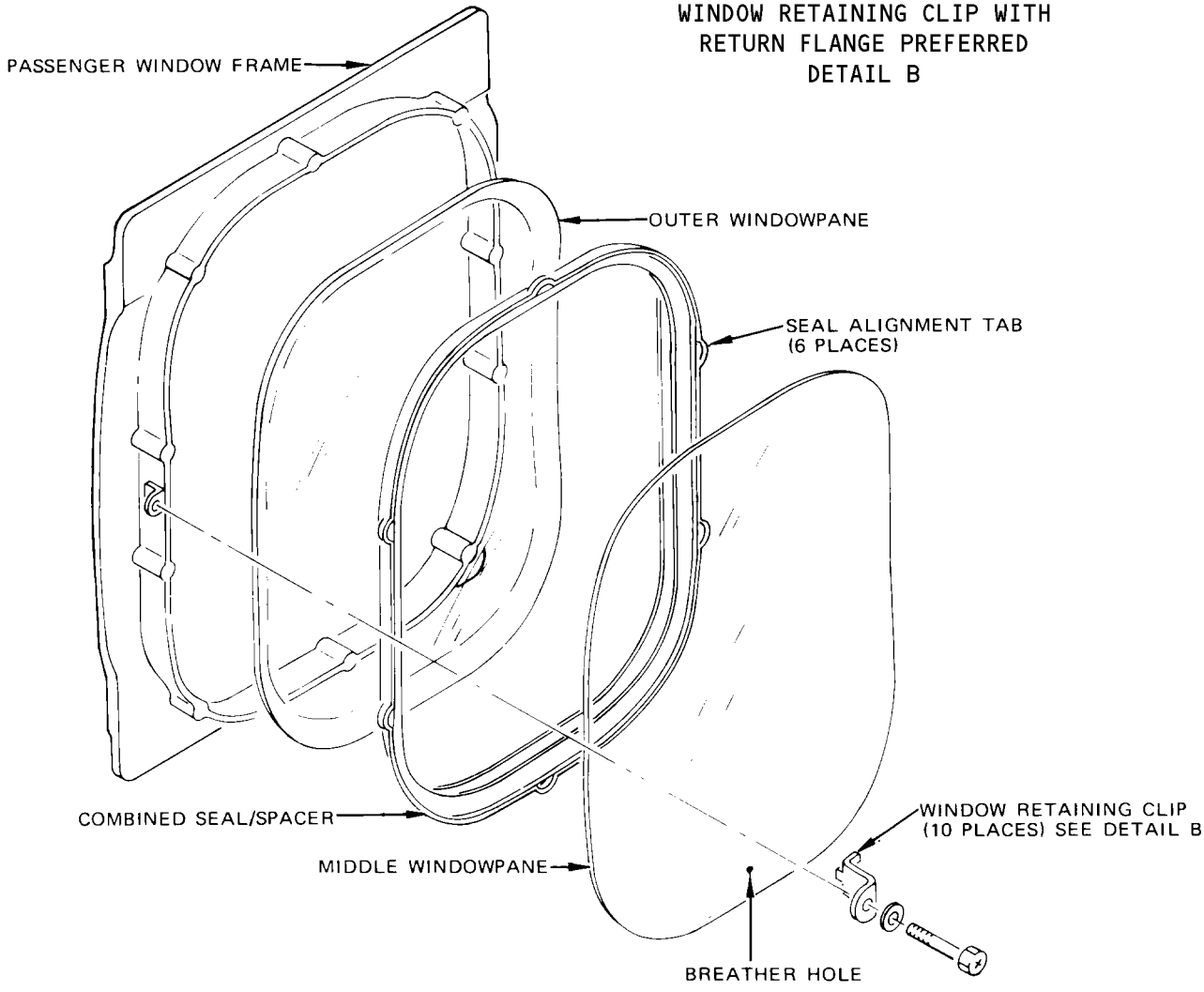
1. General
   A. Passenger cabin windows are located between the fuselage frames in those areas of the cabin where passenger seating is provided. The passenger cabin windows consist of outer, middle and inner panes (Fig. 1). The inner pane is nonstructural and is mounted in the cabin sidewall lining which is described in Passenger Cabin Equipment, Chapter 25. The outer and middle panes are each capable of taking the full cabin pressurization load. Fail-safe structure is ensured by the middle pane which is designed for 1.5 times the normal operating pressure at 70 degrees Fahrenheit. All three panes are acrylic, the structural panes being formed to improve resistance to crazing.
   B. The passenger cabin windows are designed as plug type windows subject only to the pressure acting on them. On earlier window installations (Fig. 1, Detail A), the outer and middle panes are secured to the window frame with a spacer ring, seals and window retaining clips. The outer pane of stretched acrylic plastic is rectangular in shape with rounded corners and a beveled outer edge to fit the window frame. The pane is curved to fair with the fuselage contour. The middle pane is similarly shaped but with an unbeveled edge which is seated on the inboard face of the spacer ring. A small breather hole is located near the bottom of the middle pane.
   C. The spacer ring positions both the middle and outer panes in the window frame. The spacer ring and the outer pane are sealed to the window frame by the outer windowpane seal which is a molded ethylene propylene seal with staggered beads and an integral masking feature. The outer pane is bonded to the spacer ring with a polysulfide rubber base adhesive and sealant. The middle pane is mounted on the inboard face of the spacer ring to which it is sealed by the middle windowpane seal. The middle windowpane seal is a closed cell, cellular rubber seal which is bonded to the spacer ring and middle pane. Ten window retaining clips secure the window in the window frame.
   D. On later passenger cabin window installations (figure 1, detail B), an improved method of installing and sealing the windows is provided through the use of a passenger window seal which replaces the outer pane seal, spacer ring and the middle window pane seal described in paragraphs 1.B. and 1.C. above. The passenger window seal is a molded ethylene propylene seal with six alignment tabs, staggered beads, and an integral masking feature. Bonding is not required on installation of the seal.
   E. Passenger cabin windows are designed to preclude fogging and frosting by means of multiple pane construction with intervening cavities essentially isolated from cabin interior air conditions and supply air conditions.
   F. A passenger cabin window plate (plug) may be installed in place of the outer windowpane in those areas of the passenger cabin where seating is not provided.



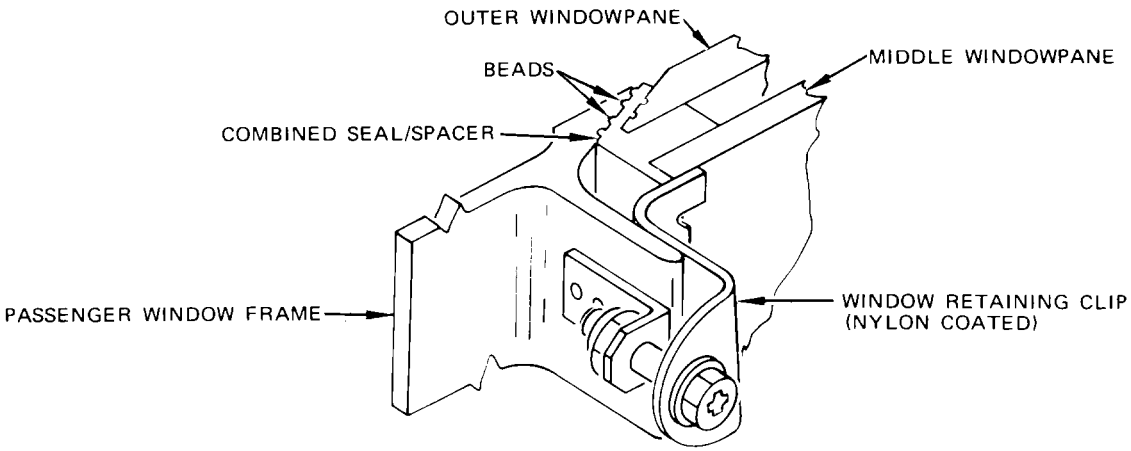
Passenger Cabin Windows
Figure 1 (Sheet 1)



WINDOW RETAINING CLIP WITH RETURN FLANGE PREFERRED
DETAIL B



Passenger Cabin Windows
Figure 1 (Sheet 2)



WINDOW RETAINING CLIP
WITHOUT RETURN FLANGE
DETAIL B

Passenger Cabin Windows
Figure 1 (Sheet 3)

PASSENGER CABIN WINDOWS - SERVICING

1. General
   A. The task to apply the antistatic solution is an optional procedure.
   B. Reapplication of the antistatic agent should not be required for several months provided the treated surfaces remain inaccessible to weather and human contact. Antistatic solution is water soluble, therefore care should be taken not to wet or mar windowpane surface after treatment.
2. Equipment and Materials
   A. Antistatic agent (Ref 20-30-31)
   B. Boiled cheesecloth (boil and drain three times)
   C. Castile soap
   D. Wax (Ref 20-30-31)
3. Prepare Passenger Cabin Windows for Servicing
   A. Remove sidewall lining (Ref Chapter 25, Passenger Cabin Lining and Insulation).
   B. Remove window assembly (Ref Passenger Cabin Windows - Removal/Installation or Emergency Exit Hatch Window - Removal/Installation).
   C. Clean inner surface of outer pane, both surfaces of middle pane, and outboard surface of inner pane, with lukewarm water and castile soap. Use a soft, clean cloth to transfer soap solution to pane surface but go over surface with bare hand only, so that any dirt can be quickly detected and removed before it scratches surface. Wipe dry with a clean, damp chamois.

      NOTE: Do not rub surfaces with a dry cloth. It causes scratches and builds up an electrostatic charge which attracts dust particles. Inner pane referred to is part of sidewall lining removed in step A.

   D. Mix 10 parts antistatic agent with 120 parts water by weight.
4. Apply Antistatic Agent to Windowpanes
   A. Soak boiled cheesecloth with antistatic solution and apply to inner surface of outer pane, both surfaces of middle pane, and outer surface of inner pane.
   B. Allow surfaces to dry, then polish with boiled cheesecloth using brisk straight motions of the hand and maintaining as light a pressure as possible.

      NOTE: Do not wet or mar window surfaces after treatment. Antistatic solution is water soluble.

5. Restore Airplane to Normal Configuration
   A. Install window assembly (Ref Passenger Cabin Windows - Removal/Installation or Emergency Exit Hatch Window - Removal/Installation, 56-22-0).

B. Install sidewall lining (Ref Chapter 25, Passenger Cabin Lining and Installation).

6. Application of Wax Coating

A. Clean outer surface of outer pane as in step 3.C.

B. Apply wax to surface of window and polish lightly with flannel cloth.

PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION

1. General
   A. In converting from a passenger cabin window installation to a window plate (plug) installation, remove the passenger cabin window as described in paragraph 4. To install the window plug, refer to Passenger Cabin Windows Plate (Plug) - Removal/Installation, 56-21-11.
   B. When a passenger cabin window is removed for repair, the same precautions should be observed in handling, storage, and packing of the window as were observed for the new window. (See, CAUTION, paragraph 4 B. and 4.C.) The window removed from the airplane should be placed in the same package in which the new replacement window was received.
2. Equipment and Materials
   A. Cellulose Acetate Sheeting, Permacel Tape No. 76, Minnesota Mining and Manufacturing Tape No. 221 or Transparent Cellophane No. 600, Spraylat SC-1058R, or equivalent
   B. Masking tape
   C. Plastic scraper (See AMM 51-31-0/201 for approved scrapers)
   D. BMS 5-44, Class B, Sealant
   E. Cheesecloth or equivalent
   F. BMS 5-55, Cement
   G. Aliphatic Naphtha, TT-N-95A, Type II

      NOTE: Freon-TF, or equivalent, may be used in lieu of aliphatic naphtha, TT-N-95A, Type II, for general cleaning of windows.

   H. Castile soap
   I. Aluminum oxide paper, 400 grit
   J. Liquabrasive, 140 grit, Wheelabrator Corporation
   K. Aluminum oxide cloth, 180 grit
   L. Angular steel grit, G-80, Panchorn Corporation
3. Prepare Passenger Cabin Window for Removal
   A. Remove sidewall lining (Ref Chapter 25).

      NOTE: Use care in handling plastic reveal. Surfaces visible to cabin interior must be free of marks, scratches, and dents.

   B. Apply protective covering of cellulose sheeting to accessible surfaces of window panes which are to be removed and reinstalled. Secure cover with masking tape if necessary.
4. Remove Passenger Cabin Window
   A. Remove clip adjusting screws (5, Fig. 401) and window retaining clips (4).

      NOTE: Note location of removed clip for aid in installation.

B. Remove window as a unit from the window frame.

CAUTION: IF WINDOW IS TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE ACETATE SHEETING MUST BE APPLIED TO ACCESSIBLE SURFACES TO PREVENT DAMAGE DURING HANDLING.

C. Examine window assembly seals for damage and disassemble if the seals are torn or damaged in any way.
(1) On window installation with separate spacer and seals, strip seals (2 and 8, Detail A) from windowpanes (3 and 7) and spacer ring (9). To strip seal, scrape the seal carefully (AMM 51-31-0/201), and clean up with aliphatic naphtha or equivalent.

WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

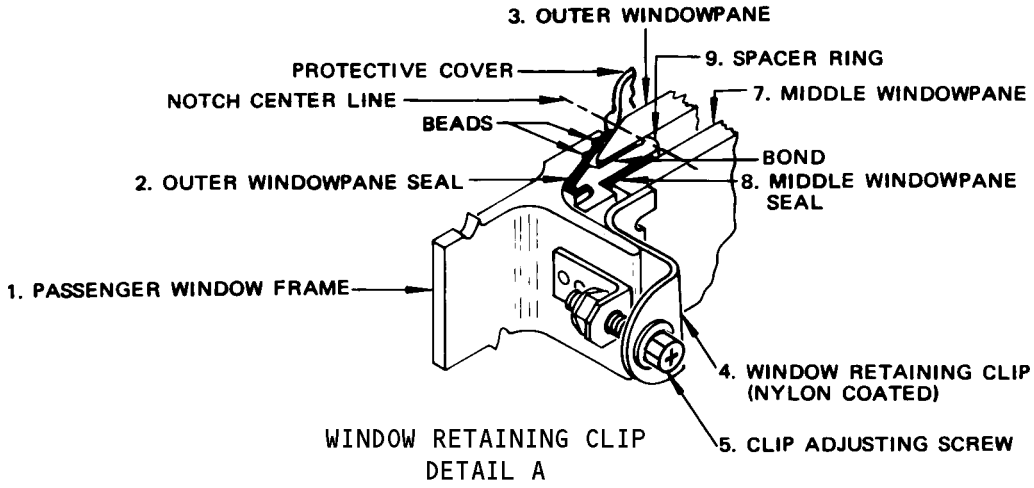
CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE SEAL. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

(2) On window installation with combined seal/spacer, remove the seal/spacer (10, Detail B) from the windowpanes (3 and 7).

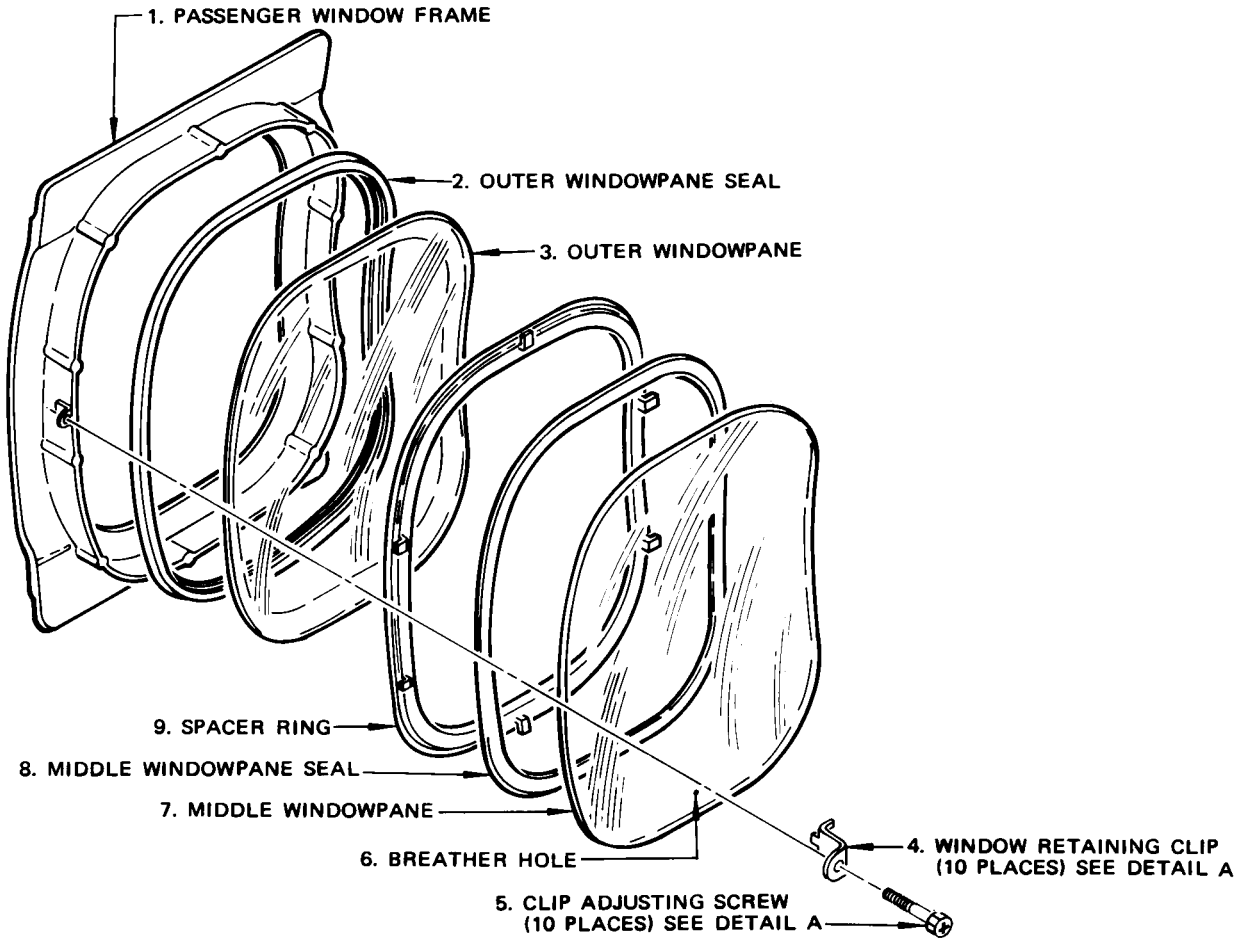
CAUTION: IF PANES ARE TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE SHEETING MUST BE APPLIED TO SURFACES TO PREVENT DAMAGE DURING HANDLING.

D. Examine forging toe for nicks or gouges. If any damage is detected, it should be blended out (Ref Structural Repair Manual).

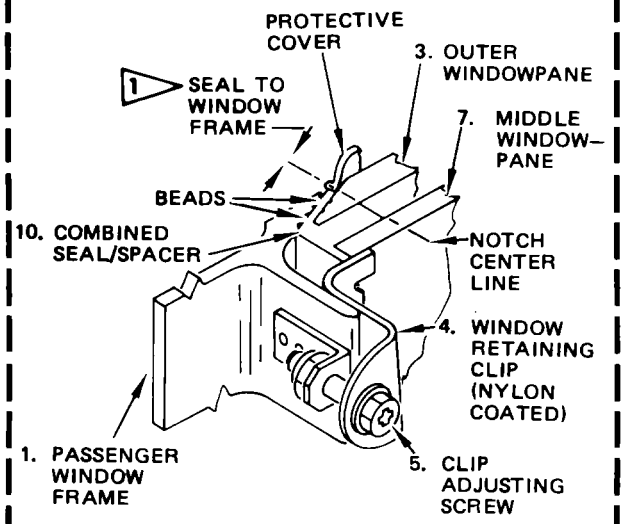
5. Prepare Passenger Cabin Window for Installation
A. On window installation with separate spacer and seals ([2 and 8], figure 401, detail A), prepare the window assembly for installation, as follows:
(1) Clean faying surfaces of outer seal and window frame with aliphatic naphtha, or equivalent, applied with a clean, oil-free, absorbent material and wipe dry before the cleaner has evaporated with a clean, lint-free, cloth.
(2) Sand both faying surfaces of the spacer ring (9) thoroughly with 400 grit aluminum oxide paper until all gloss is removed. Optional: wet abrasive blast all surfaces of the spacer ring with Liquabrasive, 140 grit, as required to remove all surface gloss.
(3) Sand both faying surfaces of the middle windowpane seal thoroughly with 180 grit aluminum oxide cloth. Optional: dry abrasive blast both sides of seal with G-80 angular steel grit, as required to remove the glossy powdered mica.



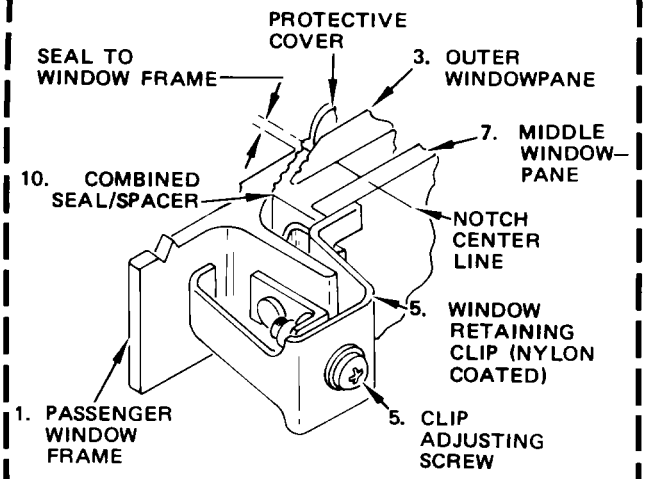
WINDOW RETAINING CLIP
DETAIL A



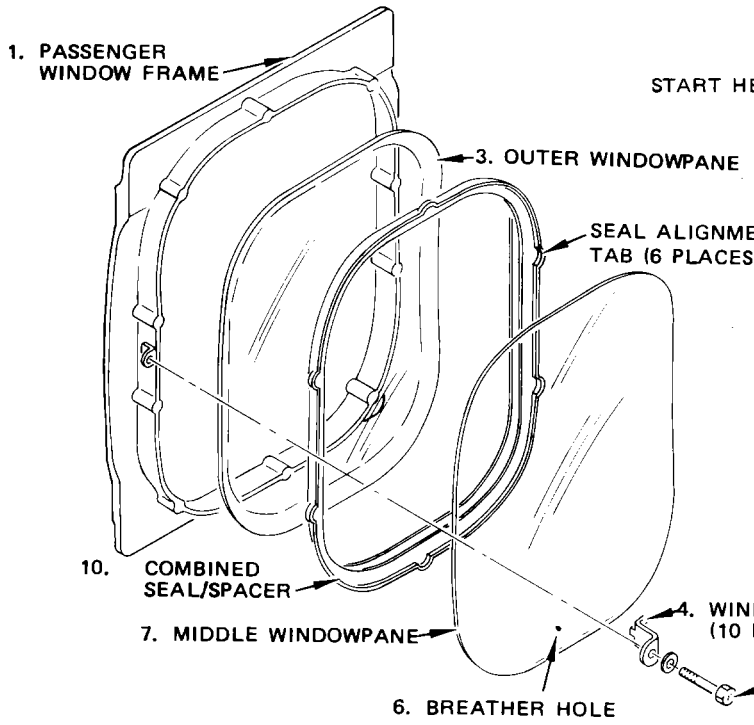
Passenger Cabin Window Installation
Figure 401 (Sheet 1)

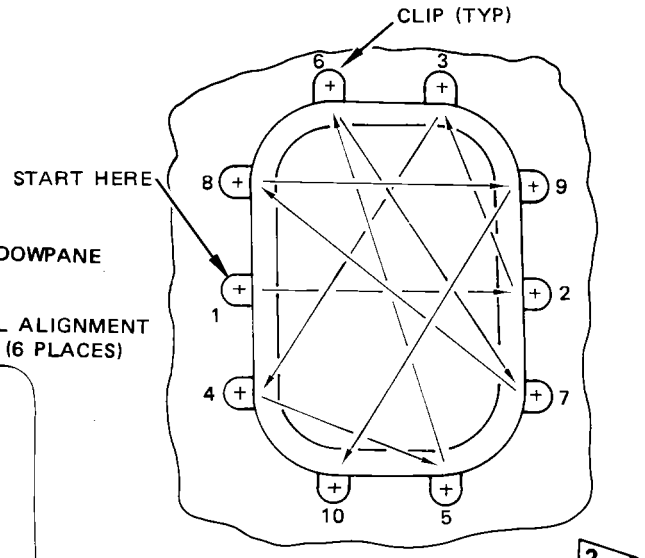


WINDOW RETAINING CLIP WITHOUT RETURN FLANGE
DETAIL B



WINDOW RETAINING CLIP WITH RETURN FLANGE
DETAIL B





2

SCREW TIGHTENING SEQUENCE DIAGRAM
DETAIL A

1 WITH 65–76765–1 SEAL, AFTER DIAPHRAGM REMOVAL EDGE OF SEAL MAY VARY + 0.04/ – 0.10 FROM EDGE OF WINDOW FRAME. WITH 65–76765–3,–4 OR–5 SEAL, AFTER DIAPHRAGM REMOVAL, EDGE OF SEAL MAY VARY + 0.10 FROM EDGE OF WINDOW FRAME.

2 THIS DIAGRAM IS INTENDED AS AN EXAMPLE ONLY. ANY SIMILAR SCREW TIGHTENING PATTERN IS SATISFACTORY.

Passenger Cabin Window Installation
Figure 401 (Sheet 2)

(4) Thoroughly clean the faying surfaces common to the seal and the middle pane with aliphatic naphtha and wipe dry.

WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

NOTE: Apply cleaner with a clean, oil free, absorbent material. Wipe off cleaner, while wet, with a clean, oil and lint-free, absorbent material such as new cheesecloth, or equivalent. The use of excessive cleaner should be avoided.

(5) Thoroughly clean the faying surfaces common to the seal and the spacer ring with aliphatic naphtha and wipe dry.
(6) Thoroughly clean the faying surfaces common to the spacer ring and the outer pane with aliphatic naphtha and wipe dry.
(7) Cut and remove material on each side, at the horizontal centerline, of the middle windowpane seal to allow the seal to lay smoothly around the periphery of the middle pane. Butt splice the seal allowing no gap at the cut.
(8) Bond faying surfaces of the outer pane to the spacer ring with BMS 5-44, Class B, sealant.
(9) Bond faying surfaces of the middle windowpane seal to the spacer ring with BMS 5-44, Class B, sealant.

NOTE: Adhesive bead extruding from under seal on inner edge of spacer ring is satisfactory.

(10) Bond faying surfaces of the middle windowpane seal and the middle windowpane with BMS 5-55, cement.
(11) Remove protective cover from the inner surface of the outer pane (3) and from the outer surface of the middle pane (7).
(12) Clean and apply antistatic agent to exposed surfaces of each pane. See Servicing, Passenger Cabin Windows.
(13) Assemble outer windowpane (3), with part number at top of pane, middle windowpane (7) with breather hole (6) at bottom of pane, and middle windowpane seal (8) on spacer ring (9). Press window assembly firmly together, taking care to avoid trapping air pockets.

NOTE: 35 percent of adhesive ultimate strength is obtained immediately using the maximum open drying period.

(14) Clean up as necessary with aliphatic naphtha.
(15) Install outer windowpane seal (2) on outer windowpane (3) and spacer ring (9).

B. On window installation with combined seal/spacer (10, figure 401, detail B) prepare the seal/spacer and the outer and middle windowpanes (3 and 7) for installation as a unit, as follows:
   (1) Clean faying surfaces of seal and window frame with aliphatic naphtha, or equivalent, as described in paragraph 5.A.(1).
   (2) Remove protective cover, clean, and apply antistatic agent to exposed surfaces of each windowpane as described in paragraphs 5.A.(11) and (12).
   (3) Assemble outer windowpane (3), with part number at the top of pane, and the middle windowpane (7), with breather hole (6) at bottom of the pane, and the seal/spacer (10) as a unit.

6. Install Passenger Cabin Window
   A. Clean accessible areas around opening between outer and inner pane (Ref 12-40-0).
   B. Install prepared window assembly (par. 5.A. or 5.B.) in window frame (1, Fig. 401).

      CAUTION: LEAKAGE MAY RESULT AROUND WINDOW IF SEAL IS INSTALLED IMPROPERLY.

      (1) Install window retaining clips (4). At this time, tighten only enough to provide some friction on seal to help keep it positioned during installation.
      (2) Grasp protective cover at least 2 inches in from edge and pul1 toward center. When released, seal should adhere to outer surface of outer pane and remain snuggly in place.
      (3) Repeat above procedure until seal edge is in place as viewed from inside airplane.
      (4) On airplanes without return flanged clips, tighten screws using criss-cross torque sequence. A suggested tightening sequence is shown in Fig. 401. Tighten until threads show past nut, and washer and head sits flat on clip.
      (5) On airplanes with return flanged clips (preferred), tighten screws using criss-cross torque sequence. A suggested tightening sequence is shown in Fig. 401. Tighten screws 12-15 pound-inches.

         NOTE: If bulging occurs reduce torque as required. If clip is loose and not seated at 15 pound-inches torque, torque may be increased 5 pound-inches as required to seat clip. Maximum torque should not exceed 25 pound-inches.

   C. Remove protective cover from inner surface of middle pane (7).
   D. Clean and apply antistatic agent to inner surface of middle pane (7) (Ref Servicing, Passenger Cabin Windows).

7. Restore Airplane to Normal Configuration
   A. Clean sidewall lining (Ref 12-40-0).

B. Install sidewall lining (Ref 25-21).

NOTE: Use care in handling plastic reveal. Surfaces visible to cabin interior must be free of marks, scratches, and dents.

C. Remove window pane seal protective cover by tearing along notch line and tear off seal cover. Start tear by cutting notch. If seal cover does not tear smoothly at notch line, it may be necessary to score notch thickness 25 to 75% all around before tearing.

CAUTION: EXTREME CARE MUST BE TAKEN DURING CUTTING OF NOTCH TO PREVENT SCRATCHING WINDOW OR CUTTING THROUGH BEADS ON EITHER SIDE OF NOTCH. DO NOT CUT THROUGH.

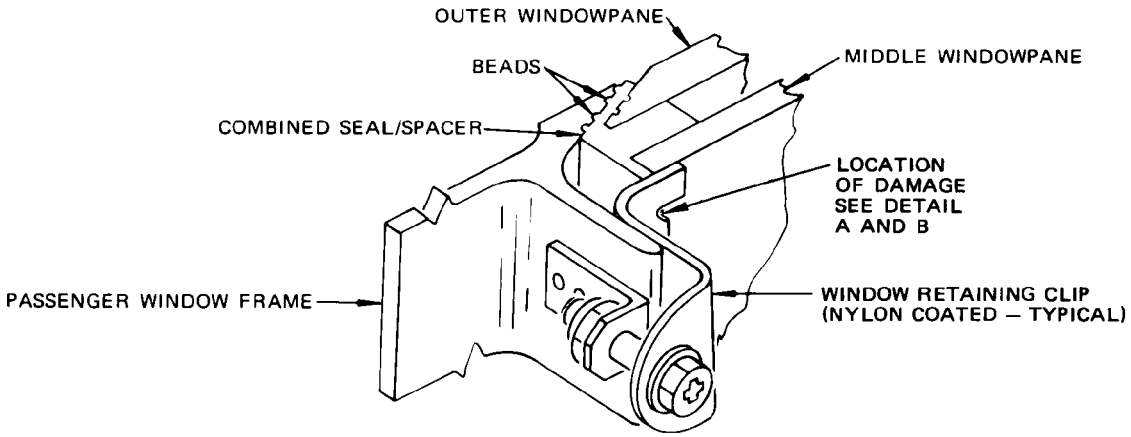
D. Clean outer surface of outer pane (3) with lukewarm water and castile soap. Use a soft, clean cloth to transfer the soap solution to the pane surface. Go over the surface with the bare hand only, so that any dirt can be quickly detected and removed before it scratches the surface.

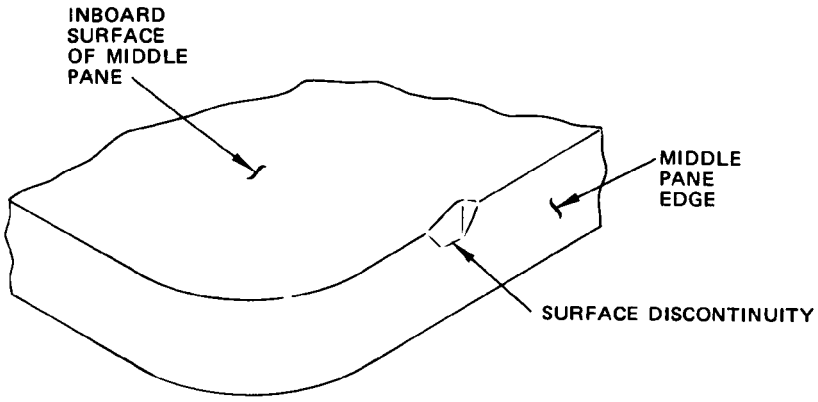
E. Wipe dry with a clean damp chamois.

NOTE: Do not rub surface with a dry cloth. It causes scratches and builds up an electrostatic charge which attracts dust particles.

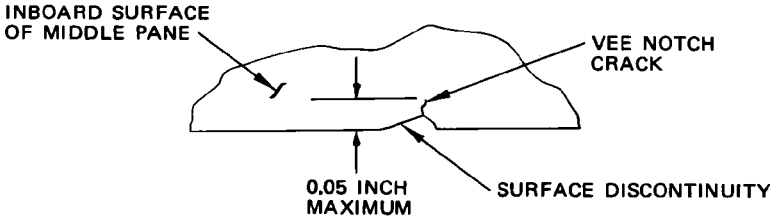
PASSENGER COMPARTMENT WINDOWS - INSPECTION/CHECK

1. Passenger Compartment Window Inspection
   A. General
      (1) During inspection of windows, if damage or normal deterioration of a component of the window installation exceeds limits described, remove window and replace component (Ref Removal/Installation).
      (2) Definitions of various types of damage are as follows:
         (a) Crazing: Series of very fine fissures perpendicular to surface of plastic. Due to extremely narrow width of fissures, crazing is very difficult to detect when viewed normal to surface. It can be seen by reflection from smooth surfaces of fissures when viewed at varying angles to the incident light.
         (b) Crack: A fissure which has visible width when viewed parallel to the faces of the fissure. A crack may propagate at any angle to surface of a plastic pane depending on direction of the driving force. Cracks in stretched acrylic may have chevron or clam shell growth lines (Fig. 603).
         (c) Scratch: The removal or displacement of material from surface of a pane along a line. The ratio of depth to width is usually quite small.
         (d) Chips:
            1) Spall (Shell Type) Chips have circular or curved periphery with many fine hairlines or ridges that follow the outline of outer edge and degenerate toward the center of deepest point of chip, similar to a clam shell.
            2) Vee shaped chips have sharp narrow "V" shape and appear to propagate toward the interior of plastic.
         (e) In-plane cracking (formerly identified as delamination): A smooth surfaced fissure, or series of fissures, parallel to pane surfaces. In-plane cracking can occur in stretched acrylic and starts at edges of pane or at deep penetrations of the surface. It is most readily detected by the reflection of light from the smooth surfaces of the fissure (Fig. 604).
   B. Materials and Equipment
      (1) Optical Micrometer - Model 966A1
      Edwards Aerospace Company
      1841 Business Pkwy
      Ontario, CA 91761
      Telephone (714) 923-3533
      Fax (714) 923-6781



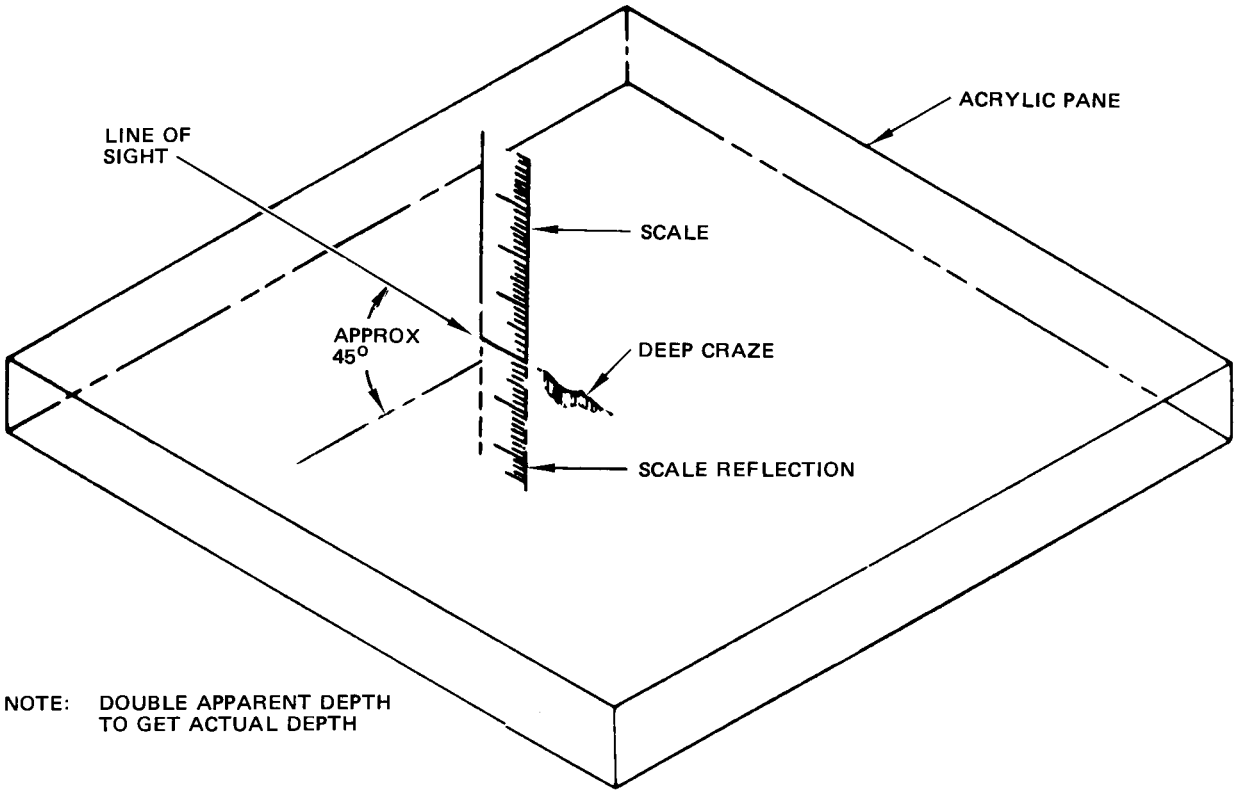


DISCRETE SURFACE
DISCONTINUITY WITH VEE NOTCH CRACK
DETAIL A

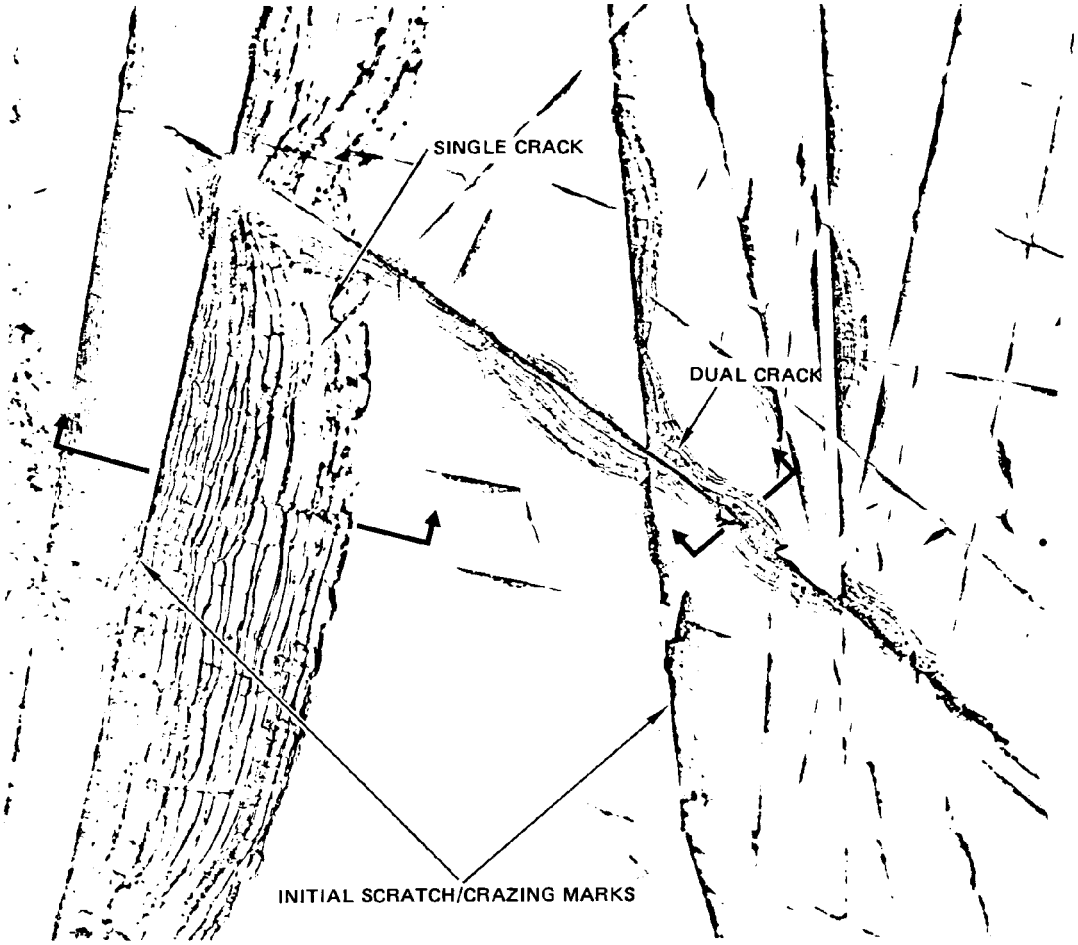


DISCRETE SURFACE
DISCONTINUITY WITH VEE NOTCH CRACK
DETAIL B

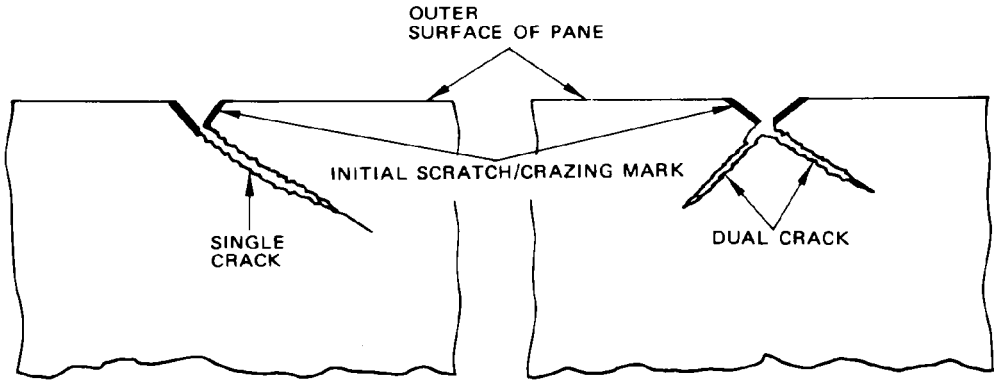
Middle Pane Damage Due to Window Clip
Figure 601



Alternate Method of Measuring Depth of Crazing
Figure 602



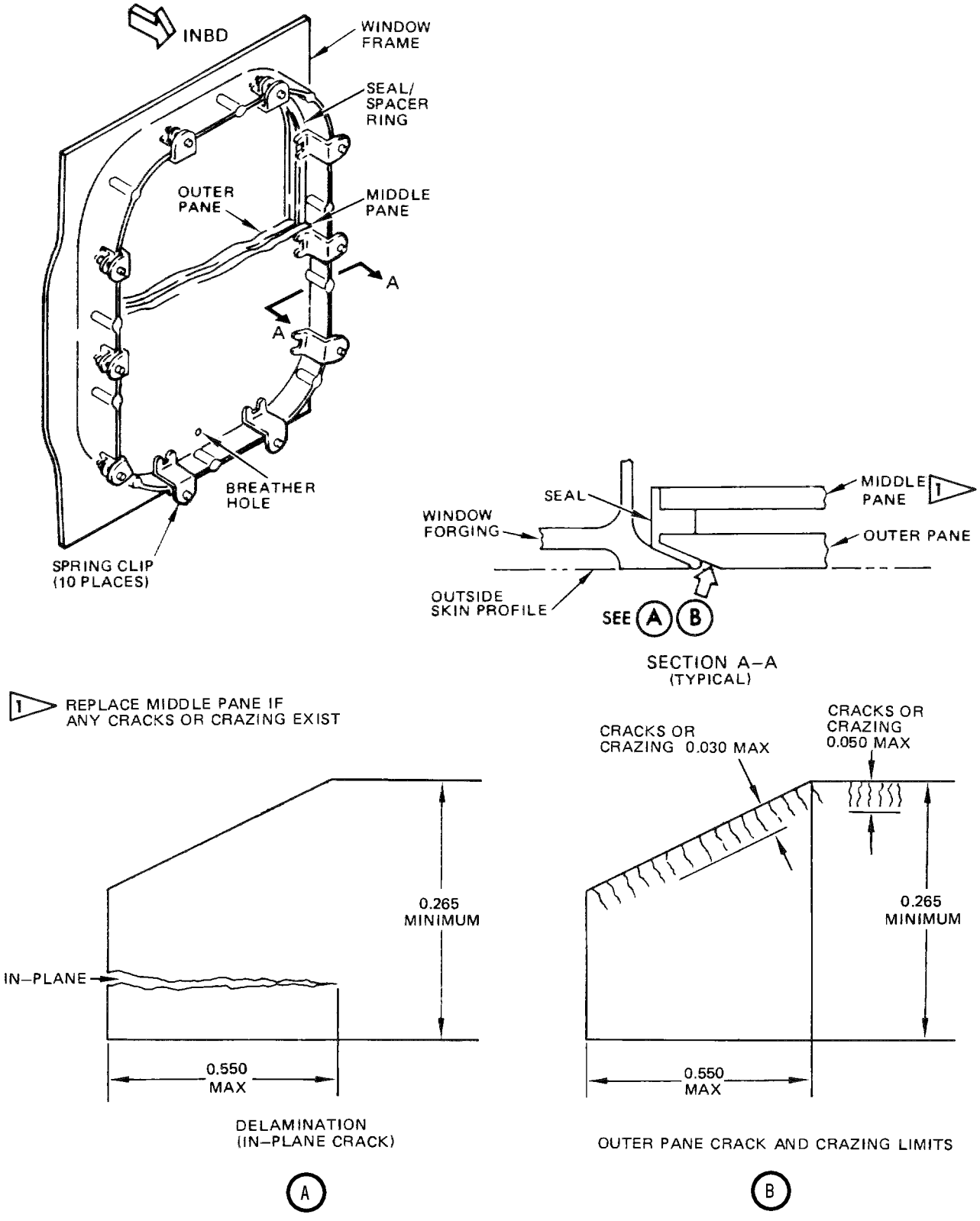
VIEW OF WINDOW SURFACE



SECTION A–A SECTION B–B

NOTE: NOT TO SCALE – SECTIONS AND ILLUSTRATIONS DEPICTING CRACKS GREATLY ENLARGED TO EMPHASIZE CHARACTERISTICS OF CRACK DEVELOPMENT

Window Surface Crack Development – Typical (Outer Pane Stretched Acrylic)
Figure 603



Passenger Compartment Window Inspection
Figure 604

C. Examine Windowpanes

(1) Examine windowpanes for cracks.

CAUTION: DO NOT PRESSURIZE AIRPLANE WITH CRACKED MIDDLE PANE. PRESSURIZATION INTEGRITY OF FUSELAGE WITH ONE PANE CRACKED IS CRITICAL, BECAUSE FAIL-SAFE FEATURE HAS BEEN ELIMINATED.

(a) Replace any cracked middle pane.
(b) Minimum thickness for middle pane is 0.157 inch.
(c) Replace outer pane if crack is deep enough that pane thickness after rework will be less than the following minimum thickness:

NOTE: Cracks 0.050 inch deep or deeper will require replacement of outer pane. Cracks in outer pane can develop from scratches or crazing (Fig. 603).

1) 0.265 inch minimum thickness for all outer passenger windowpanes in fuselage.

(d) Exact depth of crack may be measured with an optical micrometer. To obtain correct measurement, multiply micrometer reading by acrylic plastic index of refraction (1.49).
(e) Any accurate method for determining crack depth is acceptable (Fig. 602).

(2) Examine windows for crazing.

CAUTION: DO NOT PRESSURIZE AIRPLANE WITH CRAZED MIDDLE PANE. PRESSURIZATION INTEGRITY OF FUSELAGE WITH MIDDLE PANE CRAZED IS CRITICAL, BECAUSE FAIL-SAFE FEATURE HAS BEEN ELIMINATED.

(a) Replace any crazed middle pane.
(b) Replace outer pane if depth of crazing exceeds 0.03 inch on the bevel edge.

NOTE: A 0.03 inch maximum depth of crazing on the bevel edge is allowable providing a minimum thickness of window is 0.265 inch and a maximum width of bevel is 0.550 inch (Fig. 604).

(c) Replace outer pane if depth of any single craze or crack equals or exceeds 0.05 inch.

(3) Examine windows for scratches.

(a) Minor scratches in outboard surface of outer panel and inboard surface of inner pane may be made less visible by waxing.
(b) Scratches may be removed from surfaces of panes (Ref AR).

(4) Examine windows for in-plane cracking (formerly identified as delamination).
  (a) Replace outer pane whenever edge in-plane cracking can be seen with window installed.
  (b) Replace pane if in-plane cracking exceeds 0.55 inch from edge of removed pane.
  (c) In-plane cracking of outer pane at any place other than its edges, is often accompanied by chipping. Outer pane should be replaced if in-plane cracking or chips exceed the following limits:
    1) Maximum chip depth -- 0.05 inch
    2) Maximum size of in-plane cracking -- 0.40 inch diameter
    3) Minimum distance between defects -- twice maximum damage diameter
  (d) No in-plane cracking permitted in middle pane.
(5) Examine windows for chipping.
  (a) Refer to above in-plane cracking examination paragraph, for limits for chipping in outer windowpane.
(6) Examine windows for erosion.
  (a) Erosion or chipping can occur at window forward edge. Structurally this is acceptable. However, if appearance becomes objectionable, window may be repaired to remove roughness.
(7) Examine windows for concavity.
  (a) Concavity is out of contour window panes. The outer (stretched acrylic) pane bows inward and the middle (cast acrylic) pane bows outward. A deformed window is of no structural concern even if the middle and outer panes touch when the airplane is unpressurized.
    1) Place straightedge across narrow width of outboard surface of outer plane. If gap exists between straightedge and center of pane, window is concave. Windows prone to fogging are prone to uniform concavity.
  (b) Deformed windows can be returned close to their original contour by removing them from the airplane and drying them out.
(8) Examine windows for optical distortion.
  (a) Replace windows with extreme localized optical distortion, or thickness variations.

    NOTE: Uneven surface contour and reduced optical quality can be caused by exposure to high temperature, such as photo flood lamp.

(9) Examine windows for leakage into cavity between middle and outer panes.
   (a) Some signs of a leaking seal are:
      1) Fogging and concavity.
      2) Brown stains, outside in vicinity of seal or inside near vent hole in middle pane.
      3) Obvious displaced, rolled back, or damaged seals.
   (b) Replace leaking seals.
(10) Examine windowpanes for creep deformation.
   (a) Creep deformation is middle pane damage created by window retainer clip against the edge of pane (Fig. 601).
   (b) Middle pane creep deformation is permissible within the following limits:
      1) Without discrete surface discontinuity, surface or edge is slightly displaced, but a fingernail cannot detect a discontinuity. No rework is necessary.
      2) Discrete discontinuity, but no evidence of a vee notch crack. Window should be reworked (Ref Approved Repairs).
      3) Discrete surface discontinuity and a vee notch crack less than 0.05 inch inward from edge of pane. Window should be reworked.
      4) Discrete surface discontinuity and a vee notch crack greater than 0.05 inch inward from edge of pane. Window should be replaced.

PASSENGER CABIN WINDOWS - APPROVED REPAIRS

1. General
   A. This section contains repairs to be accomplished with windows installed in the airplane. For window repairs to be accomplished on the bench (including repairs to the bevel edge and the seal plane), refer to Component Maintenance Manual 56-21-31 or 56-21-51.
   B. Chips or scratches in the passenger compartment windows are removed by sanding, polishing, or buffing. Damage criteria and limits are established in Passenger Windows - I/C.
   C. Use clean cotton gloves when handling windowpanes to avoid additional damage.
   D. Use only approved materials.
   E. Take care not to scratch the window surface with finger rings or other sharp objects.
2. Equipment
   A. Optical Micrometer - Model 966A1
      Edwards Aerospace Company
      1841 Business Pkwy
      Ontario, CA 91761
      Telephone (714) 923-3533
      Fax (714) 923-6781
   B. Sander, Vibrating - Air Driven (with rubber pad) (Commercially Available)
   C. Sanding Block - Rubber Block of Shore-A Scale Durometer 35 Hardness (Optional: Wood Block with Several Layers of Flannel) (Commercially Available)
3. Materials
   A. Protective Coating - Spraylat SC-1071 (Ref 20-30-51)
   B. Aluminum Foil Tape - Permacel P112 (Ref 20-30-51)
   C. Protective Tape - Gizard Protex 20V (Ref 20-30-51)
   D. Canton (cotton) flannel cloth, clean and oil free, any source
   E. Chamois - KK-C-300 (Ref 20-30-51)
   F. Buffing Compound - Learock No. 888 (Ref 20-30-31)
   G. Buffing Compound - Learock No. S-30 (Ref 20-30-31)
   H. Dustless Acrylic Window Cleaner (Ref 20-30-31)
   I. Plex-I-Glow Cleaner and Polish (Ref 20-30-31)
   J. Wet-or-Dry Sandpaper No. 600-A to 100-A
   K. Micromesh Cloths 1600 thru 8000 grit - Kit SN2 (Ref 20-30-51)
   L. Mirror Glaze Polish, MGH-10 (Ref 20-30-31)
   M. Mirror Glaze Polish, MGH-17 (Ref 20-30-31)
   N. Micro-Gloss Cleaner, (Ref 20-30-31)

4. Repair Outer Pane External Surface

A. Use optical micrometer to determine if window thickness will permit rework.

NOTE: Minimum pane thickness after rework must not be less than 0.265 inch for all outer windowpanes in fuselage.

B. Check condition of seal. If window fogging or seal damage is evident, replace window.
C. Mask window frame and exposed seal, with tape.
D. Apply water spray, and remove loose dirt and abrasives with bare hand.
E. Remove defects as follows:
(1) Remove minor clamshell surface chips, scratches, or surface crazing, with an abrasive paper or cloth appropriate to the surface starting condition (generally not coarser than 100 grit for gouges, deep scratches and severe crazing). Use ample water to keep the window surface cool and to flush away grit and acrylic material removed. A vibrating sander (approx. 8000 cpm) stroked with alternating 100% horizontal coverage, followed by 100% vertical coverage over the entire window surface works well. One to two minutes of coarse grit sanding will remove approximately 0.005 inches of acrylic from a window. Change abrasive paper frequently, flush well with water, and continue until all surface damage is removed and the surface appearance is uniform. Then continue for approximately one more minute to ensure complete removal of craze/cracks.

NOTE: If the condition requiring repair is minor, start with a finer abrasive to reduce subsequent polishing time. Do not attempt to rework only a local part of surface area as this will result in optical distortion.

(2) Polish window with a graduated series of abrasive materials. Use 100 - 600 grit paper and micromesh cloths of 1600 - 8000. Continue each step until the polishing marks of the previous step are removed (normally 2-3 minutes). Use alternating horizontal and vertical strokes with the vibrating sander and make sure water flow is continuous.

F. Check finished window dimensions.

NOTE: Minimum window thickness must not be less than 0.265 inch for all outer windowpanes in fuselage.

G. Remove water spray.

H. Finish polishing the window with buffing compound and a clean muslin or wool pad. If necessary, use coarse and fine compounds to obtain a high gloss. If a rotary buffer is used, wheel surface speed should be 3200 fpm for coarse compound and 4200 fpm for fine compound.
I. Check window visually for optical quality. If distortion exists, repeat polishing procedure provided pane will meet minimum thickness dimensions after polishing.
J. Wax exterior surface
   (1) Minimum thickness of middle windowpane -- 0.157 inch.
   (2) Maximum depth of defect in inner pane (dust cover) is 0.03 inch. Polish defects out by polishing entire viewing surface.
K. Polish window with wax and cover with protective coating or tape.
L. Reinstall window if removed for rework.

PASSENGER CABIN WINDOWS PLATE (PLUG) - REMOVAL/INSTALLATION

1. General
   A. In converting from a passenger cabin window plate (plug) installation to a passenger cabin window installation, remove the plate (plug) as described in paragraph 3. To install the passenger cabin window, refer to 56-21-0, Removal/Installation.
2. Equipment and Materials
   A. Cellulose Acetate Sheeting - Permacel Tape No. 76, Minnesota Mining and Manufacturing Tape No. 221 or Transparent Cellophane No. 600, Spraylat SC-1058R
   B. Masking Tape
   C. Cheesecloth or equivalent
   D. Aliphatic Naphtha - TT-N-95, Freon TF
3. Remove Window Plate (Plug)
   A. Remove protective sidewall lining or grill to gain access to window (Ref Chapter 25, Passenger Cabin Lining and Insulation).
   B. Remove insulation pillow, if installed.
   C. Remove clip adjusting screws and remove the ten window retaining clips (detail A, Fig. 401).
   D. Disconnect grounding strap (if installed) from plate (plug).
   E. Remove window plate (plug) and seal.

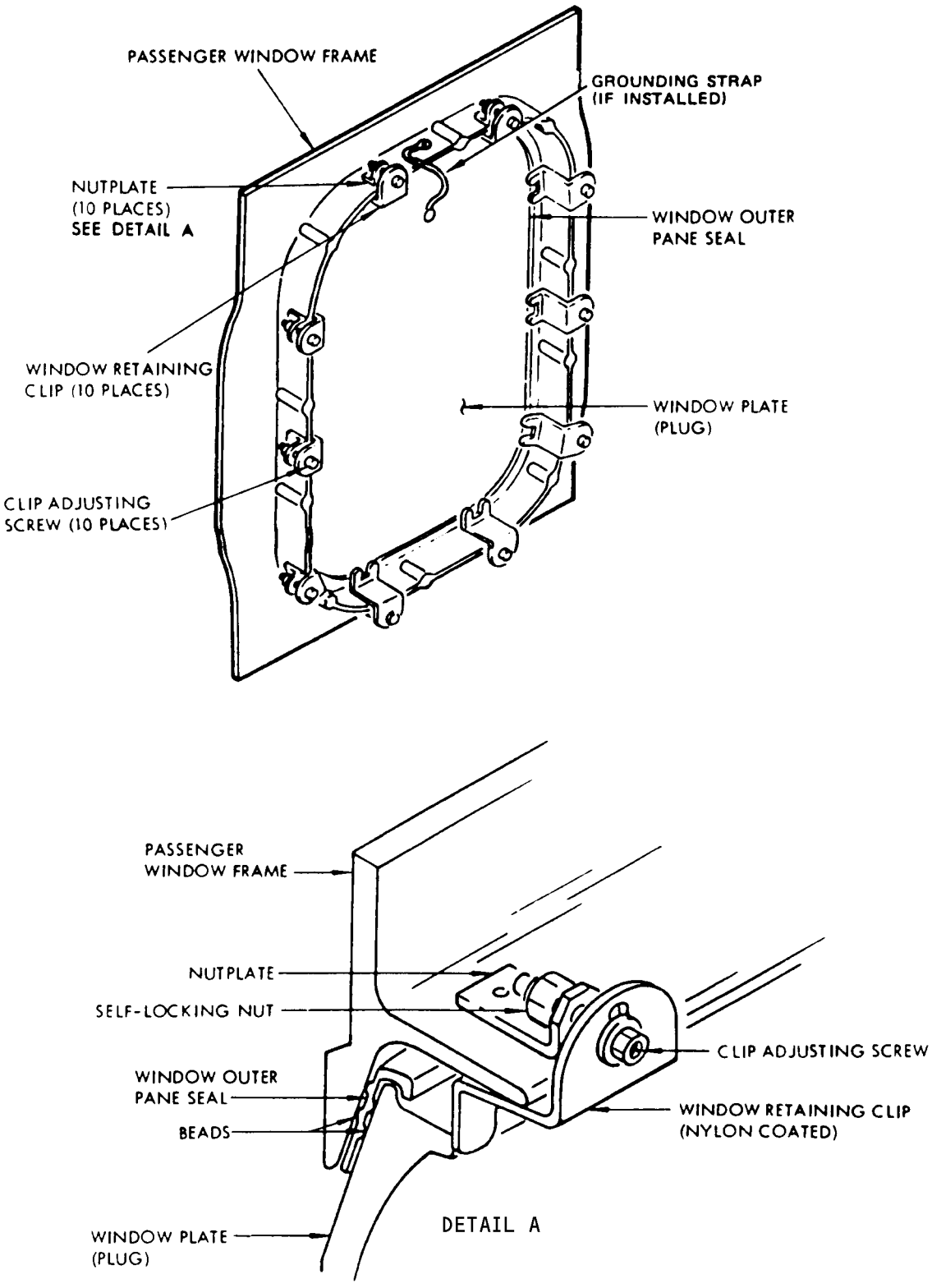
      CAUTION: UNLESS PLATE (PLUG) IS TO BE IMMEDIATELY REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE SHEETING OR EQUIVALENT, SHOULD BE APPLIED TO PLATE SURFACES TO PREVENT DAMAGE DURING HANDLING.

   F. Remove seal from plate (plug). This step is only necessary if the seal is torn or damaged in any way.
4. Prepare Window Plate (Plug) for Installation
   A. Remove protective cover if installed, from window plate (plug).
   B. Clean faying surfaces of seal and window frame with aliphatic naphtha, applied with a clean, oil-free, absorbent material.

      WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

   C. Wipe plate (plug) and window frame surfaces dry with a clean, oil and lint-free, absorbent material such as Finetex, new cheesecloth or equivalent.
5. Install Window Plate (Plug)
   A. Install seal on plate (plug) if seal was removed.
   B. Install window plate (plug) with seal in window frame (Fig. 401).
   C. Install window retaining clips and adjusting screws (detail A). Torque clip adjusting screws until screw head and washer sit flat on clip.
   D. Connect grounding strap (if installed) to plate (plug).
   E. Install insulation pillow, if removed.

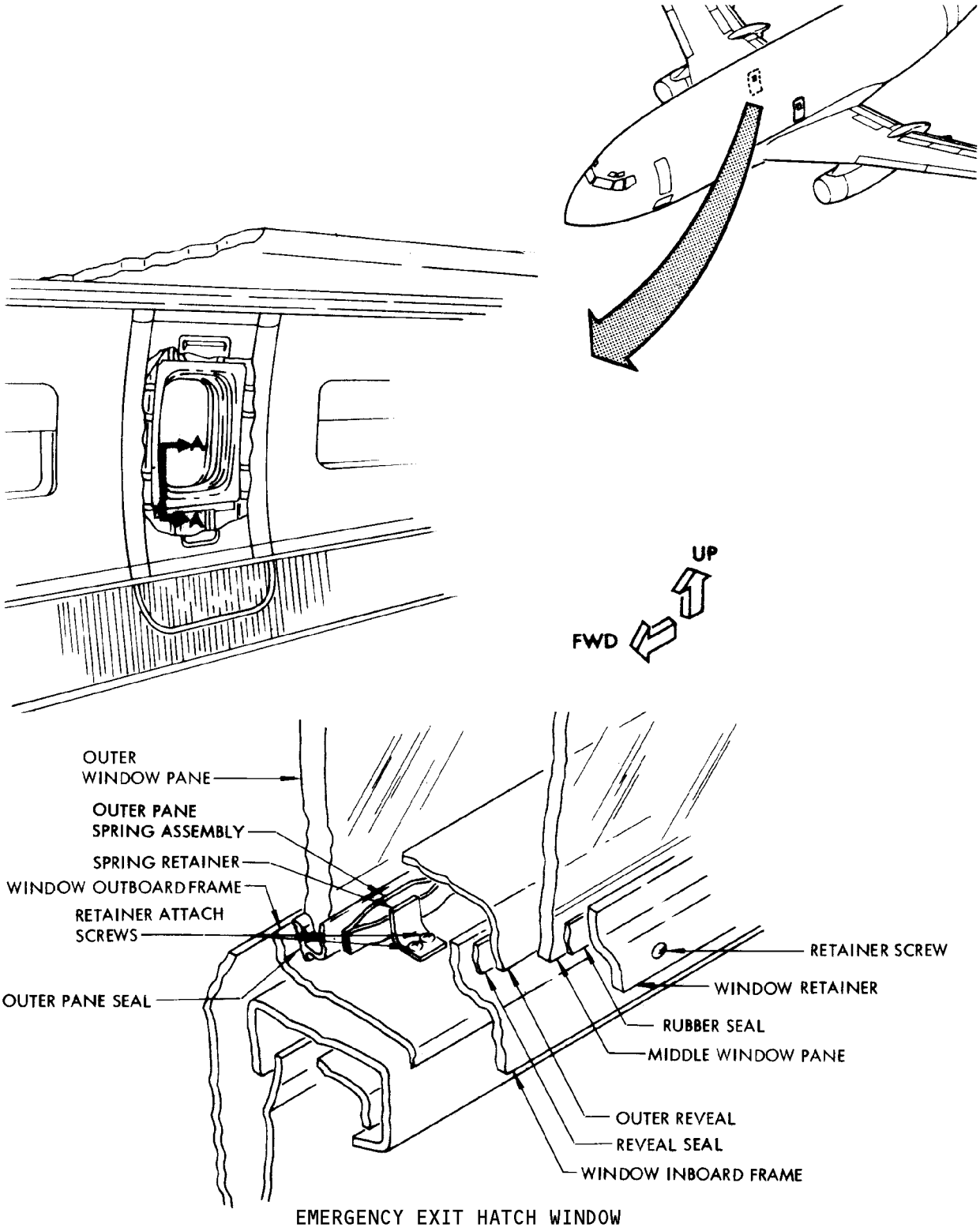
F. Install protective sidewall lining or grill, as applicable (Ref Chapter 25, Passenger Cabin Lining and Insulation.



Passenger Cabin Window Plate (Plug) Installation
Figure 401

EMERGENCY EXIT HATCH WINDOW - DESCRIPTION AND OPERATION

1. General
   A. The emergency exit hatch window, installed in each emergency exit hatch in the passenger cabin, is located in the upper portion of the hatch and is similar in external appearance to the passenger windows. (See figure 1.) The window consists of outer, middle and inner panes. The inner pane is nonstructural and is mounted in the emergency exit hatch trim panel which is described in Emergency Exit Hatch Lining, Chapter 52. The outer and middle panes are each capable of taking the cabin ful1 pressurization load. All three panes are acrylic, the structural panes being formed to improve resistance to crazing.
   B. Each emergency exit hatch window is designed as a plug type window subject only to the pressure acting on it. The outer window pane of stretched acrylic plastic is rectangular in shape with rounded corners and a routed outer edge to fit the window outboard frame. The pane is curved to fair with the fuselage contour. The middle window pane of modified acrylic sheet is similarly shaped but with an unrouted edge which is seated on the window inboard frame.
   C. The outer pane has a peripheral seal of molded synthetic silicone rubber. An outer pane spring assembly and ten outer pane spring retainers secure the outer pane in position on the window outboard frame. The center pane is pressure sealed to the window inboard frame and outer reveal and is secured by screws which are spaced around the periphery of the window retainer.
   D. The emergency exit hatch window is designed to preclude fogging and frosting by means of multiple pane construction with intervening cavities essentially isolated from cabin interior air conditions and supply air conditions.



EMERGENCY EXIT HATCH WINDOW
SECTION A-A

Emergency Exit Hatch Window Installation
Figure 1

EMERGENCY EXIT HATCH WINDOW - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Cellulose acetate sheeting, Permacel Tape No. 76, Minnesota Mining and Manufacturing Tape No. 221 or Transparent Cellophane No. 600, Spraylat SC-1058R
   B. Masking tape
   C. Cheesecloth
   D. EC 1128 - Minnesota Mining and Manufacturing Co.
   E. Aliphatic Naphtha, TT-N-95A, Type II

      NOTE: Freon-TF may be used in lieu of aliphatic naphtha, TT-N-95A, Type II, for general cleaning of windows.

   F. Castile soap
2. Prepare Emergency Exit Hatch Window for Removal
   A. Remove emergency exit hatch trim panel (Ref Chapter 52, Emergency Exit Hatch Lining.
   B. Apply protective covering of cellulose sheeting to accessible surfaces of window panes which are to be removed and reinstalled. Secure cover with masking tape if necessary.
3. Remove Emergency Exit Hatch Window
   A. Remove window retainer screws (2, Fig. 401) and retainer (3) so that middle window pane (5) can be removed.
   B. Remove middle pane (5), seal (4), and window outer reveal (6).

      CAUTION: IF PANE IS TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE SHEETING SHOULD BE APPLIED TO SURFACES TO PREVENT DAMAGE DURING HANDLING. USE CARE IN HANDLING PLASTIC REVEAL. SURFACES VISIBLE TO CABIN INTERIOR MUST BE FREE OF MARKS, SCRATCHES AND DENTS.

   C. Strip seal (7) from outer reveal (6) and inboard frame (8). This step is only necessary if the seals are torn or damaged. To strip seal, scrape seal carefully (AMM 51-31-0/201), and clean up with aliphatic naphtha.

      CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE SEAL. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

   D. Remove outer pane spring retainers (12) by removing the two attaching screws (10) on each spring retainer.

E. Remove spring assembly (13), outer pane (l) and outer pane seal (9) from window outboard frame (11).

CAUTION: DO NOT COMPRESS SPRING TO LESS THAN 0.18 INCH WHEN REMOVING SPRING RETAINERS AS PERMANENT SET MAY OCCUR WHICH WILL PREVENT OBTAINING A SATSFACTORY WEATHER SEAL ON INSTALLATION OF THE WINDOW. IF PANE IS TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE SHEETING OR EQUIVALENT SHOULD BE APPLIED TO SURFACES TO PREVENT DAMAGE DURING HANDLING.

4. Prepare Emergency Exit Hatch Window for Installation

A. Clean faying surfaces of new seals (4, 7, and 9, figure 401), and outer reveal (6) and window frames (8 and 11), if seals are being replaced, with aliphatic naphtha applied with a clean, oil-free, absorbent material.

WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

B. Wipe off solvent before it has evaporated with a clean, oil and lint-free, absorbent material such as Finetex, new cheesecloth or equivalent.
C. Repeat applications of clean solvent as necessary.
D. Mix EC 1128, Minnesota Mining and Manufacturing Company, thoroughly before using.
E. Brush adhesive onto both faying surfaces of reveal seals (6 and 8).
F. Allow an open drying period 5 to 20 minutes for adhesive to become tacky, but not to transfer when touched lightly.

NOTE: Adhesive may be reactivated by wiping with aliphatic naphtha, TT-N-95.

G. Press seal (7) and reveal (6) firmly together, taking care to avoid trapping air pockets.

NOTE: 35% of adhesive ultimate strength is obtained immediately, using the maximum open drying period. EC 1128 shall not be heat-cured.

H. Clean up as necessary with aliphatic naphtha, TT-N-95.

5. Install Emergency Exit Hatch Window
   A. Install outer pane (1, figure 401) with outer pane seal (9) and spring assembly (13) on window outboard frame (11). Install outer pane spring retainers (12) by installing the two attaching screws (10) on each spring retainer.

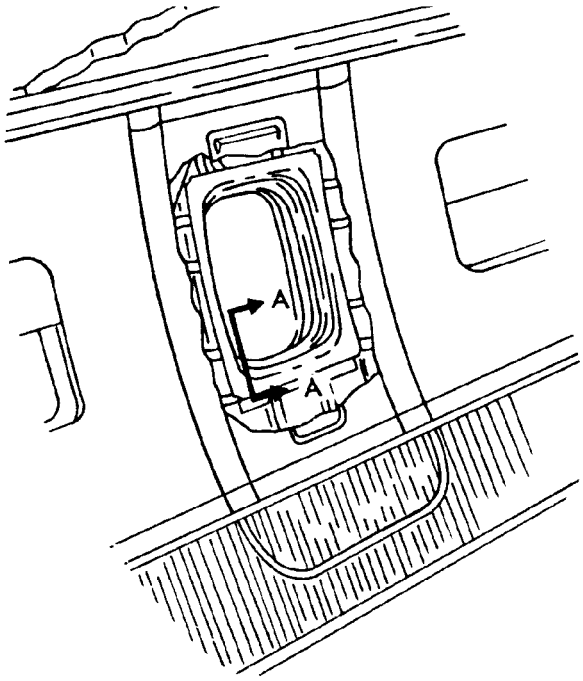
      CAUTION: DO NOT COMPRESS SPRING TO LESS THAN 0.18 INCH WHEN INSTALLING SPRING RETAINERS AS PERMANENT SET MAY OCCUR WHICH WILL PREVENT OBTAINING A SATISFACTORY WEATHER SEAL.

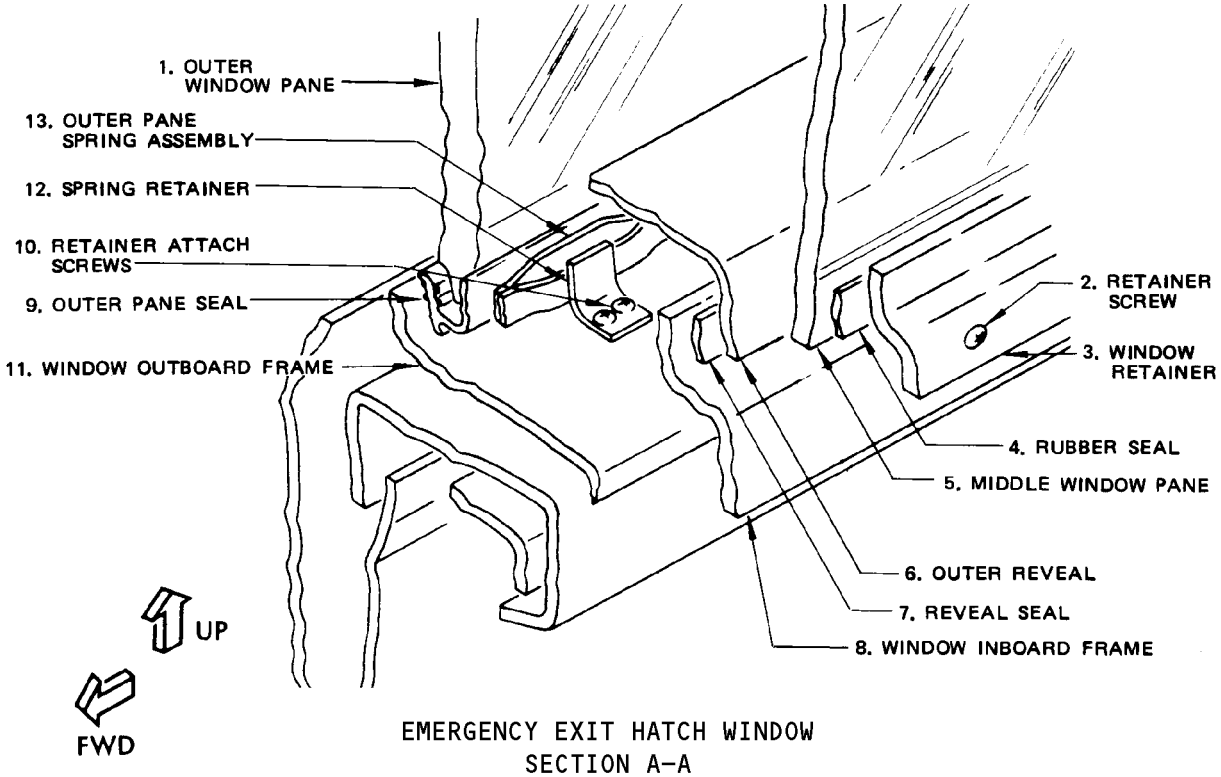
   B. Remove protective cover from inner surface of outer pane (1).
   C. Clean , and apply antistatic agent to, inner surface of outer pane (l). Refer to Servicing, Passenger Windows.
   D. Remove protective cover from outer surface of middle pane (5).
   E. Clean and apply antistatic agent to outer surface of middle pane (5) Refer to Servicing, Passenger Windows.
   F. Install outer reveal (6) with seal (4) and middle pane (5) on window inboard frame (8)

      CAUTION: USE CARE IN HANDLING PLASTIC REVEAL. SURFACES VISIBLE TO CABIN INTERIOR MUST BE FREE OF MARKS, SCRATCHES, AND DENTS.

   G. Position window retainer (3) and seal (4) to hold middle pane (5) in place and install retainer screws (2).
   H. Remove protective cover from inner surface of middle pane (5).
   I. Clean, and apply antistatic agent to, inner surface of middle pane (5). See Servicing, Passenger Windows.
6. Restore Airplane to Normal Configuration
   A. Install emergency exit hatch trim panel. Refer to Emergency Exit Hatch Lining, Chapter 52.
   B. Remove protective cover from outer surface of outer pane (1).
   C. Clean outer surface of outer pane with lukewarm water and castile soap. Use a soft, clean cloth to transfer the soap solution to the pane surface. Go over the surface with the bare hand only, so that any dirt can be quickly detected and removed before it scratches the surface.
   D. Wipe dry with a clean, damp chamois.

      CAUTION: DO NOT RUB SURFACE WITH A DRY CLOTH. IT CAUSES SCRATCHES AND BUILDS UP AN ELECTROSTATIC CHARGE WHICH ATTRACTS DUST PARTICLES.





EMERGENCY EXIT HATCH WINDOW
SECTION A-A

Emergency Exit Hatch Window Installation
Figure 401

EMERGENCY EXIT HATCH WINDOW - INSPECTION/CHECK

1. Emergency Exit Hatch Window Inspection
   A. General
      (1) The optical qualities of windows are of prime importance. If window condition impairs visibility, replace the window.
      (2) During inspection of windows, if damage or normal deterioration of a component of the window installation exceeds limits described, remove window and replace component (Ref R/I).
   B. Examine for the Following:
      (1) Scratches, cracks and crazing of acrylic panes as described.
      (2) Deterioration of seals.
      (3) Marks, scratches and dents in plastic reveal.
      (4) Loose or missing fasteners at window retaining brackets.
   C. Definitions of various types of damage are as follows:
      (1) Crazing:
         (a) Series of very fine fissures usually perpendicular to surface of plastic. Due to extremely narrow width of fissures, crazing is very difficult to detect when viewed normal to surface. It can be seen by reflecting from smooth surfaces of fissures when viewed at varying angles to the incident light. Crazing, which is anticipated only in the outer pane, is usually the result of incorrect window installation, producing higher than acceptable stress levels, or the inadvertent application of one or more of the following materials: gasoline, alcohol, benzene, hexane, xylene, acetone, carbon tetrachloride, fire extinguisher fluids, lacquer thinners, and window cleaning or deicing fluids which have not been approved.
      (2) Crack:
         (a) A fissure which has visible width when viewed parallel to the faces of the fissure. A crack may propagate at any angle to surface of a plastic pane depending on direction of the driving force. Cracks in stretched acrylic may have chevron or clamshell growth lines (Fig. 601).
      (3) Scratch:
         (a) The removal or displacement of material from surface of a pane along a line. The ratio of depth to width is usually quite small.
      (4) Chips:
         (a) Spall (Shell-Type) Chips have circular or curved periphery with may fine hairlines or ridges that follow the outline of outer edge and degenerate toward the center of deepest point of chip, similar to a clamshell.
         (b) Vee-shaped chips have sharp narrow V-shape and appear to propagate toward the interior of plastic.

(5) In-plane Cracking (formerly identified as delamination):
(a) A smooth surfaced fissure, or series of fissures, parallel to panel surfaces. In-plane cracking can occur in stretched acrylic and starts at edges of pane or at deep penetrations of the surface. It is most readily detected by the reflection of light from the smooth surfaces of the fissure.

D. Equipment and Materials
(1) Optical Micrometer - Model 966A1, Edwards Aerospace Company, 1841 Business Pkwy, Ontario, CA 91761, Tel (714) 923-3533, Fax (714) 923-6781

E. Examine Windowpanes
(1) Examine windowpanes for cracks or crazing.
(a) Replace cracked or crazed middle panes.

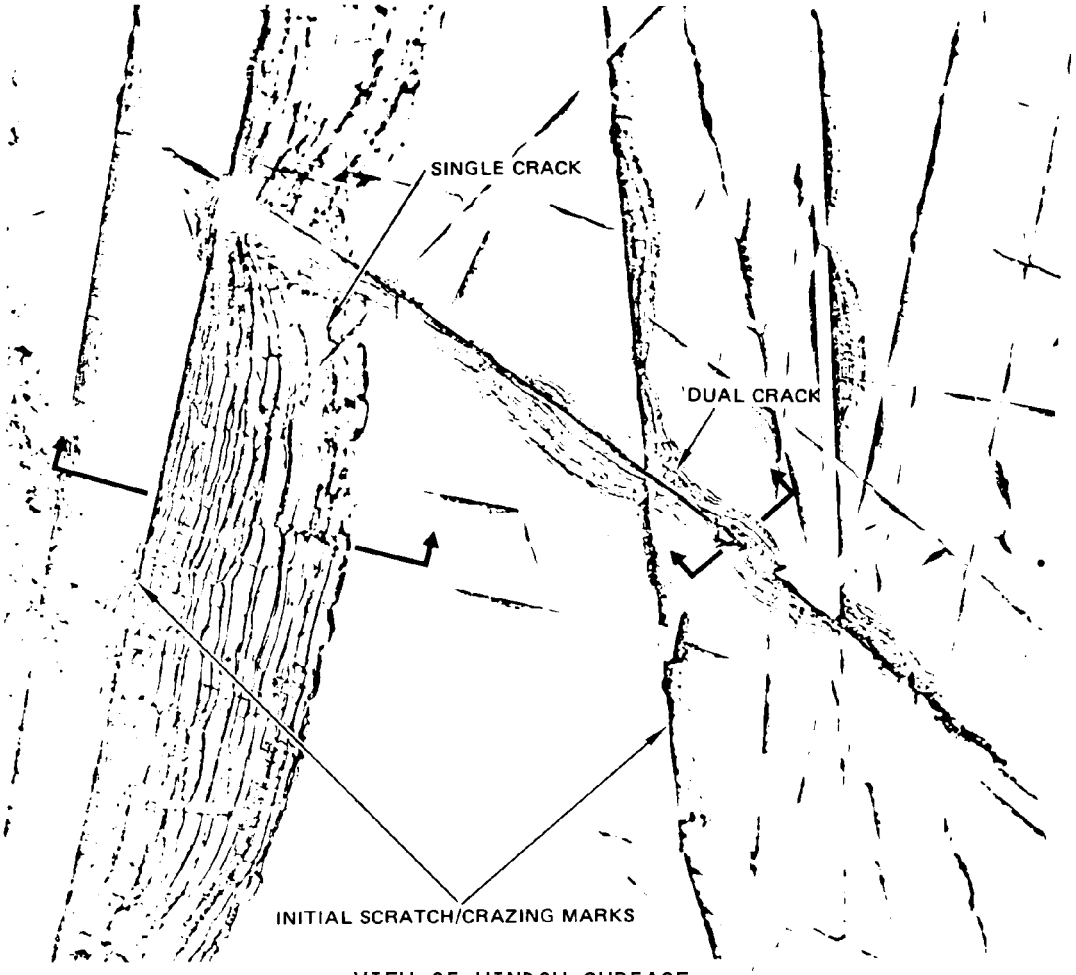
CAUTION: DO NOT PRESSURIZE AIRPLANE WITH CRACKED OR CRAZED MIDDLE PANE. PRESSURIZATION INTEGRITY OF FUSELAGE WITH ONE PANE CRACKED IS CRITICAL BECAUSE FAIL-SAFE FEATURE HAS BEEN ELIMINATED.

NOTE: Middle pane may be repaired if minimum thickness after approved repair procedure is 0.165 inch (Ref Overhaul Manual).

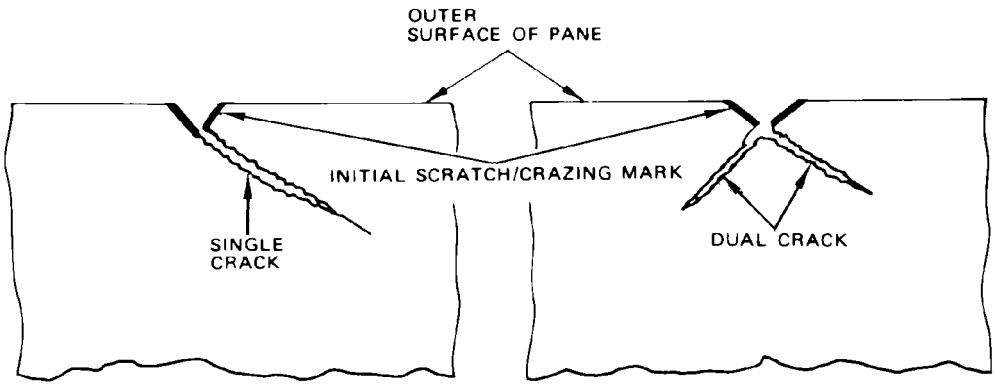
(b) Replace outer pane if depth of any single crack or craze equals or exceed 0.05 inch.
(c) Replace outer pane if cracking or crazing is deep enough that pane thickness after rework will be less than 0.260 inch. Outer pane may be repaired if minimum thickness after Approved Repair Procedure is 0.260 inch.

NOTE: Cracks can develop in outer pane from scratches and/or crazing (Fig. 601).

(d) Exact depth of crack or craze may be measure with an optical micrometer. To obtain correct measurement, multiply acrylic plastic index of refraction (1.49) by micrometer reading.
(e) Any accurate method for determining crack depth is acceptable (Fig. 602).



VIEW OF WINDOW SURFACE



SECTION A–A

SECTION B–B

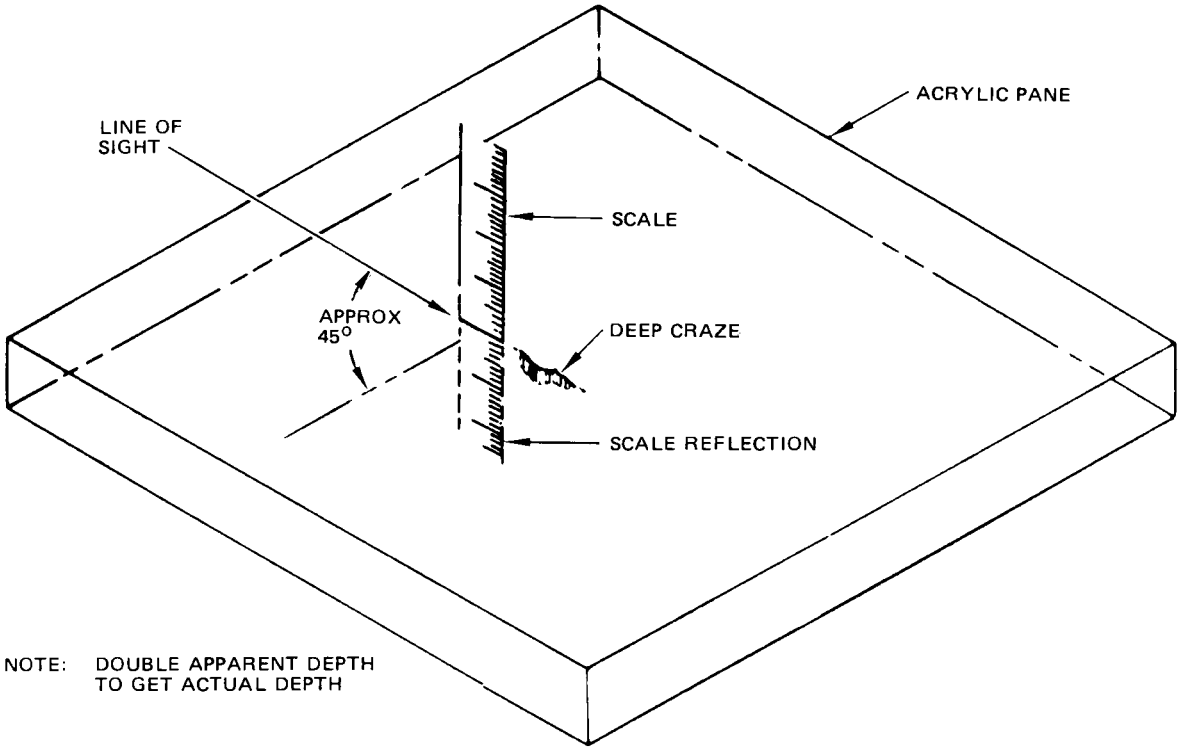
NOTE: NOT TO SCALE – SECTIONS AND ILLUSTRATIONS DEPICTING CRACKS GREATLY ENLARGED TO EMPHASIZE CHARACTERISTICS OF CRACK DEVELOPMENT

Window Surface Crack Development – Typical (Outer Pane Stretched Acrylic)
Figure 601

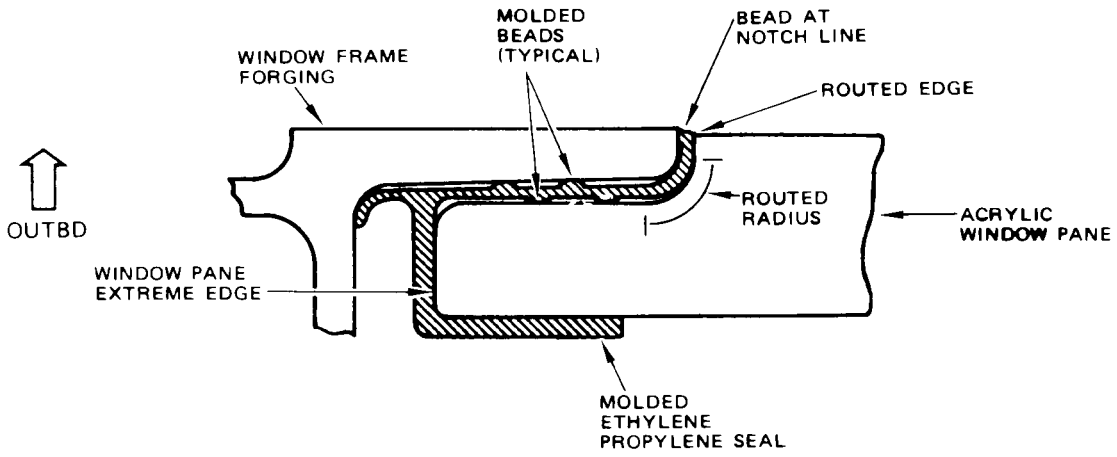
(2) Examine windowpanes for routed radius crazing.
   (a) Crazing in the radius of the routed edge (Fig. 603) of an outer pane is more serious than that in the overall surface. As the point of crazing moves around the radius towards the outside surface of the pane so the seriousness of the defect decreases. This is due to a falling off in stress levels to the point where, at the intersection of the outside contour with the routed edge, there is very little stress.
   (b) The routed edge of the windowpane is the most likely part in which crazing may occur. The routed edge, being that part of the pane nearest the surrounding structure, is more prone to contamination with cleaning solvents and other undesirable materials when window is inadequately masked during cleaning or painting. The contamination material could seep down into the gap between the pane and the window frame forging where the outer pane peripheral seal might aggravate the situation by soaking up the material and prolonging contact. Also, the routed radius unavoidably constitutes a stress raiser, especially since it is adjacent to the supporting forging and is at a point of near maximum shear transfer.
   (c) The routed radius can be checked for crazing without having to remove the pane; it can be checked from the inside. If examination of the windowpanes is done on a sampling basis, some windows will have crazed routed radii and will not get checked. However, stretched acrylic has the quality of restraining craze propagation and will probably last until the next overhaul. If crazing is evident in the routed radius above the limits mentioned, that pane should be replaced and remaining windows examined.
   (d) Crazing around the routed radius and routed edge may be more or less continuous in which case the maximum depth of penetration shall be 0.025 inch. Crazing around delaminated areas shall not exceed 0.010 inch deep.

(3) Examine windowpanes for in-plane cracking (formerly identified as delamination).
   (a) The stretching process used in the acrylic pane manufacture results in a lower shear strength parallel to the pane surface than that perpendicular to the surface. Because of this the acrylic behaves, in many ways, like a multilayer laminate. In-plane cracking is a separation of adjacent layers parallel to the pane surface. It can be induced by a blow with a sharp instrument on the pane edge and usually accompanies deep penetrations into the pane surface. For clarity, fine continuous in-plane cracking is defined as crazing.

      CAUTION: NO IN-PLANE CRACKING IS ALLOWED IN THE CENTER PANE.



Method of Measuring Depth of Crazing
Figure 602



Joint of Acrylic Pane with Window Frame Forging
Figure 603

(b) Outer pane in-plane cracking at the extreme edge (Fig. 603) is permissible within the following limits:
   1) Maximum extension in from edge 0.40 inch
   2) Maximum length at edge 1.00 inch
   3) Minimum distance between defects 2.00 inches
   4) Maximum number per edge 2
   5) Maximum number per pane 4

(c) Large in-plane cracks in the routed radius are definitely more serious than crazing at the same place. This is because the stretching process of manufacture decreases the ability of the acrylic to resist spreading of in-plane cracking, parallel to the direction of stretching.

(d) A routed radius in-plane crack will probably not occur as often as a crazing defect in the same place. Whereas the rubber peripheral seal on the outer pane tended to aggravate the crazing, it now serves as a protective bumper against sharp blows on the radius producing in-plane cracking. Should evidence of routed radius in-plane cracking be found, the window frame forging should be examined for sharp protrusions and the general fit of the pane in the forging examined.

(e) In-plane cracking around the routed edge and routed radius may be continuous and the maximum depth of penetration shall be 0.025 inch. For localized in-plane cracking in the routed radius and routed edge, one local area per side of windowpane may have a maximum depth of penetration of 0.05 inch with a maximum length of 0.50 inch provided the crazing around the in-plane cracked area does not exceed 0.010 deep.

(f) In-plane cracking of the outer pane, at any place other than the edges, is often accompanied by chipping especially in the case of a blow with a blunt object. In the case of penetration by a sharp object, the in-plane cracking takes the form of a circle concentric with the hole. In-plane cracking and chips are permissible within the following limits:
   1) Maximum chip depth 0.05 inch
   2) Maximim size of in-plane crack 0.50-inch diameter

3) Minimum distance between defects twice maximum damage diameter

(4) Examine windows for scratches.

(a) Scratches in the routed radius can have the same criteria applied as for crazing at the same place, except in the case of very severe scratches.

(b) As with in-plane cracking, the outer pane seal will help protect the radius against scratching during installation. Care in handling while the pane is out of the airplane is also of prime importance in reducing the amount of possible damage of any kind in the routed radius.

(c) Again the scratches in the routed radius will be impossible to see, unless the windowpane is removed. Thus, the same general criteria as were applied for crazing and in-plane cracking are repeated here. If scratches exceeding 0.005 inch in depth, regardless of length, are found, the windowpane should be replaced. Undetected scratches approximating the foregoing are considered safe until overhaul or other reason for window removal.

(d) Measurement of the depth of scratch can be made either approximately with the fingernail or accurately by using an optical micrometer. It can also be done by visual comparison with scratches of known depth.

(e) The most likely place for scratches to be found is on the exterior surface of the pane which is exposed to weather and washing and the accompanying foreign bodies which inevitably get on that surface.

(f) Scratches in exterior surface of outer pane, easily detected by visual examination, are critical if they exceed limits set out below. This surface of the pane is in tension under cabin pressurization load and severe scratches act as stress raisers. In certain cases exterior surface scratches can be hand polished or buffed out. For such procedures, refer to Passenger Cabin Windows, Approved Repairs. Minor scratches 0.002 inch or less (barely felt with fingernail) are not critical and do not require polishing.

Scratch Depth	Max. Length One Scratch	Max. Total Length
0.02 inch	1 inch	5 inches
0.01 inch	3 inches	9 inches
0.005 inch	4 inches	10 inches

(g) The center pane provides the fail-safe feature under cabin pressurization loads if the outer pane should fail. Therefore, scratches are critical in the center pane if they exceed the limits described in par. (f) above.

(h) The inner pane, mounted in the emergency exit hatch trim panel, is not structural. Only optical or visibility criteria apply for removal and replacement.

(5) Examine windowpanes for chipping.

(a) No surface chips are allowed in the center pane. Small, shell shaped, edge chips no greater than 0.06 inch in the maximum dimension are permissible. V-shaped chips shall be cause for removal of the center window.

(b) Criteria for allowed chipping in the outer window are given in par. (3)(f).

(6) Examine windowpanes for creep deformation.

(a) Creep deformation is center pane damage created by window retainer against the edge of pane (Fig. 604).

(b) Center pane creep deformation is permissible within the following limits:

1) Without discrete surface discontinuity, surface or edge is slightly displaced, but a fingernail cannot detect a discontinuity. No rework is necessary.

2) Discrete discontinuity, but no evidence of a vee notch crack. Window should be reworked (Ref Passenger Cabin Windows - Approved Repairs).

3) Discrete surface discontinuity and a vee notch crack less than 0.05 inch inward from edge of pane, window should also be reworked, or replaced, if crack is greater than 0.05 inch from edge.

(7) Examine windowpanes for concavity.

(a) Concavity, out of contour, windowpanes. The outer stretched acrylic pane bows inward. The middle cast acrylic panes bows outward. Concavity in its self is not a reason for window replacement, even if panes touch.

1) Extreme localized distortion and thickness variances.

a) Check for uneven surface contour and reduced optical quality. Exposure to high temperature such as photoflood lamp is cause.

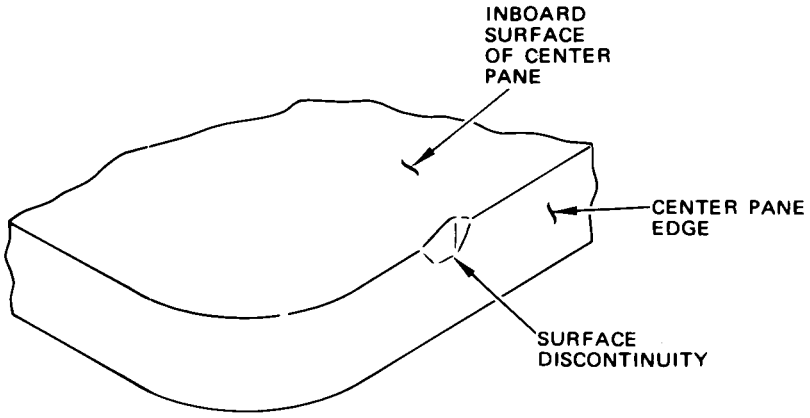
2) Gentle uniform concavity.
   a) Place straightedge across narrow width of outboard surface of outer pane. If gap exists between straightedge and center of pane, window is concave. Windows prone to fogging are prone to uniform concavity.
   b) Windows can be returned close to their original contour by removing them from airplanes and drying them. This can be accomplished by leaving them exposed at room temperature. Drying time is depended on local humidity and how badly window is deformed.

      NOTE: Windows generally do not return completely to original contour.

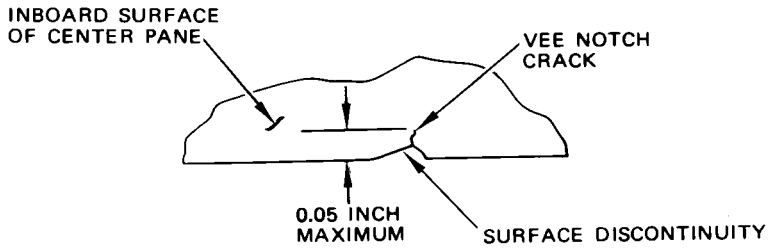
   c) Check seals for leakage into window cavity between outer and middle pane.
   d) Check window edges thoroughly for in-plane cracking per par. (3).
   e) Replace concave windows with leaking seals.

(8) Examine middle pane for warping and deformation.
   (a) Minor warping or deformation alone is not a cause for rejection unless pressure sealing is affected.

      CAUTION: REPLACE MIDDLE PANE IMMEDIATELY IF PRESSURE SEALING AFFECTED. PRESSURIZATION INTEGRITY OF FUSELAGE IS CRITICAL BECAUSE FAIL-SAFE FEATURE HAS BEEN ELIMINATED.



DISCRETE SURFACE
DISCONTINUITY NO VEE NOTCH CRACK



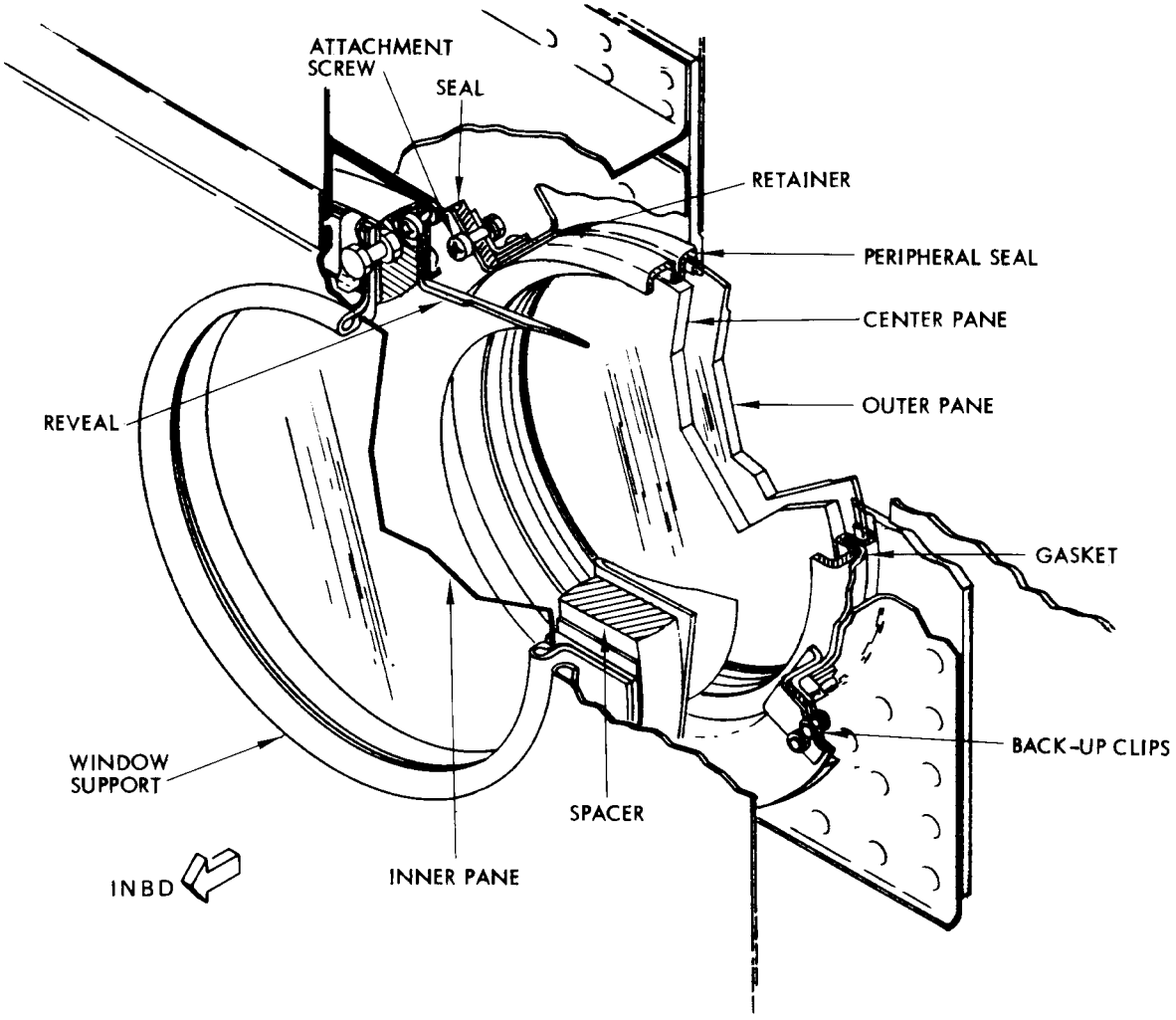
DISCRETE SURFACE
DISCONTINUITY WITH VEE NOTCH CRACK

Center Pane Damage Due to Window Clip
Figure 604

DOOR-MOUNTED WINDOWS - DESCRIPTION AND OPERATION

1. General

   A. The windows in doors are of similar design and each window consists of three panes of acrylic sheet. (Fig. 1) The outer and center panes are designed to withstand cabin pressurization loads and are supported by a peripheral seal and a retainer. The retainer is attached by three screws to the door structure with a rubber seal between the structure and retainer. Three backup clips are provided to hold the peripheral seal against the inner pane. A reveal attached by screws to the door structure, provides a duct between the inner pane and the center pane. The inner pane, which is a non-structural component, is mounted in a vinyl support, which is bolted to the door lining. The inner pane can be readily removed with a smooth soft spatula or the handle of a comb. A spacer is provided between the inner pane support and the reveal.



Typical Door-Mounted Window
Figure 1

DOOR-MOUNTED WINDOWS - REMOVAL/INSTALLATION

1. General
   A. The entry and galley door windows consist of three panes. The outer and center panes are frame mounted and each is capable of taking full cabin pressurization loads. The inner panel is nonstructural and is mounted in the door lining.
2. Equipment and Materials
   A. Cellulose Acetate Sheeting
   B. Masking Tape
   C. Boiled Cheesecloth
   D. Castile Soap
3. Remove Door-Mounted Windows
   A. Remove door lining and insulation as necessary to gain access to window. Refer to Door Lining and Insulation, Chapter 52.
   B. Apply protective cover to accessible surfaces of window panes which are to be removed and later reinstalled.
   C. Remove three frame mounting bolts (2, figure 401) holding window assembly in position.
   D. Remove window assembly.
   E. Remove outer pane (5) by lifting edge of peripheral seal (3).
   F. Remove center pane (4).
      (1) Remove three backup clips (6) holding center pane (4) in position.
      (2) Lift peripheral seal (3) and remove center pane.
   G. Apply protective cover to uncovered surfaces of any panes which are removed, but will be reinstalled.
4. Install Door-Mounted Windows
   A. Remove protective covering from inner surface of outer pane (5, figure 401) and from outer surface of center pane (4).
   B. Clean inner surface of outer pane and outer surface of middle pane with lukewarm water and castile soap. Use a soft, clean cloth to transfer the soap solution to the pane surface, but go over the surface with the hand only, so that any dirt can be quickly detected and removed before it scratches the surface.
   C. Wipe dry with a clean, damp chamois.

      CAUTION: DO NOT RUB SURFACE WITH A DRY CLOTH. IT CAUSES SCRATCHES AND BUILDS UP AN ELECTROSTATIC CHARGE WHICH ATTRACTS DUST PARTICLES.

   D. Clean accessible areas around opening between outer and middle pane. Refer to Chapter 12, Cleaning and Washing.

E. Install pane or panes in peripheral seal (3).

CAUTION: HANDLE ASSEMBLY WITH CARE, STIFFNESS OF THE PERIPHERAL RUBBER SEAL IS THE ONLY THING HOLDING PANES IN PLACE AT THIS STAGE.

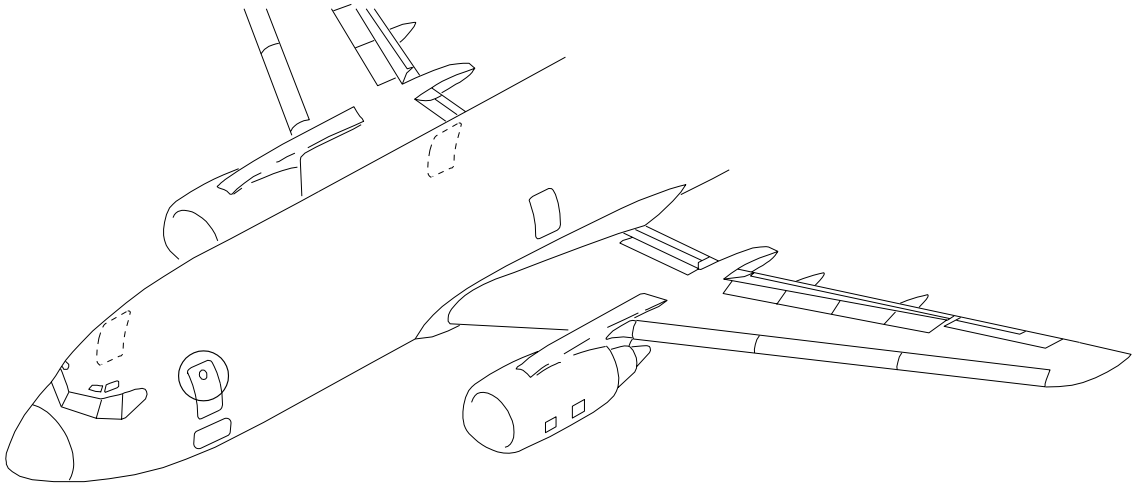
F. Install three backup clips (6) which secure center pane in position in window assembly.

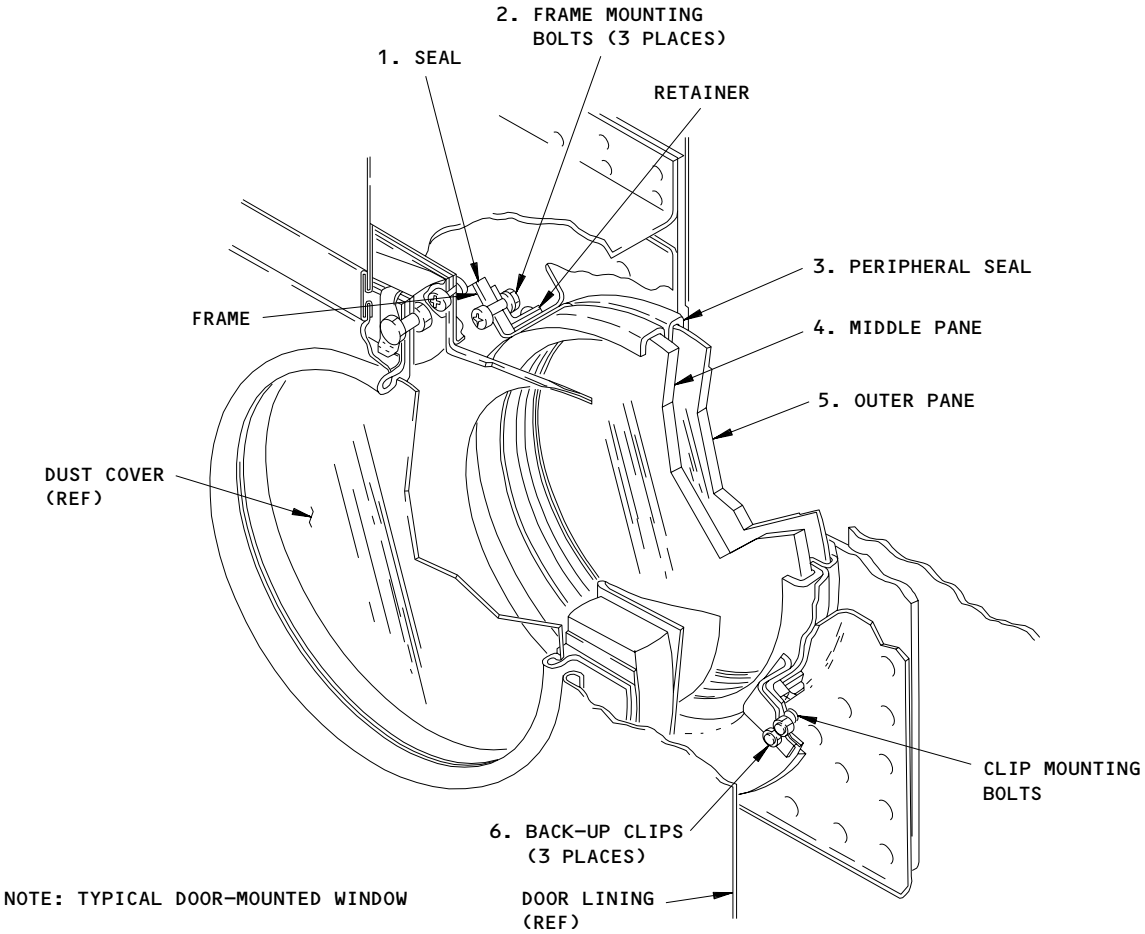
NOTE: Curvature of window panes must be oriented on assembly so that markings on panes are positioned correctly. The manufacturing code and date are in the 11:00 position on the middle pane and the 1:00 position on the outer pane. The markings can either be black ink or sandblast lettering.

G. Place window assembly in door and install three frame mounting bolts (2).
H. Remove protective covering from accessible surfaces of panes.
I. Clean accessible surfaces of panes with lukewarm water and castile soap. Refer to step B.
J. Wipe dry with a clean, damp chamois.

CAUTION: REFER TO STEP C.

K. Clean door lining. Refer to Chapter 12, Cleaning and Washing.
L. Install door lining and insulation. Refer to Chapter 52, Door Lining and Insulation.





Door Mounted Window Installation
Figure 401

DOOR MOUNTED WINDOWS - INSPECTION/CHECK

1. Examine for the Following
   A. Scratches, cracks and crazing of acrylic panes as described in par. 2.
   B. Deterioration of seals.
   C. Marks, scratches and dents in plastic reveal.
   D. Loose or missing fasteners at window retaining brackets.
2. Window Replacement Criteria
   A. In attempting to establish window replacement criteria for the normally expected defects as listed below it has been assumed that the optical or visibility criterion will be established by the individual operators.
   B. Cracks
      (1) A crack is a fissure perpendicular to the surface of the pane. No cracks are permitted in the outer and center panes since they are the primary structural and safety panes respectively. Pressurization of fuselage with one pane cracked is critical because the fail-safe feature has been eliminated in that there is now no alternate load path should the other pane crack. If the cracked pane cannot be replaced immediately the airplane must not be pressurized until such time as replacement can be effected.
   C. Crazing
      (1) Crazing is defined as a series of small fissures perpendicular to the surface, but not extending all the way through the pane. There are no surface breaks visible with crazing and it is difficult to see unless the pane can be viewed from an angle so that light is reflected off the fissure surface.

          CAUTION: CRAZING IN ANY CENTER PANE IS CAUSE FOR IMMEDIATE REMOVAL AND DESTRUCTION OF THE WINDOW. IF A NEW PANE CANNOT BE INSTALLED IMMEDIATELY, THE AIRPLANE MUST NOT BE PRESSURIZED UNTIL THE DEFECTIVE PANE HAS BEEN REPLACED.

      (2) Crazing, which is anticipated only in the outer pane, is usually the result of incorrect window installation, producing higher than acceptable stress levels, or the inadvertent application of one or more of the following materials: gasoline, alcohol, benzene, hexane, xylene, acetone, carbon tetrachloride, fire extinguisher fluids, lacquer thinners, and window cleaning or deicing fluids which have not been approved.
      (3) Surface crazing in the outer pane, other than at the routed edge, is permissible within the following limits:
          (a) 0.060 inch maximum depth in local area not over 2 inches in diameter.
          (b) 0.050 inch maximum depth over entire surface.

(4) Determination of the exact depth of crazing is not easy, especially on an installed window, but the following method has been found to give a very close approximation. Hold a 6 inch metal scale normal to, and contacting, the surface of the pane where crazing is deepest. Viewing the reflection of the scale at about 45°, determine the apparent depth of craze. Double this apparent depth to get approximation of actual depth (Fig. 601). The apparent depth cannot be used because of the refractive qualities of the acrylic.

(5) Routed Radius Crazing

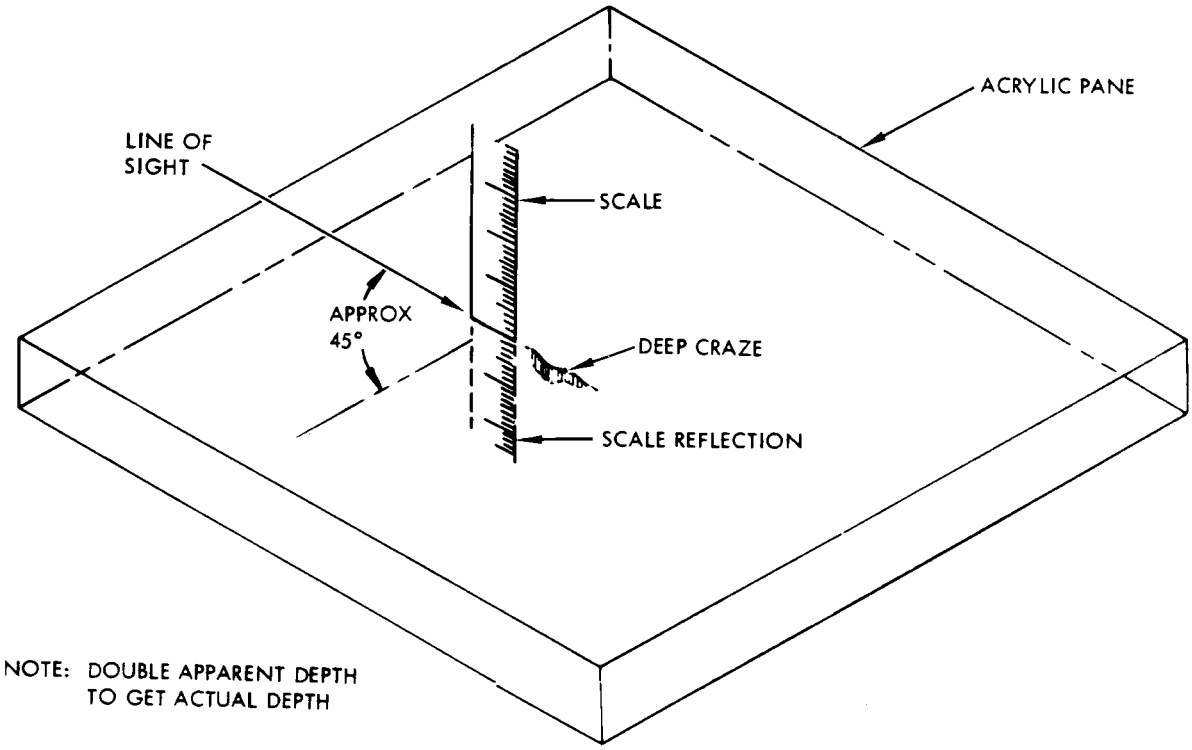
(a) Crazing in the radius of the routed edge (Fig. 602) of an outer pane is more serious than that in the overall surface. As the point of crazing moves around the radius towards the outside surface of the pane so the seriousness of the defect.

(b) decreases. This is due to a falling off in stress levels to the point where, at the intersection of the outside contour with the routed edge, there is very little stress.

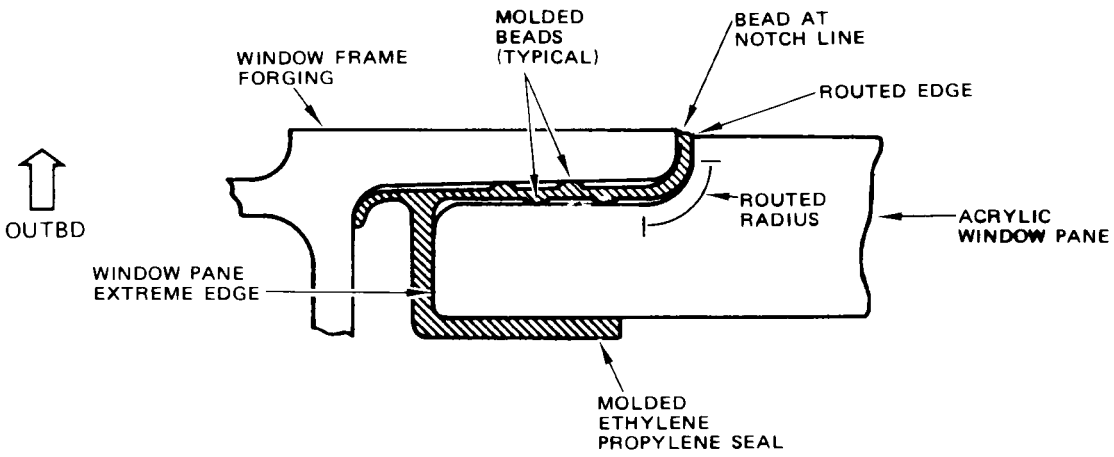
(c) The routed edge of the windowpane is the most likely part in which crazing may occur. The routed edge, being that part of the pane nearest the surrounding structure, is more prone to contamination with cleaning solvents and other undesirable materials when window is inadequately masked during cleaning or painting. The contaminating material could seep down into the gap between the pane and the window frame forging where the outer pane peripheral seal might aggravate the situation by soaking up the material and prolonging contact. Also, the routed radius unavoidably constitutes a stress raiser, especially since it is adjacent to the supporting forging and is at a point of near maximum shear transfer.

(d) The routed radius can be checked for crazing without having to remove the pane; it can be checked from the inside. If examination of the windowpanes is done on a sampling basis, some windows will have crazed routed radii and will not get checked. However, stretched acrylic has the quality of restraining craze propagation and will probably last until the next overhaul. If crazing is evident in the routed radius above the limits mentioned in par. (d), that pane should be replaced and remaining windows examined.

(e) Crazing around the routed radius and routed edge may be more or less continuous in which case the maximum depth of penetration shall be 0.012 inch. Crazing around delaminated areas shall not exceed 0.005 inch deep.



Method of Measuring Depth of Crazing
Figure 601



Joint of Acrylic Pane with Window Frame Forging
Figure 602

D. Delamination (Outer Panes Only)

(1) The stretching process used in the acrylic pane manufacture results in a lower shear strength parallel to the pane surface than that perpendicular to the surface. Because of this the acrylic behaves, in many ways, like a multilayer laminate. Delamination is a separation of adjacent layers parallel to the pane surface. It can be induced by a blow with a sharp instrument on the pane edge and usually accompanies deep penetrations into the pane surface. For clarity, fine continuous delamination is defined as crazing.

CAUTION: NO DELAMINATION IS ALLOWED IN THE CENTER PANE.

(2) Outer pane delamination at the extreme edge (Fig. 602) is permissible within the following limits:
   (a) Maximum extension in from edge 0.20 inch
   (b) Maximum length at edge 0.50 inch
   (c) Minimum distance between defects 1.00 inch
   (d) Maximum number per pane 2

(3) Large delaminations in the routed radius are definitely more serious than crazing at the same place. This is because the stretching process of manufacture decreases the ability of the acrylic to resist spreading of delamination, parallel to the direction of stretching.

(4) A routed radius delamination will probably not occur as often as a crazing defect in the same place. Whereas the rubber peripheral seal on the outer pane tended to aggravate the crazing, it now serves as a protective bumper against sharp blows on the radius producing delaminations. Should evidence of routed radius delamination be found, the window frame forging should be examined for sharp protrusions and the general fit of the pane in the forging examined.

(5) Delaminations around the routed edge and routed radius may be continuous and the maximum depth of penetration shall be 0.012 inch. For localized delaminations in the routed radius and routed edge, one local area per side of window pane may have a maximum depth of penetration of 0.025 inch with a maximum length of 0.25 inch provided the crazing around the delaminated area does not exceed 0.005 inch deep.

(6) Deleted.

(7) Delamination of the outer pane, at any place other than the edges, is often accompanied by chipping especially in the case of a blow with a blunt object. In the case of penetration by a sharp object the delamination takes the form of a circle concentric with the hole. Delamination and chips are permissible within the following limits:
   (a) Maximum chip depth 0.025 inch

(b) Maximum size of delamination 0.25 inch diameter
(c) Minimum distance between defects Twice maximum damage diameter

E. Scratches
(1) Scratches in the routed radius can have the same criteria applied as for crazing at the same place, except in the case of very severe scratches.
(2) As with delamination, the outer pane seal will help protect the radius against scratching during installation. Care in handling while the pane is out of the airplane is also of prime importance in reducing the amount of possible damage of any kind in the routed radius.
(3) Again the scratches in the routed radius will be impossible to see, unless the window pane is removed. Thus, the same general criteria as were applied for crazing and delamination are repeated here. If scratches exceeding 0.005 inch in depth, regardless of length, are found, the window pane should be replaced. Undetected scratches approximating the foregoing are considered safe until overhaul or other reason for window removal.
(4) Measurement of the depth of scratch can be made either approximately with the fingernail or accurately by using an optical micrometer. It can also be done by visual comparison with scratches of known depth.
(5) The most likely place for scratches to be found is on the exterior surface of the pane which is exposed to weather and washing and the accompanying foreign bodies which inevitably get on that surface.
(6) Scratches in exterior surface of outer pane, easily detected by visual examination, are critical if they exceed limits set out below. This surface of the pane is in tension under cabin pressurization load and severe scratches act as stress raisers. In certain cases exterior surface scratches can be hand polished or buffed out. For such procedures, refer to Door-Mounted Windows, Approved Repairs. Minor scratches 0.002 inch or less (barely felt with fingernail) are not critical and do not require polishing. Scratch Depth Max. Length One Scratch Max. Total Length 0.01 inch 0.50 inch 2.5 inches 0.005 inch .5 inches 4.0 inches
(7) The center pane provides the fail-safe feature under cabin pressurization loads if the outer pane should fail. Therefore, scratches are critical in the center pane if they exceed the limits described in par. (6) above.
(8) The inner pane, mounted in the cabin sidewall lining, is not structural. Only optical or visibility criteria apply for removal and replacement.

F. Chipping
   (1) No surface chips are allowed in the center pane. Small, shel1 shaped, edge chips no greater than 0.03 inch in the maximum dimension are permissible. V-shaped chips shall be cause for removal of the center window.
   (2) Criteria for allowed chipping in the outer window are given in par. D.(7).

G. Windowpane Concavity
   (1) Concavity, out of contour, windowpanes. The outer stretched acrylic pane bows inward. The middle cast acrylic panes bows outward. Concavity in its self is not a reason for window replacement, even if panes touch.
      (a) Extreme localized distortion and thickness variances.
         1) Check for uneven surface contour and reduced optical quality. Exposure to high temperature such as photoflood lamp is cause.
      (b) Gentle uniform concavity.
         1) Place straightedge across narrow width of outboard surface of outer pane. If gap exists between straightedge and center of pane, window is concave. Windows prone to fogging are prone to uniform concavity.
         2) Windows can be returned close to their original contour by removing them from airplanes and drying them. This can be accomplished by leaving them exposed at room temperature. Drying time is depended on local humidity and how badly window is deformed.

            NOTE: Windows generally do not return completely to original contour.

         3) Check seals for leakage into window cavity between outer and middle pane.
         4) Check window edges thoroughly for delamination per par. D.
         5) Replace concave windows with leaking seals.

H. Examine Middle Pane for Warping and Deformation.
   (1) Minor warping or deformation alone is not a cause for rejection unless pressure sealing is affected.

      CAUTION: DO NOT PRESSURIZE AIRPLANE IF PRESSURE SEALING IS AFFECTED. PRESSURIZATION INTEGRITY OF FUSELAGE IS CRITICAL BECAUSE FAIL-SAFE FEATURE HAS BEEN ELIMINATED.

ENTRY AND GALLEY SERVICE DOOR WINDOWS - APPROVED REPAIRS

1. General
   A. Area of the entry and galley service windows most likely to get scratched is the exterior surface of the outer pane, at the fuselage skin line. The apparent depth of a scratch may be deceptive. This is due to a furrowing action which may cause a material buildup on each side of the crevice which is usually two to three times as high, from the acrylic surface, as the crevice is deep.
   B. For repair reasons, scratches can be divided into three types: superficial, minor and major. Superficial scratches are those which may be caused by careless removal of traffic film and can be made by rubbing a dry piece of cheesecloth over the windowpane. Superficial scratches are under 0.001 inch in depth. Minor scratches do not have a buildup on the sides and are in the 0.001 to 0.004 inch depth range. Major scratches are 0.004 inch or greater in depth and usually have a buildup on both sides of the crevice.
   C. Approved repair processes include cleaning, waxing, sanding and polishing. Hand sanding is used to remove the buildup at major scratches. Machine polishing or buffing may be used by competent personnel, providing care is used to avoid overheating the windowpane.
   D. Care should be used in handling of windowpanes to avoid scratching or otherwise damaging the plastic surfaces.
      (1) When repairing a windowpane surface, the unscratched areas should be covered with a protective coating, tape or suitable paper after the pane has been carefully cleaned.
      (2) Polished windowpanes should only be handled when wearing clean cotton gloves.
      (3) The use of harmful cleaners or solvents must be avoided.
      (4) Care must be taken not to scratch the window surface with finger rings or other sharp objects.
2. Equipment and Materials
   A. Waxes
      (1) Kwykwax
      (2) Simoniz - Simoniz Company, Chicago, Illinois
      (3) Franklins plexiglas wax
      (4) Duco No. 7
   B. Buffing Compounds
      (1) Learock No. 888 - Lea Manufacturing Co., 16 Cherry Avenue, Waterbury 20, Connecticut
      (2) Learock No. S-30 - Lea Manufacturing Co.
      (3) No. 962 Matchless Grey - Matchless Metal Polish Co., 726 Bloomfield Avenue, Glen Ridge, New Jersey
   C. Buffing Wheels
      (1) Stitch flannel buffing wheels - 4, 6 and 8 inches in diameter, 1 and 2 inches thick for 0.25-inch arbor

(2) Grey No. 4M-30 or Red No. B-7 - Hanson-Van Winkle - Munning Co., Matawan, New Jersey
(3) Triple A - Goodison Manufacturing Co.

D. Cleaners and Polishes per Federal Specification P-P-560, Plastic Polish (Ref Chapter 20, Cleaners and Polishers).

E. Protective Coating and Tapes
(1) Spraylat - SC-1058R per MIL-C-6799 (Item 3.12 Total Light Transmission may be waived)
(2) Spraylat - SC-1072, Black
(3) Permacel No. 76 Tape - Industrial Tape Corp., New Brunswick, N.J.
(4) No. 221 Tape - Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
(5) Transparent Cellophane Tape - Minnesota Mining Co.
(6) 3M, Number Y-9044 Tape - Minnesota Mining Co.
(7) Gizard Protex 20V Tape - Mask-Off Company, Monrovia, California

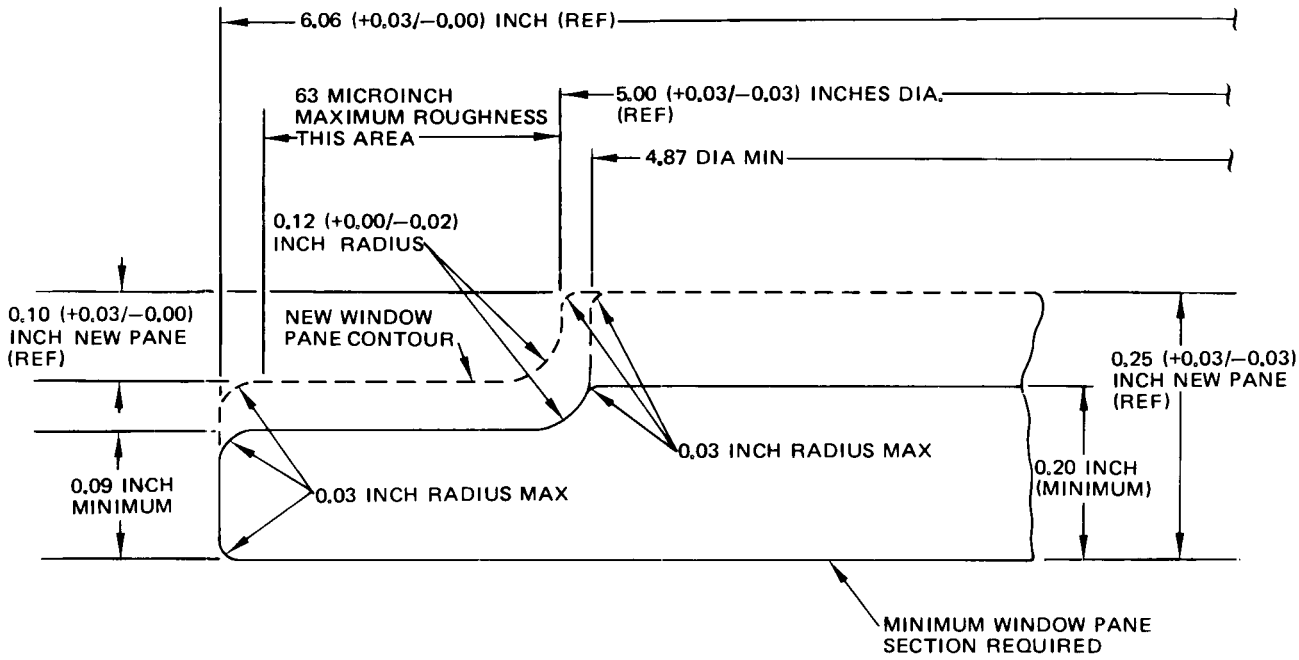
F. Sandpaper
(1) Carborundum Wet-and-Dry paper - 400A and 600A grit

3. Repair Outer Windowpane
A. Rework limits on outer panes should be limited to the minimum thicknesses after rework as shown of Fig. 801.

4. Cleaning, Sanding, Polishing and Waxing
A. Windowpanes with superficial or minor scratches can be restored to satisfactory condition after removal from airplane by cleaning, sanding, polishing and waxing.
(1) Clean pane by flushing surface with plenty of clean water using bare hand to gently feel and remove any sand or abrasive material. Wash with mild soap and water using a soft cloth, sponge or chamois. Wash window with clean water and dry with clean compressed air or a clean damp chamois. If soap and water do not satisfactorily clean window, apply a cleaning agent such as Wilco Anti-Static Plastic Cleaner with soft tissue or flannel cloth. Rinse with clean water and dry with clean compressed air or a clean damp chamois.

CAUTION: THE USE OF INCORRECT CLEANING METHODS OR AGENTS MAY LEAD TO FAILURE OF WINDOW.

(2) Cover side of window not being polished with sprayed or taped protective covering. Polish window with one of the approved polishes either by hand and suitable cloths or by using machine-driven wheel. Cloths which are acceptable for hand polishing include clean flannel or flannelette. Suitable buffing wheels for machine polishing are loosely stitched flannel or muslin.



Entry and Galley Service Window Outer
Figure 801

(3) Hand polishing or buffing operations should be done with circular motion of hand and cover as large a portion of window as possible. Start at pane center and work outwards to edges. It is preferable to use a clean cloth for each operation in the procedure. Superficial scratches can be removed by applying polish to a wet clean cloth and rubbing window, but minor scratches may require rubbing first with cloth and fine buffing compound such as Learock No. 888 and finishing with one of the listed polishes.

(4) Machine polishing and buffing are preferred when equipment and a qualified operator are available. The contact pressure and wheel speed must be regulated to prevent overheating the surface.

CAUTION: TO AVOID OVERHEATING WINDOW, KEEP BUFFING WHEEL IN CONSTANT MOTION OVER WINDOW SO THAT WINDOW SURFACE TEMPERATURE DOES NOT EXCEED 125 TO 130°F. AT THIS TEMPERATURE, WINDOW WILL NOT FEEL HOT WHEN TOUCHED BY BACK OF HAND WITHIN 2 SECONDS OF REMOVING PANE FROM BUFFING WHEEL.

(5) Minor or superficial scratches can be removed by using machine polishing or buffing with Learock No. 888 buffing compound. If required, preliminary buffing may be done with a stitched muslin wheel and a buffing compound such as Learock S-30 at a wheel surface speed of 3200 feet per minute. The final high gloss polishing is then done with Learock 888 compound on a loose open unstitched muslin wheel with spacers or a loosely stitched flannel wheel at a surface speed of 4200 feet per minute. (To make spacers, remove all the muslin disks and reduce half of them to 1/2 the original diameter. Reassemble wheel, alternating large disks with small ones. This type of wheel reduces heating due to friction.) Sometimes an unsatisfactory condition can be detected at the edge of the buffed area. If window is held at the correct angle to the light, a very slight clouded margin can be seen. One cause of this condition is insufficient wheel speed. This problem can be eliminated by increasing wheel speed or by buffing entire surface of window.

(6) After window has been polished, it should be carefully measured to ensure that it complies with minimum thickness requirements and then waxed. One of the approved waxes should be applied to window and lightly polished with a flannel cloth. Finally, window faces should be brushed or sprayed with Spraylat or masked with an approved tape for storage.

B. Hand sanding should be used to remove buildup material on major scratches. Use of a buffing wheel with an abrasive compound on this type of scratch may result in excessive optical distortion. A vibrator with sandpaper is not recommended as excessive material may be removed from window.

(1) Before hand sanding damaged area, window should be cleaned and masked as described in par. 4.A.(1) and (2).

(2) Start sanding with wet-and-dry No. 400-A sandpaper which has been soaked in water for a few minutes. Wrap paper around a rubber block having a Shore Type "A" durometer hardness of 35 or a wooden block wrapped with several layers of flannel. By sanding an area approximately 4 inches in diameter optical distortion can be minimized. Surface should be rubbed across the scratch at a 45-degree angle using light hand pressure with frequent applications of water. Change sandpaper as required. The affected area should be sanded with No. 400-A sandpaper until scratch buildup material is removed. The sanding abrasions are then reduced by repeating sanding with No. 600-A wet-and-dry sandpaper which has been soaked in water.

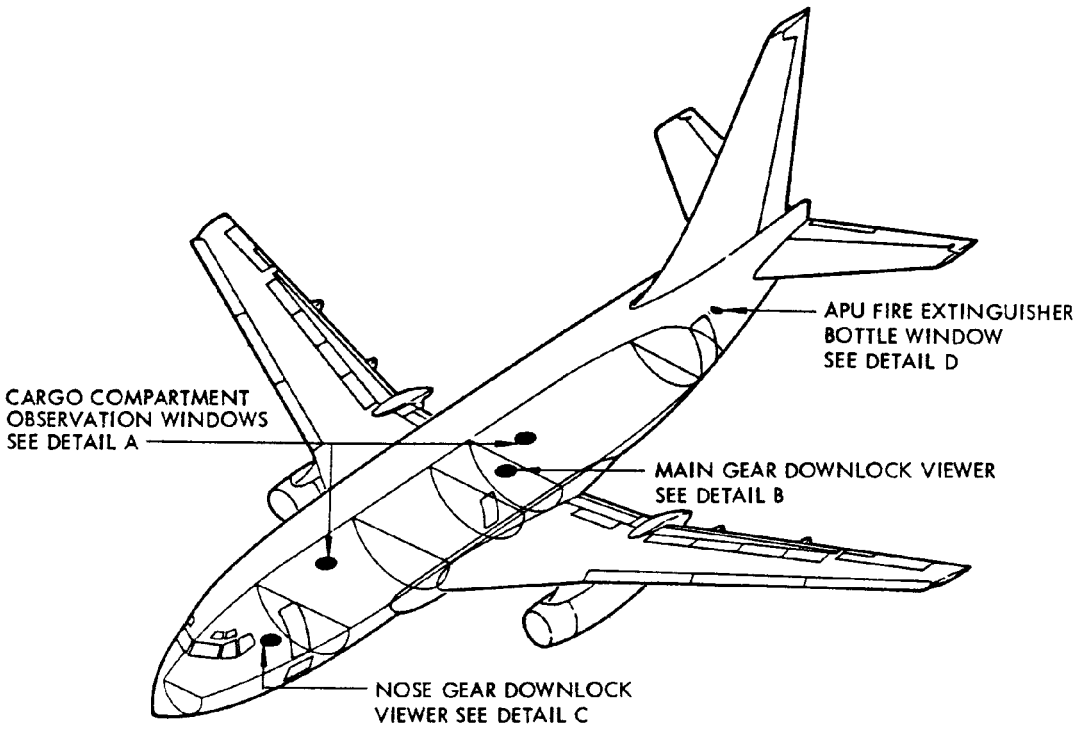
(3) After sanding, scratches should be in the minor category and sanded area takes on a frosted appearance. Apply Learock S-30, or its equivalent, to a buffing wheel and buff affected area as detailed in par. 4.A.(2) until frosted finish is removed. Optical transparency occurs at the time all frosted finish is removed. The use of Learock S-30 should cease at this point as overusage of S-30 results in optical distortation.

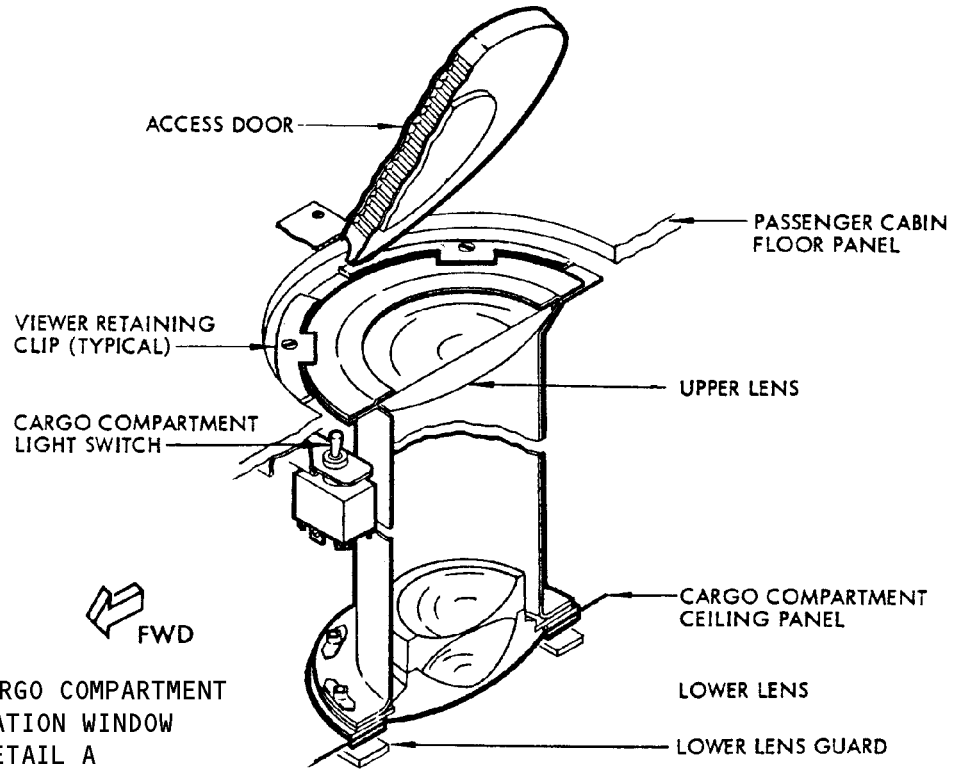
(4) Apply Learock 888 buffing compound to a clean buffing wheel and polish the window surface to a high gloss, as described in par. 4.A.(4).

(5) Following repair, check that window thickness complies with minimum thickness requirement, lightly polish with one of the approved waxes and protect faces with Spraylat or an approved tape.

VIEWERS AND OBSERVATION WINDOWS - DESCRIPTION AND OPERATION

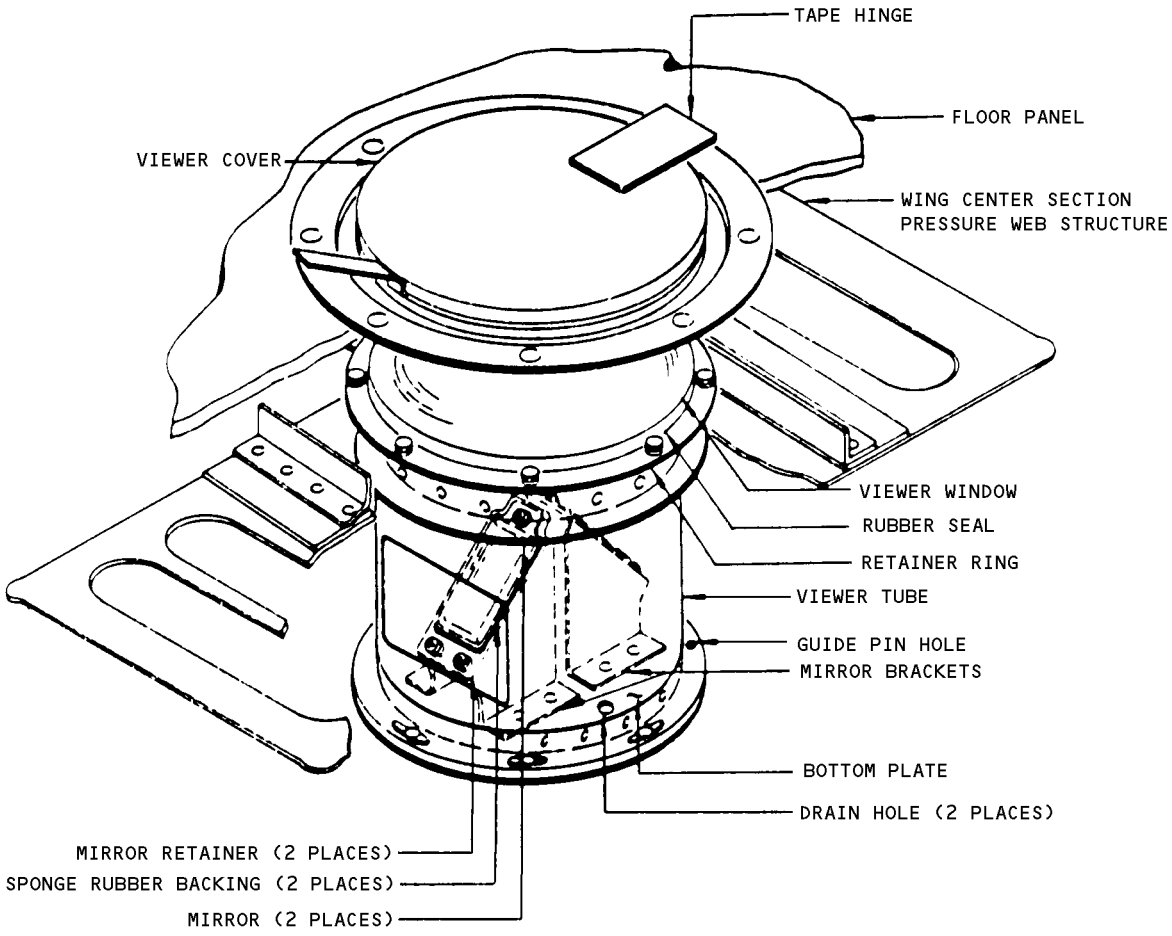
1. General
   A. The inspection and observation equipment consists of cargo compartment observation windows, main gear downlock viewer, a nose gear downlock viewer, and APU fire extinguisher bottle window. (See figure 1.) The cargo compartment observation windows are mounted in the passenger cabin floor and permit a visual inspection of the forward and aft cargo compartments. The main gear downlock viewer is located in the aisleway of the main cabin floor over the wheel well area and is arranged to provide inflight visual inspection of the main gear downlock indicators when the main gear is down and locked. The nose gear downlock viewer is installed above the nose gear wheel well and is arranged to provide inflight visual inspection of the nose gear drag link locking components when the nose gear is down and locked. The APU fire extinguisher bottle window is located on the right aft lower surface of the fuselage. The window provides a rapid means for ground personnel to read the gauges on the APU fire extinguisher system which are visible through the window from the exterior of the airplane.
2. Cargo Compartment Observation Windows
   A. A cargo compartment observation window is installed in the passenger cabin floor above each cargo compartment. (See detail A, figure 1.) Each observation window has a wide angle lens which permits a visual inspection of most of the cargo compartment at one time. The window consists of a tube with a lens at the passenger cabin floor level and another lens at the bottom of the tube, just below the level of the floor beam and in the plane of the cargo compartment ceiling panels. A cargo compartment light switch is located near the upper lens.
3. Main Gear Downlock Viewer
   A. The purpose of the main gear downlock viewer is to provide a positive means for inflight visual inspection of the main landing gear downlock indicators. (See detail B, figure 1.) The cover over the window of the downlock viewer is located in the floor near the aisleway of the main cabin over the wheel well area at approximately station 700 at LBL 11.50. The plywood cover is hinged by tape to the floor panel to allow exposing of the viewer window. The viewer consists of the window and two mirrors mounted in an aluminum alloy viewer tube assembly which is attached to the wing center section pressure web structure. The two-ply, 0.125-inch,





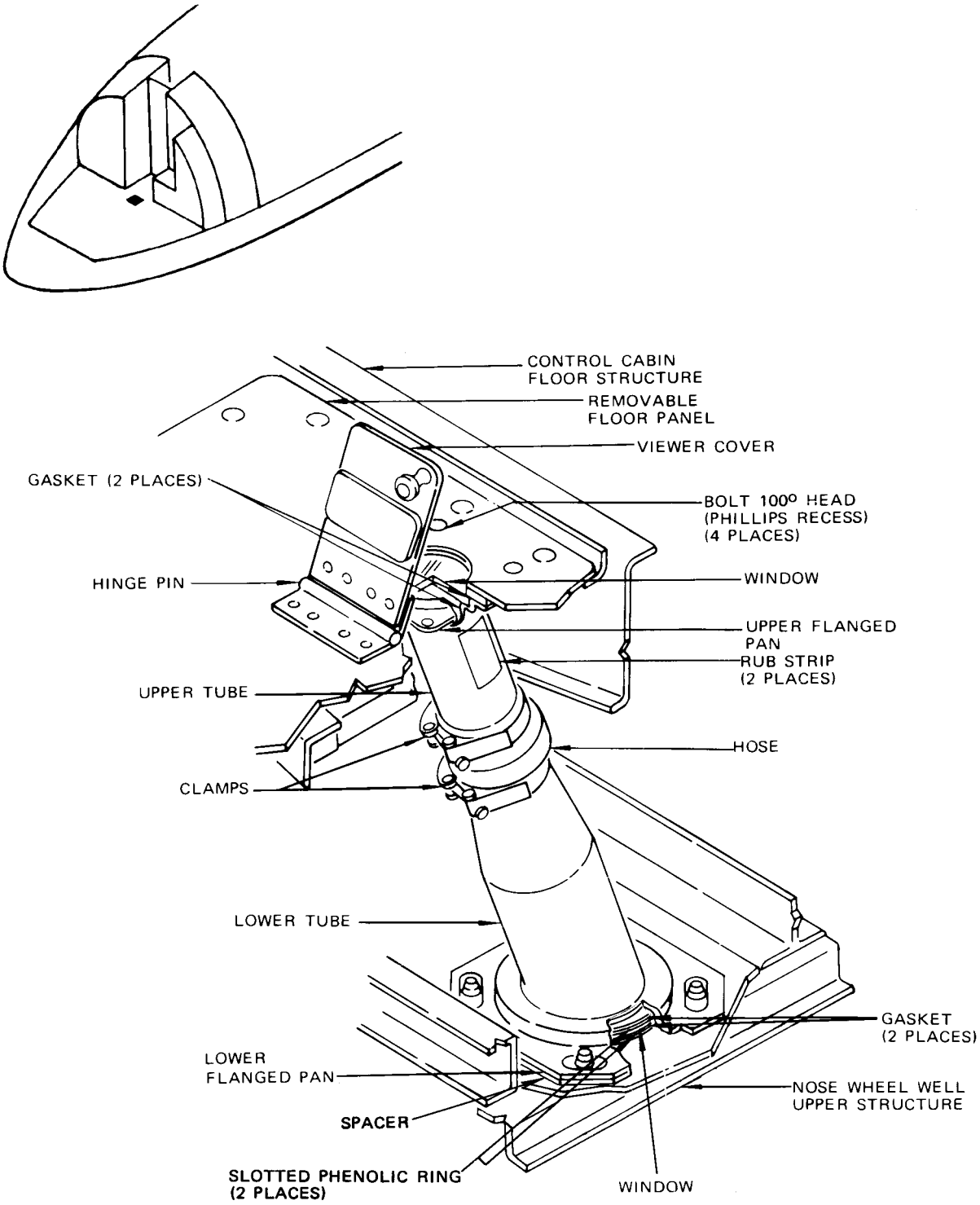
TYPICAL CARGO COMPARTMENT OBSERVATION WINDOW DETAIL A

Viewers and Observation Windows
Figure 1 (Sheet 1)



DETAIL B
MAIN GEAR DOWNLOCK VIEWER

Viewers and Observation Windows
Figure 1 (Sheet 2)



NOSE GEAR DOWNLOCK VIEWER
LEFT SIDE VIEW
DETAIL C

Viewers and Observation Windows
Figure 1 (Sheet 3)

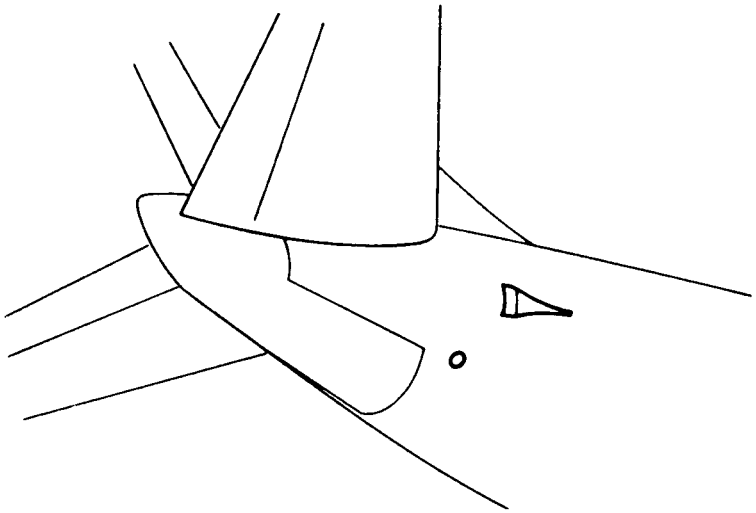
B. glass window is mounted in a silicone rubber seal in a retainer ring, which is secured over the upper end of the viewer tube. The two mirrors are mounted on sponge rubber backing on mirror retainers that are attached to mirror brackets. The brackets are attached to a bottom plate that is secured to the lower end of the viewer tube. Two drain holes are locked in the bottom plate. The mirrors are aligned with cutouts in the viewer tube and are arranged so that the main landing gear downlock indicators are centered in the field of vision of each mirror. Removed paint stripes are located on the main gear lower side strut and the lower downlock link. When the main gear is down and locked, the removed paint stripes on the lower side strut will align with the removed paint stripe on the lower downlock link. A light is provided for illuminating the indicator.

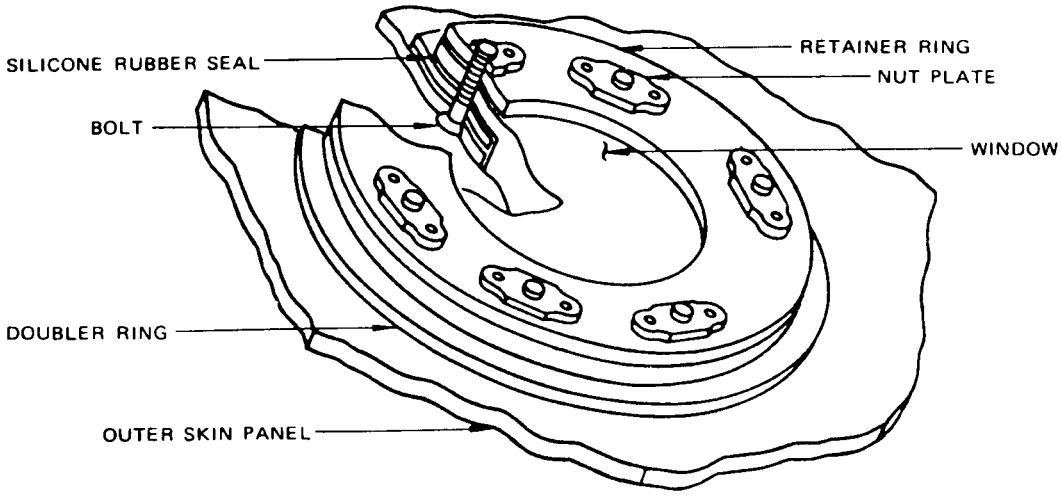
4. Nose Gear Downlock Viewer

A. The nose gear downlock viewer is arranged to provide inflight visual inspection of the nose gear drag link locking components when the gear is down and locked (Detail C, Fig. 1). The nose gear viewer window and cover are located in the control cabin floor above the nose gear wheel well. The viewer cover is attached to the floor and is opened to allow exposing of the viewer window. The viewer consists of the cover and two windows mounted in an aluminum alloy tube assembly. The upper end of the upper tube contains a 0.250-inch thick stretched acrylic sheet window cushioned by synthetic rubber seal gaskets in the upper flanged pan. The upper pan is bolted to the control cabin floor structure. The lower window of 0.250-inch thick glass is mounted between slotted phenolic rings, with the slots adjacent to the window, and sealed by synthetic rubber seal gaskets in the lower flanged pan on the lower end of the lower tube. A phenolic spacer is located under the flange of the lower flanged pan. The lower pan is sealed and bolted to the nose wheel well upper structure. The two tubes are connected by a hose and clamps. Four small equally spaced breather holes are provided in the viewer tube through which cabin air is introduced. The air flows over the lower window reducing fogging and is bled overboard through the slots in the phenolic rings. The slots also provide water drainage from the viewer. The viewer components are aligned so that the minimum field of vision will include the nose gear lock brace and the indicator, with the image centered in the window (Ref Chapter 32, Landing Gear).

B. On airplanes not incorporating SB 53-1109, all of the nose gear downlock viewer must be removed and disassembled to remove the upper and lower windows for replacement or cleaning.

C. On airplanes incorporating SB 53-1109, the upper window can be removed for replacement or cleaning by removing a window retention plate on the floor of the control cabin. All of the viewer must be removed to remove the lower window.





APU FIRE EXTINGUISHER BOTTLE WINDOW
DETAIL D

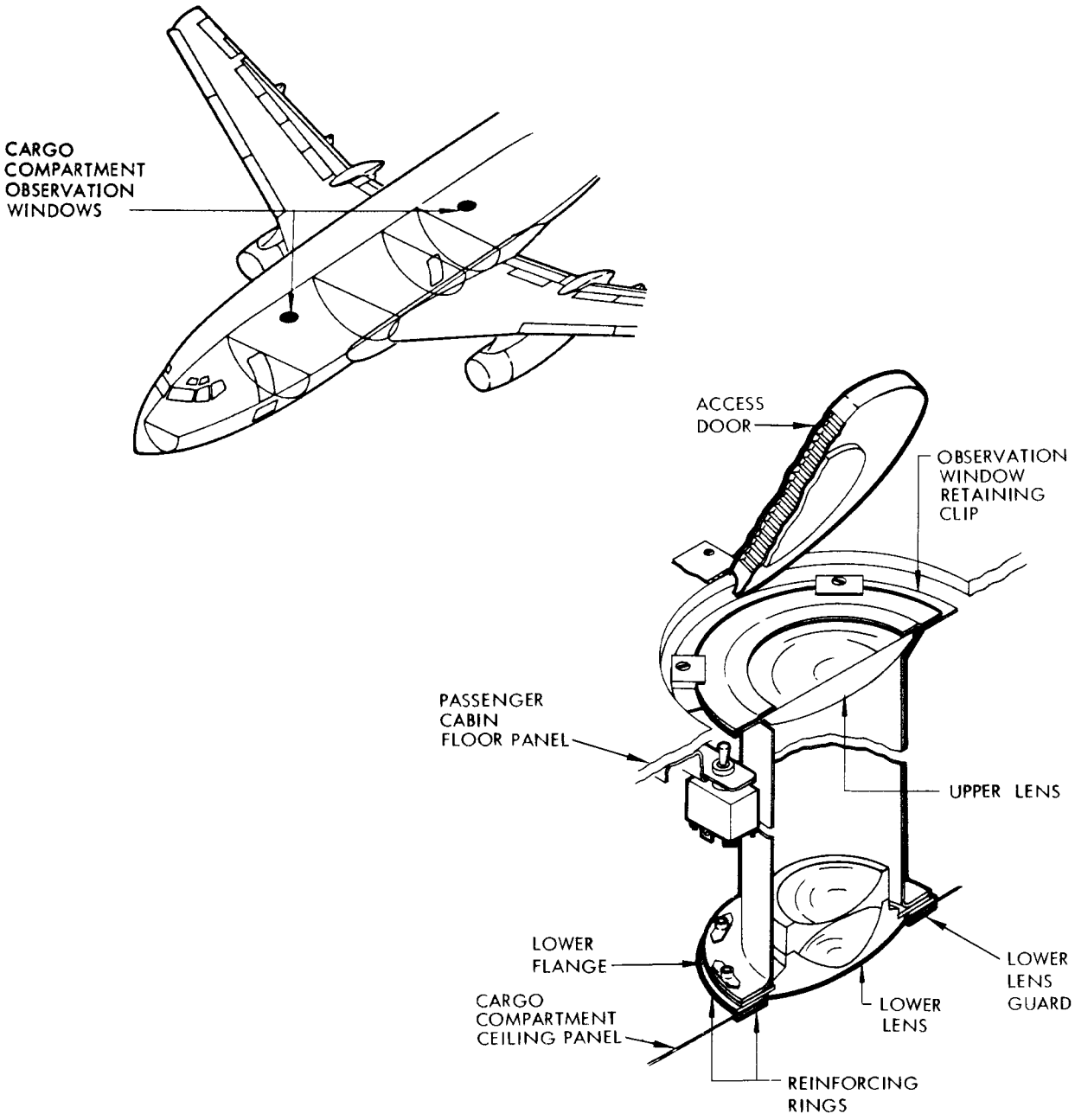
Viewers and Observation Windows
Figure 1 (Sheet 4)

5. APU Fire Extinguisher Bottle Window

A. The APU fire extinguisher bottle window is located on the right, aft, lower surface of the fuselage (Detail D, Fig. 1). It is a small round, plug type window that is installed so that its outer surface is flush with the exterior surface of the fuselage. The window consists of a formed, round, acrylic sheet mounted on a doubler ring and secured in position by a silicone rubber seal and an aluminum retainer ring. It is attached to fuselage structure by six mounting bolts and nut plates. The window is situated so that it is accessible to ground personnel to read the pressure gauges on the APU fire extinguisher system through the window from the exterior of the airplane.

CARGO COMPARTMENT OBSERVATION WINDOW - REMOVAL/INSTALLATION

1. General
   A. The forward and aft cargo compartment observation windows are identical units. Therefore, only one removal installation is given.
2. Equipment and Materials
   A. Cellulose Acetate Sheeting
   B. Masking Tape
   C. Castile Soap
   D. Boiled Cheesecloth
3. Remove Cargo Compartment Observation Window (See figure 401)
   A. Apply protective cover of cellulose acetate to accessible surface of lower lens. Secure cover with masking tape.
   B. Remove screws holding lower lens guard and cargo compartment ceiling panel to lower flange of observation window.
   C. Fold back or remove passenger cabin floor rug between right seat tracks over floor panel in which observation window is located.
   D. Open observation window access door and retain in open position.
   E. Apply protective cover of cellulose acetate to accessible surface of upper lens. Secure cover with masking tape.
   F. Remove observation window retaining clips and screws.
   G. Lift window out through hole in floor panel.
4. Install Cargo Compartment Observation Window (See figure 401)
   A. Apply protective cover of cellulose acetate to accessible surfaces of observation window lenses. Secure covers with masking tape.
   B. Install window by inserting through hole in floor panel.
   C. Install window retaining clips and screws.
   D. Remove protective cover from upper lens.
   E. Clean upper lens with lukewarm water and soap applied with a soft cloth such as cheesecloth, rinse with clean water and wipe dry.
   F. Close observation window access door.
   G. Unfold or replace passenger cabin floor rug over observation window floor panel and tape down.
   H. Install screws holding lower lens guard and cargo compartment ceiling panel to lower flange of observation window.
   I. Remove protective cover from lower lens of observation window.
   J. Clean lower lens with lukewarm water and soap applied with a soft cloth, such as cheesecloth, rinse with clean water and wipe dry.



Cargo Compartment Observation Window Installation
Figure 401

CARGO COMPARTMENT OBSERVATION WINDOW - INSPECTION/CHECK

1. Cargo Compartment Observation Window Check
   A. Check Cargo Compartment Observation Window
      (1) Unfold passenger cabin aisle rugs over viewer cover and open viewer cover.
      (2) Turn on light switch.
      (3) Visually check that view through the observation window of the interior of the cargo compartment is unobstructed.
      (4) Turn off light switch.
      (5) Close viewer cover, unfold passenger cabin aisle rugs over viewer cover and tape down.

MAIN GEAR DOWNLOCK VIEWER - REMOVAL/INSTALLATION

1. General
   A. The main gear downlock viewer window and two mirrors are mounted in an aluminum alloy viewer tube assembly which is attached to the wing center section pressure web structure at approximately station 700 at LBL 11-50. In normal servicing of the viewer installation only the bottom plate (13, figure 401) with attached mirror brackets (12) and mirrors (17) are removed, cleaned and reinstalled. The interior surfaces of the viewer tube (10) and the lower surface of viewer window (7) are cleaned after the bottom plate (13) is removed.
2. Equipment and Materials
   A. Cellulose acetate sheeting, or equivalent
   B. Masking tape
   C. Plastic scraper (See AMM 51-31-0/201 for approved scrapers)
   D. Cheesecloth or equivalent
   E. Castile soap
   F. Naphtha
   G. EC1300L Adhesive Compound - Minnesota Mining and Manufacturing Co., or equivalent
   H. Q-3-0121 Adhesive Compound - Dow-Corning Corporation, or equivalent
3. Prepare Main Gear Downlock Viewer for Removal
   A. Fold passenger cabin aisle rugs above viewer cover (3, figure 401) which exposes the removable floor panel (5) above the viewer window (7), if a replacement window or window seal is to be installed or the upper surface of the viewer window is to be cleaned.
   B. Remove viewer cover (3) and tape hinge (4).
   C. Remove floor panel (5) exposing wing center section pressure web structure (6) in which viewer tube (10) with viewer window (7) is installed.

      NOTE: Steps "A" through "C" are necessary only if the upper surface of the viewer window is to be cleaned.

   D. Apply a protective cover of cellulose acetate sheeting or equivalent, to the upper surface of the viewer window (7). Secure cover with masking tape.
4. Remove Main Gear Downlock Viewer
   A. Remove the eight hex head bolts (2, figure 401) and flat washers (1) from retainer ring (9).
   B. Remove viewer window (7) with rubber seal (8) from retainer ring (9).

C. Strip rubber seal (8) from edge of window (7) only if a new seal is to be installed.

CAUTION: IF THE WINDOW IS TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE ACETATE SHEETING OR EQUIVALENT, SHOULD BE APPLIED TO BOTH UPPER AND LOWER SURFACES OF THE WINDOW TO PREVENT DAMAGE DURING HANDLING. IF A NEW SEAL IS TO BE INSTALLED, DO NOT COVER THE AREA WHICH WILL CONTACT THE RUBBER SEAL AROUND THE PERIPHERY OF THE GLASS WINDOW.

NOTE: Steps "A" through "C" are necessary only if a replacement window or window seal is to be installed.

D. Working from below the viewer installation, apply protective covers of cellulose acetate sheeting or equivalent, to accessible surfaces of the two mirrors (17). Secure covers with masking tape.
E. Remove the eight pan head screws (16) and flat washers (15) attaching bottom plate (13) to ring on lower end of viewer tube (10).
F. Remove bottom plate (13) with attached mirror brackets (12) and mirrors (17) as an assembly from the lower end of viewer tube (10).
G. If new mirrors, mirror retainers, or sponge rubber backing is to be installed, remove six pan head screws (21) and flat washers (20) from the mirror brackets (12).
H. Remove mirror retainer (19), sponge rubber backing (18) and mirror (17) from mirror bracket (12).

NOTE: Steps "G" and "H" are necessary only if replacement mirrors, new rubber backing or mirror retainer is to be installed.

5. Prepare Main Gear Downlock Viewer for Installation
   A. If a window seal is being installed, clean faying surfaces of new rubber seal (8, figure 401) and viewer window (7) with naphtha applied with a clean, oil-free cheesecloth or other absorbent material
   B. Wipe off solvent before it has evaporated with clean, oil and lint-free absorbent material such as Finetex, new cheesecloth, or equivalent.
   C. Repeat application of clean solvent as necessary.
   D. Mix EC-1300L adhesive compound thoroughly before using. Adhesive which has thickened excessively or jelled shall not be used.
   E. Apply two thin, uniform brush coats of adhesive to faying surfaces on the window (7) and seal (8). Allow 30 minutes drying time at room temperature between coats.

F. Allow the last coat of adhesive to dry until it is tacky, but will not transfer to the knuckle when touched lightly. This will require 10 to 20 minutes at room temperature.

NOTE: Adhesive may be reactivated by lightly wiping one surface with a clean cheesecloth saturated with solvent.

G. Shape and bend the new rubber seal (8) around the glass window (7) while adhesive is tacky, applying sufficient pressure to ensure intimate contact. Care must be taken to avoid entrapping air pockets.
H. The assembly may be handled immediately. Full strength is not developed for 24 hours or longer at room temperature.
I. Remove excessive adhesive with naphtha. Wipe dry with a clean oil and lint-free cheesecloth or equivalent.
J. Clean retainer ring (9) and upper surface of ring on the tube (10) by wiping surfaces with a clean cheesecloth saturated with naphtha. If a residue of hardened adhesive is present, use an approved plastic scraper to dislodge the material.
K. Wipe off solvent before it has evaporated with a clean, oil and lint-free cheesecloth or equivalent.
L. Immediately prior to installation, remove protective cover from viewer window (7) and clean the window with lukewarm water and castile soap applied with a soft material such as boiled cheesecloth. Rinse with clean water and wipe dry.

NOTE: Steps "A" through "L" are necessary only if a replacement window or window seal is being installed.

M. Clean interior surfaces of viewer tube (10), upper surface of bottom plate (13) and surfaces of mirror brackets (12). Use an oil and lint-free cheesecloth or equivalent. Make sure drain holes (14) in bottom plate (13) are open.
N. If new sponge rubber backing (18) is to be installed, clean mirror retainer (19) and upper surfaces of mirror brackets (12) with naphtha. Wipe dry before the solvent has evaporated with a clean oil and lint-free cheesecloth or equivalent.
O. Apply a uniform layer of Q-3-0121 adhesive compound over one or both surfaces to be bonded on the mirror (17), rubber backing (18), and mirror retainer (19).
P. Join the surfaces as soon as possible after adhesive application. Exposure to the air for more than a few minutes will cause the adhesive to form a skin which interferes with adhesion.

Q. Apply sufficient pressure to ensure complete contact but not enough to squeeze out an excessive amount of adhesive. A bond line thickness of at least 15 mils gives best results.

NOTE: Steps "N" through "Q" are necessary only if a replacement mirror, new sponge rubber backing or mirror retainer is being installed.

6. Install Main Gear Downlock Viewer

A. Install viewer window (7, figure 401) with rubber seal (8) on upper surface of ring on top of viewer tube (10).

CAUTION: MAKE SURE THE WINDOW RUBBER SEAL (8) IS IN PLACE AND A CLEAN PROTECTIVE COVER IS POSITIONED OVER THE UPPER VIEWING SURFACE ONLY OF THE WINDOW.

B. Secure the window (7) and seal (8) on upper ring of tube (10) with retainer ring (9), flat washer (1) and eight hex head bolts (2).

CAUTION: PRESS DOWN ON THE RETAINER RING WHILE TIGHTENING BOLTS TO ENSURE A PRESSURE TIGHT JOINT.

C. Remove protective cover from window (7) and install removable floor panel (5) on the pressure web structure (6).

D. Install viewer cover (3) and tape hinge (4).

NOTE: Steps "A" through "D" are necessary only if a replacement window or window seal is installed.

E. If mirror (17), the rubber backing (18) or mirror retainer (19) was removed from mirror bracket (12) install these items on the mirror bracket (12) with flat washer (20) and pan head screw (21).

F. Immediately prior to installation remove protective covers from mirrors and clean each mirror with lukewarm water and castile soap applied with a soft cloth, such as boiled cheesecloth. Rinse with clean water and wipe dry with an oil and lint-free cheesecloth or equivalent.

G. Install a clean protective cover of cellulose acetate sheeting on each mirror. Secure with masking tape.

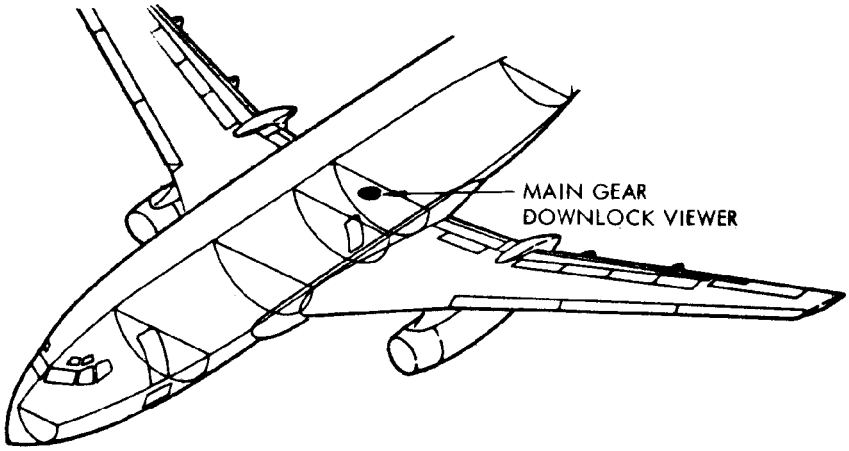
H. Align guide pin on bottom plate (13) with guide pin hole (11) in lower ring of viewer tube (10) and install the bottom plate (13) with the attached mirror assembly on lower ring on the tube (10). Secure with flat washers (15) and pan head screws (16).

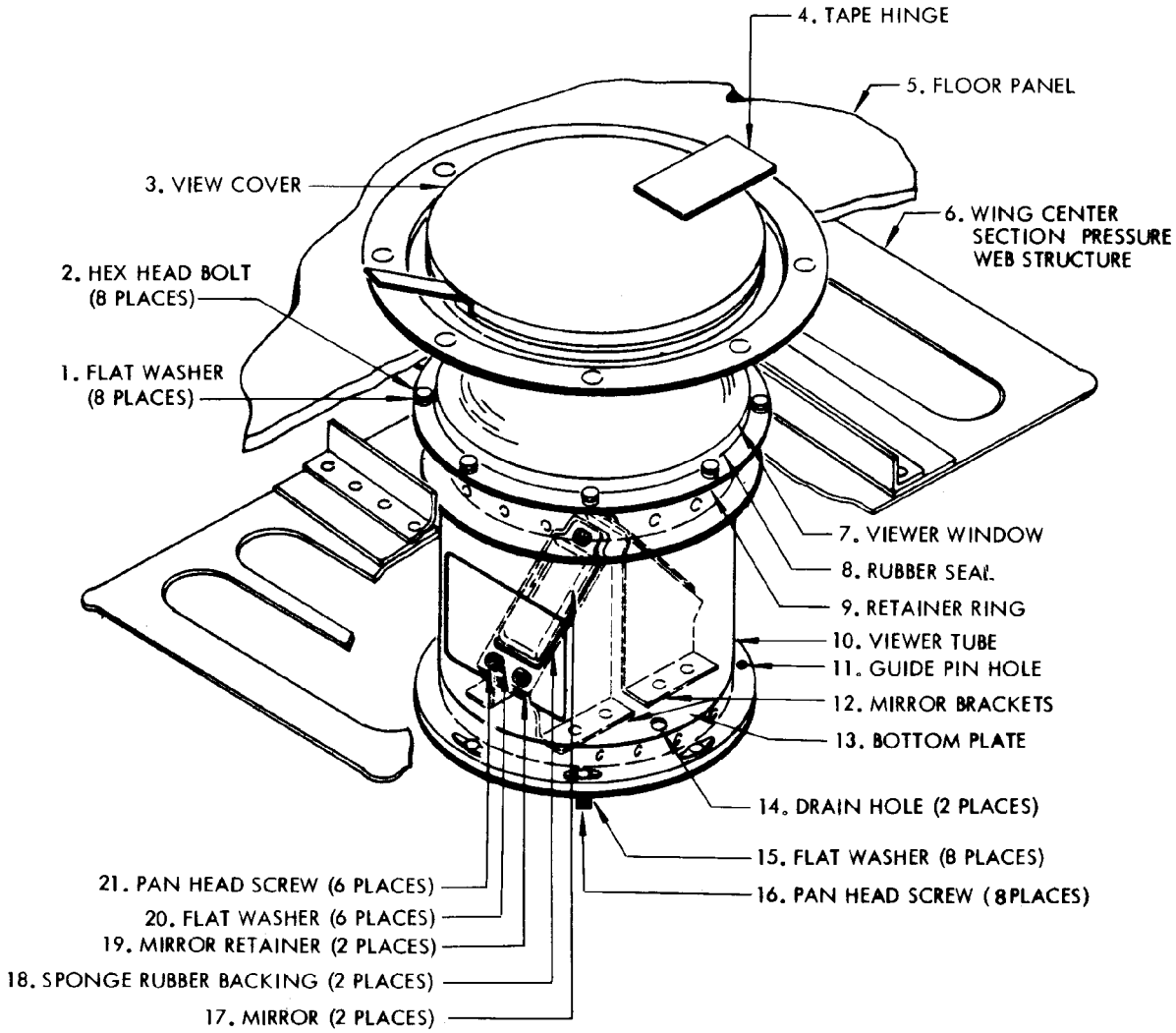
I. Remove protective cover from each mirror.

7. Restore Airplane to Normal Configuration

A. Open viewer cover (3, figure 401) and visually check to make sure the image of each downlock indicator is clearly visible. Close viewer cover.

B. Unfold passenger cabin aisle rugs over the floor panel and tape down.





Main Gear Downlock Viewer
Figure 401

MAIN GEAR DOWNLOCK VIEWER - INSPECTION/CHECK

1. Main Gear Downlock Viewer Check
   A. Check Main Gear Downlock Viewer
      (1) Unfold passenger cabin aisle rugs over viewer cover and open viewer cover.
      (2) Turn on light switch.
      (3) Visually check that the image of each main gear downlock indicator is visible in the mirrors.
      (4) Turn off light switch.
      (5) Close viewer cover, unfold passenger cabin aisle rugs over viewer cover and tape down.

NOSE GEAR DOWNLOCK VIEWER - REMOVAL/INSTALLATION

1. General
   A. The nose gear downlock viewer window and cover are located in the control cabin floor above the nose gear wheel well (Fig. 401). Normal servicing requires only the cleaning of the upper surface of the upper window which is located under the viewer cover and the outer surface of the lower window which is situated in the nose wheel well upper structure.
   B. On airplanes incorporating SB 53-1109, the upper window can be removed without removing the viewer by removing the upper window retention plate on the floor of the control cabin.
2. Equipment and Materials
   A. Cellulose acetate sheeting, Permacel Tape No. 76, Minnesota Mining and Manufacturing Company, Tape No. 221, or Transparent Cellophane No. 600, Spraylat SC-1058R
   B. Masking tape
   C. Plastic scraper (AMM 51-31-0/201 for approved scrapers)
   D. Cheesecloth
   E. Sealant - BMS 5-44, Class B
   F. Aliphatic Naphtha - TT-N-95A, Type II

      NOTE: Freon-TF may be used in lieu of aliphatic naphtha, TT-N-95A, Type II for general cleaning of windows.

   G. Castile soap
   H. Adhesive - BMS 5-105 Type II Class 1 or 2
   I. Sandpaper
3. Prepare Nose Gear Downlock Viewer for Removal
   A. Open viewer cover (5, Fig. 401) exposing viewer window (16).
   B. Apply a protective covering of cellulose acetate sheeting, or equivalent, to accessible surfaces of the windows (9 and 16) which are to be removed and reinstalled. Secure with masking tape.
   C. Remove the aft left access panel on the side of the nose wheel wel1 structure to gain access to the viewer installation.
4. Remove Nose Gear Downlock Viewer
   A. On airplanes incorporating SB 53-1109, do as follows:
      (1) Remove the 4 fasteners attaching the upper window retention plate (20) and remove the plate.
      (2) Before you remove other components of the viewer, examine the condition of the upper window (16).
      (3) Do a check to see if there is condensation or fogging on the window.
   B. Remove the upper window (16) and the 2 gaskets.
   C. Remove bolts attaching lower flanged pan (11) Fig. 401 to the nose wheel well upper structure (10).

D. On airplanes not incorporating SB 53-1109, support the viewer assembly and remove bolts (17) attaching upper flanged pan (15) to the floor panel (2).
E. Remove the floor panel (2) from the control cabin floor structure (4).
F. On airplanes incorporating SB 53-1109, remove the foam filter (19) from the upper viewer tube (14) if there is condensation or fogging on the window (16).

Note: The foam filter is bonded onto the viewer. You must remove with sandpaper the adhesive and remaining filter material completely before you replace the filter.

G. Remove viewer assembly by lifting it upward through the opening in the control cabin floor.
H. Disconnect clamps (13) and remove hose (7) from lower tube (12) and upper tube (14).
I. Remove window (16) from upper flanged pan (15).
J. Remove window (9) from lower flanged pan (11).
K. Strip gaskets (1 and 8) from windows (16 and 9) if new gaskets are to be installed.

CAUTION: IF WINDOWS ARE TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE ACETATE SHEETING, OR EQUIVALENT, MUST BE APPLIED TO SURFACES TO PREVENT DAMAGE DURING HANDLING. DO NOT COVER THE AREAS WHICH CONTACT THE GASKETS ON BOTH INNER AND OUTER FACE OF EACH WINDOW.

L. Remove the slotted phenolic rings (18).
M. Remove phenolic spacer (19) from the lower flanged pan if replacement is required.

5. Prepare Nose Gear Downlock Viewer for Installation
A. Remove sealant residue from interior surfaces of the flanged pans (11 and 15, figure 401) with a cloth moistened with aliphatic naphtha. Use an approved plastic scraper to dislodge adhesive. Wipe dry before solvent has evaporated with clean cheesecloth or equivalent. Dry with an oil and lint-free cloth.
B. Clean interior surfaces of lower tube (12), hose (7), and upper tube (14) with a clean cloth moistened with aliphatic naphtha. Wipe the surfaces dry with an oil and lint-free cloth.
C. On airplanes with SB 53-1109, if the foam filter was removed, lightly sand the upper tube to remove any foam that has not come off. Wipe the surface with a clean cloth moistened with aliphatic naptha. Wipe the surface dry with an oil and lint free cloth before you install new foam filter.

D. If new gaskets (8) and slotted phenolic rings (18) are to be installed, clean faying surface of each window and ring with a cloth moistened with aliphatic naphtha. Wipe dry before the solvent has evaporated with an oil and lint-free cloth.
E. Immediately before use, thoroughly blend components of BMS 5-44, class B, sealant. Apply a thin, even coat of the sealant to each faying surface of the windows (9 and 16), gaskets (1 and 8) and the slotted phenolic rings (18).
F. Assemble the two gaskets (l) on window (16).
G. Assemble the two slotted phenolic rings (18) and the two gaskets (8) on window (9). Locate the phenolic ring slots adjacent to each face of the lower window. Apply a firm, uniform pressure to ensure complete contact of the faying surfaces.
H. Wipe off excessive sealant before it has cured, using a clean cloth moistened with aliphatic naphtha.

CAUTION: MAKE SURE THE DRAIN SLOTS IN THE PHENOLIC RINGS ARE FREE OF SEALANT AND ARE OPEN.

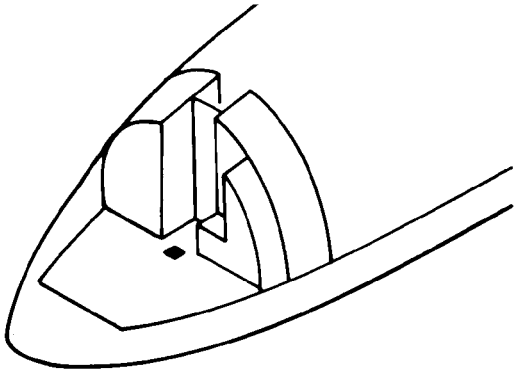
I. Remove protective covers and clean each window with lukewarm water and castile soap applied with a soft cloth, such as boiled cheesecloth or equivalent. Rinse with clean water and wipe dry with an oil and lint-free cloth.
J. Install a clean protective cover of cellulose acetate sheeting, or equivalent, over one surface only of each window.

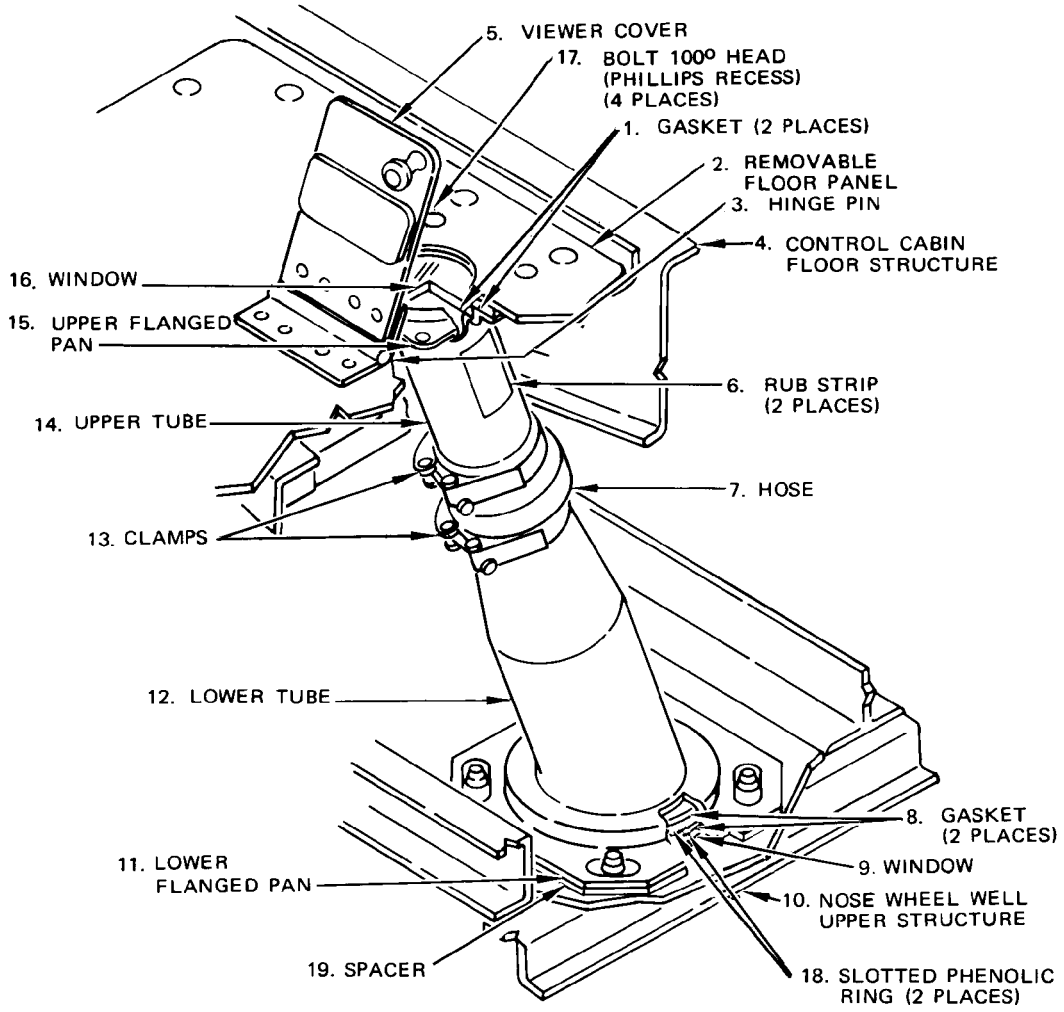
CAUTION: DO NOT COVER THE GASKET.

6. Install Nose Gear Downlock Viewer
A. Apply a thin, even coat of the sealant to faying surfaces of the gaskets (1 and 8, Fig. 401) and gasket seat on upper flanged pan (15) and lower flanged pan (11).
B. Install window (16) in upper flanged pan (15). The protective cover is attached to the outer upper surface only of the window.

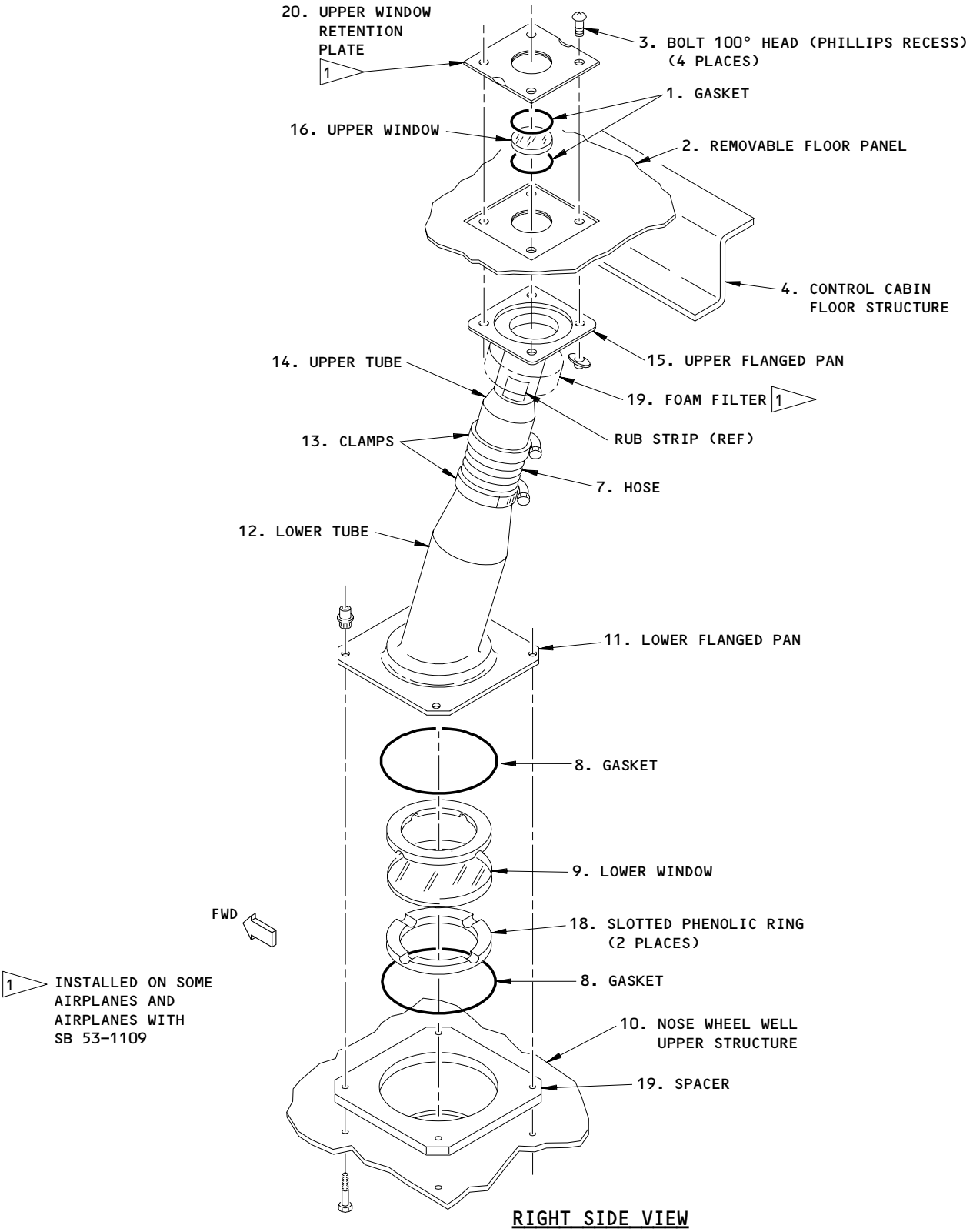
CAUTION: MAKE SURE THE GASKETS ARE IN PLACE BEFORE INSTALLING THE WINDOWS.

C. Install window (9) with the slotted rings (18) and gaskets (8) in lower flanged pan (11). The protective cover is attached to the outer lower surface only of the window.
D. Apply a firm, uniform pressure on each window gasket to ensure complete contact of the faying surfaces.
E. Wipe off excessive sealant before it has cured, using a clean cloth moistened with aliphatic naphtha.





Nose Gear Downlock Viewer Installation
Figure 401 (Sheet 1)



RIGHT SIDE VIEW

Nose Gear Down Lock Viewer Installation
Figure 401 (Sheet 2)

F. Install spacer (19) in the lower flanged pan with BMS 5-44, class B, sealant.
G. On airplanes with SB 53-1109, if the foam filter (19) was removed, install the foam filter using BMS 5-105 Type II. Make sure the viewer is free from old adhesive and foam filter.

WARNING: ADHESIVE BMS 5-105 CONTAINS ISOCYANATES. AVOID SKIN CONTACT AND INHALATION OF VAPORS. MIX AND USE IN OPEN AREAS WITH SUFFICIENT AIR CIRCULATION.

CAUTION: AVOID APPLICATION OF BMS 5-105 CLOSER THAN 0.30 INCH FROM ALL VENT HOLES IN THE UPPER TUBE OF THE VIEWER.

H. Position hose (7) and clamps (13) on upper tube (14) and lower tube (12). Do not tighten clamps at this time.
I. Position the assembled viewer on nose wheel upper structure (10) with lower flanged pan (11) centered over viewer cutout in the structure.
J. Install bolts attaching lower flanged pan (11) to nose wheel upper structure (10).

CAUTION: MAKE SURE THE OUTER GASKET IS IN PLACE BEFORE INSTALLING BOLTS IN LOWER FLANGED PAN.

K. Install removable floor panel (2) on control cabin floor structure (4). Position upper flanged pan (15) to align with viewer cutout in the floor panel before installing bolts.
L. On airplanes not incorporating SB 53-1109, attach upper flanged pan (15) to the floor panel (2) with the four bolts (17).

CAUTION: MAKE SURE THE OUTER GASKET IS IN PLACE BEFORE INSTALLING BOLTS IN THE UPPER FLANGED PAN.

M. On airplanes incorporating SB 53-1109, install the upper window retention plate with the four fasteners.
N. Tighten clamps (13) that secure hose (7) to upper tube (14) and lower tube (12).

7. Restore Airplane to Normal Configuration
A. Remove the protective cover from each window.
B. Visually check that the image of the nose gear downlock indicator is centered in the viewer window (16, Fig. 401). Refer to Landing Gear, Chapter 32.
C. Close viewer cover (5).
D. Install the access panel on the side of the nose wheel well structure.

NOSE GEAR DOWNLOCK VIEWER - INSPECTION/CHECK

1. Nose Gear Downlock Viewer Check
   A. Check Nose Gear Downlock Viewer
      (1) Open viewer cover.
      (2) Turn on light switch.
      (3) Visually check that the nose gear downlock indicator is visible through the viewer window.
      (4) Turn off light switch.
      (5) Close viewer cover.

NOSE GEAR DOWNLOCK VIEWER - CLEANING/PAINTING

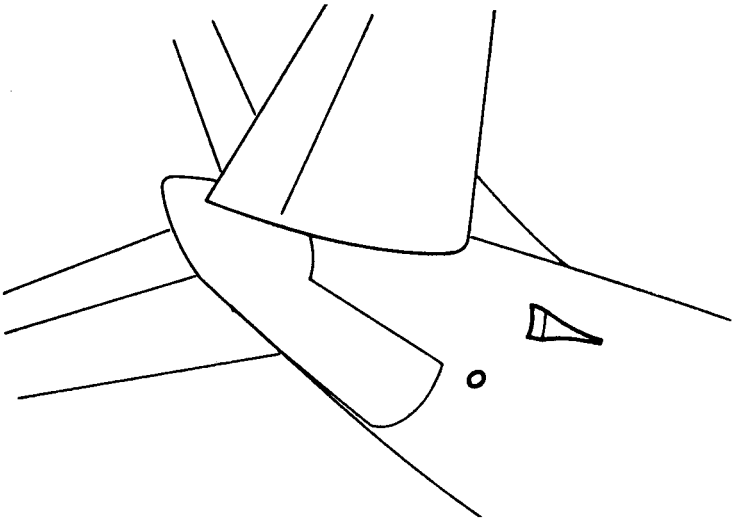
1. General
   A. The upper surface of the upper window can be cleaned from the control cabin without viewer removal. The lower surface of the lower window can be cleaned from the nose wheel well without viewer removal. Window surfaces inside the viewer assembly must be accessed by first removing, then disassembling the viewer.
   B. The window surfaces inside the viewer can become stained with nicotine and may require periodic cleaning.
2. Clean Nose Gear Downlock Viewer Assembly and Windows
   A. Remove and disassemble viewer per 56-41-31 R/I, steps 3 and 4.
   B. Clean viewer assembly and windows and reassemble per 56-41-31 R/I, step 5.
   C. Install viewer and restore airplane to normal per 56-41-31 R/I, steps 6 and 7.
   D. Check operation of viewer (Ref 56-41-31 I/C).

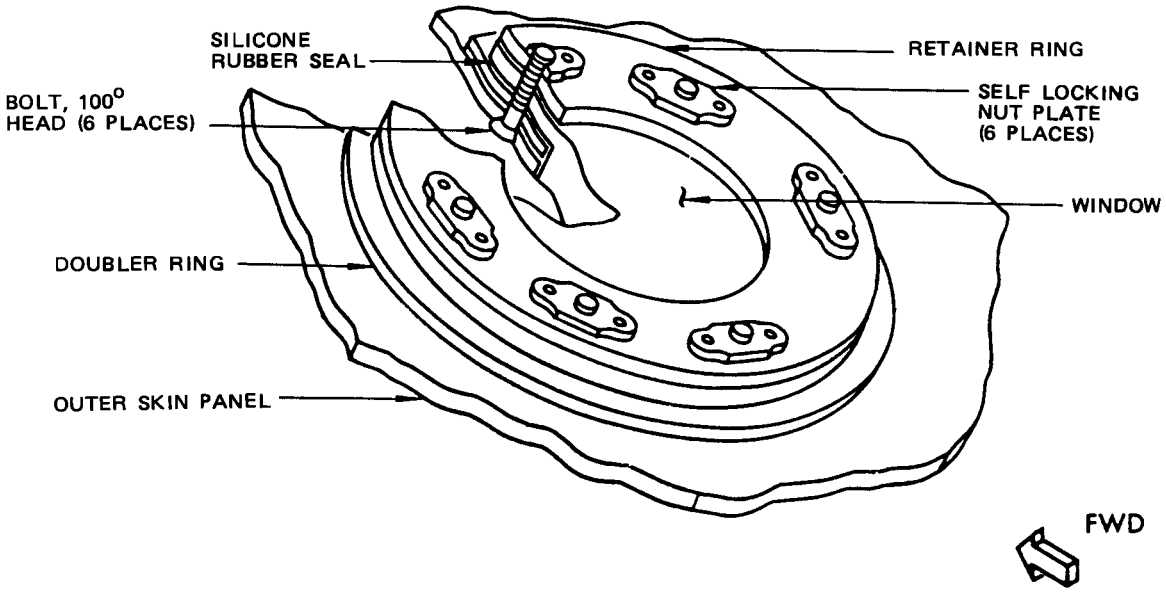
APU FIRE EXTINGUISHER BOTTLE WINDOW - REMOVAL/INSTALLATION

1. General
   A. The window pane in the APU fire extinguisher bottle window consists of a single sheet of formed, round, acrylic plastic. It is mounted on an aluminum doubler ring which is attached and sealed to the outer skin panel. The window is installed in an unpressurized compartment of the fuselage. Access to the window is gained through the section 48 access and blowout door.
2. Equipment and Materials
   A. Cellulose Acetate Sheeting
   B. Masking Tape
   C. Boiled Cheesecloth or equivalent
   D. Castile Soap
   E. Chamois
3. Remove APU Fire Extinguisher Bottle Window (See figure 401.)
   A. Apply protective covers of cellulose acetate to accessible surfaces of the window pane if it is to be removed and later reinstalled. Secure covers with masking tape.
   B. Remove the six mounting bolts attaching the window assembly to fuselage structure.
   C. Remove window assembly.
   D. Remove retainer ring and silicone rubber seal from window pane.
   E. Apply a protective cover to uncovered surfaces of window pane if it will later be reinstalled.
4. Install APU Fire Extinguisher Bottle Window (See figure 401.)
   A. Remove protective covering from the surfaces of the window pane.
   B. Clean the window pane with lukewarm water and castile soap. Use a soft, clean, cloth to transfer the soap solution to the pane surface, but go over the surface with the hand only, so that any dirt can be quickly detected and removed before it scratches the surface.
   C. Wipe dry with a clean damp chamois.

      CAUTION: DO NOT RUB SURFACES WITH A DRY CLOTH. IT CAUSES SCRATCHES AND BUILDS UP AN ELECTROSTATIC CHARGE WHICH ATTRACTS DUST PARTICLES.

   D. Position silicone rubber seal and retainer ring on window pane.
   E. Install window pane with the rubber seal and retainer ring on the doubler ring.
   F. Install the six mounting bolts that secure the window assembly to fuselage structure.
   G. From the exterior of the airplane, visually check that the view through the window of the APU fire extinguisher system pressure gauges is unobstructed.





APU Fire Extinguisher Bottle Window Installation
Figure 401