

CHAPTER

56

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CHAPTER 56

WINDOWS

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CONTROL CABIN WINDOWS - DESCRIPTION AND OPERATION

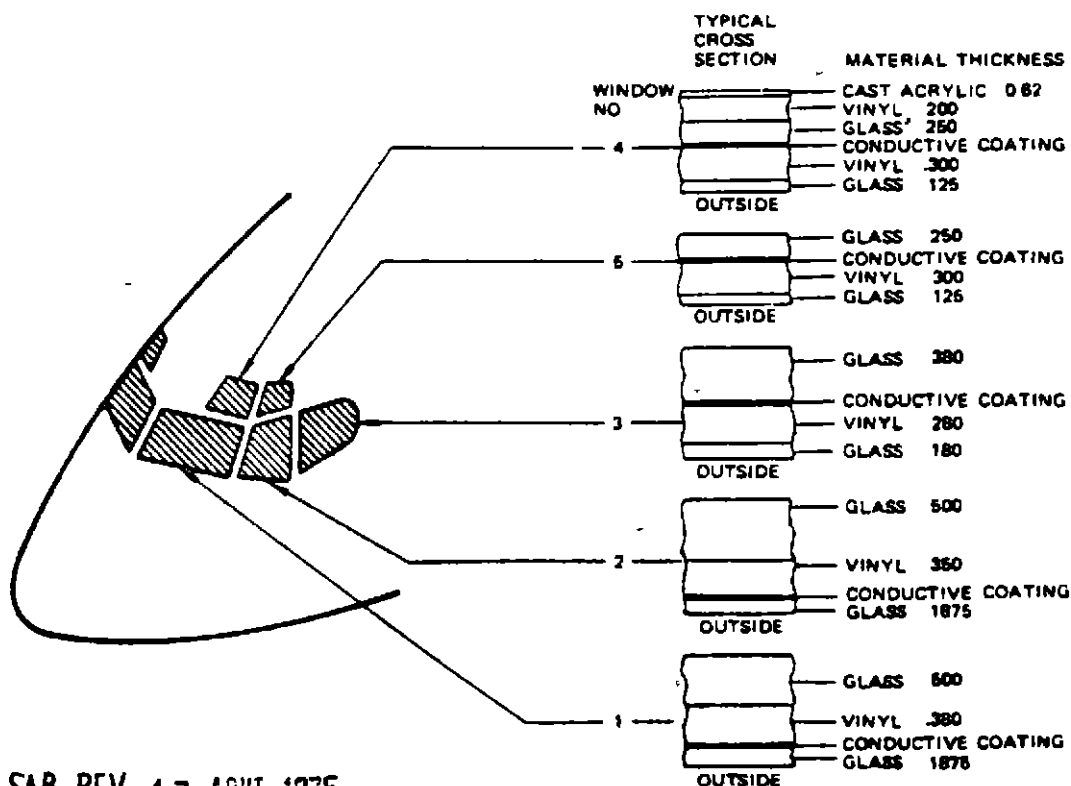
1. General

- A. There are 10 windows symmetrically located around the flight compartment. Windows No 1, 3, 4 and 5 are stationary. Window No 2 is a sliding window, mounted on tracks, to permit ventilation and communication on the ground (Fig. 1).

2. Fixed Windows

A. Window No. 1 (Forward Windshield)

- (1) The construction of window No. 1 consists of a glass pane laminated to each side of a polyvinyl butyral (vinyl) interlayer or core (Fig 1). The inner glass pane is the thicker of the two and is the primary load carrying member. The vinyl interlayer, or core, acts as the "fail-safe" load carrying member and prevents the window from shattering if the inner pane should break. The outer pane has no structural significance, but provides rigidity and a hard, scratch resistant surface. A thin strip of parting medium is laminated around the window edges between the vinyl interlayer and the inner glass pane. This is to prevent edge chipping of the glass under conditions of differential expansion and contraction.



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Control Cabin Window Details
Figure 1

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- (2) A conductive film, applied on the inner face of the outer glass pane is provided to permit electrical heating for anti-icing and defogging. An improved windshield with Z-channel seal has an additional forward and aft edge heater embedded in the vinyl core near the inner pane surface. Bus bars molded into the upper and lower edges of the windows in contact with the conductive film are connected to electrical terminals. For further information concerning window anti-icing and defogging refer to Chapter 30, Control Cabin Window Anti-Icing System.

B. Window No. 3 (Crew Side Window)

- (1) The construction of window No. 3 consists of a glass pane laminated to each side of a polyvinyl butyral (vinyl) interlayer or core (Fig. 1). A thin strip of parting medium is laminated around the window edges between the vinyl interlayer and the inner glass pane. This is to prevent edge chipping of the glass under conditions of differential expansion and contraction. The outer glass pane has no structural significance, but provides rigidity and a hard, scratch resistant surface.
- (2) A conductive film, laminated to the inner face of the vinyl interlayer, is provided to permit electrical heating for anti-icing and defogging. Bus bars molded into the upper and lower edges of the windows in contact with the conductive film are connected to electrical terminals. For further information concerning window anti-icing and defogging refer to, Control Cabin Window Anti-Icing System, Chapter 30.

C. Window No. 4 (Eyebrow Window)

- (1) The construction of window No. 4 consists of an outer glass pane and a inner glass pane that is laminated to each side of a polyvinyl butyral (vinyl) interlayer, or core with an additional vinyl layer laminated to the inboard surface of the inner pane and an acrylic sheet laminated to the additional vinyl layer (Fig. 1). These additional layers prevent glass from scattering throughout the cabin in the event of bird impact. The additional layers are of no structural importance. A thin parting medium is laminated around the window edges between the vinyl interlayer and the inner glass pane. This is to prevent edge chipping of the glass under conditions of differential expansion and contraction.
- (2) A conductive film, laminated to the inner face of the vinyl interlayer, is provided to permit electrical heating for anti-icing and defogging. Bus bars molded into the upper and lower edges of the windows in contact with the conductive film are connected to electrical terminals. For further information concerning window anti-icing and defogging refer to Chapter 30, Control Cabin Window Anti-Icing System.

D. Window No. 5 (Eyebrow Window)

- (1) The construction of window No. 5 is principal, the same as window No. 3 with the following exceptions. Window No. 5 is smaller in size, has a different shape and the individual laminations are generally thinner.

E. Fixed Window Seals and Sealants

- (1) The function of the fixed window pressure seal is to keep cabin pressure in and moisture out. Equally important are the functions of vibration and stress absorber and space to compensate for material differential expansion.
- (2) The fixed control cabin windows number 1 and 3 are sealed on installation by a beaded silicone rubber molded-in-place pressure seal which is molded to the window mounting surface. Window number 1 has a molded silicone rubber bumper strip, integral with the pressure seal, around the periphery of the outer glass pane.
- (3) An improved method of installing and sealing No. 1 windows and replacement No. 1 windows, utilizes a pressure seal bonded to the edge of the window mounting surface. The bonded seal consists of a stainless steel Z-channel strip sandwiched between a silicone rubber cushion and a beaded pressure seal (Fig. 201).
- (4) Fixed control cabin windows number 4 and 5 are pressure sealed on installation by means of sealant between the surface of each window and its frame, except on the windows installed as described in par. 2.E.(5). The sealant is applied to the windowpane edge. Fairing compound is applied to the window frame structure to accommodate the small irregularities in the frame surface and to ensure that a perfectly flat surface is presented to the windowpane. A parting strip or rubber gasket is installed between the window frame fairing compound and the windowpane sealant to allow windowpane removal without disturbing the faying surfaces.
- (5) An improved method of installing and sealing windows number 4 and 5, and replacement number 4 and 5 windows, utilizes a beaded silicone rubber molded-in-place pressure seal which is molded to the window mounting surface. The windows are installed with bolts, bolt spacers, O-rings, flat washers, and self-locking hex head nuts. The improved method of installing and sealing the windows facilitates removal and installation procedure and eliminates the use of the sealant and parting strip or rubber gasket described in par. 2.E.(4).
- (6) An aerodynamic smoother is installed on each of the fixed windows, in the gap between the window frame and the edge of the outer pane or bumper strip. The smoother provides aerodynamic flushness and protection against water entrapment. A nylon cord is installed under the aerodynamic smoother to facilitate its removal when required.



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3. Pilots' Sliding Windows

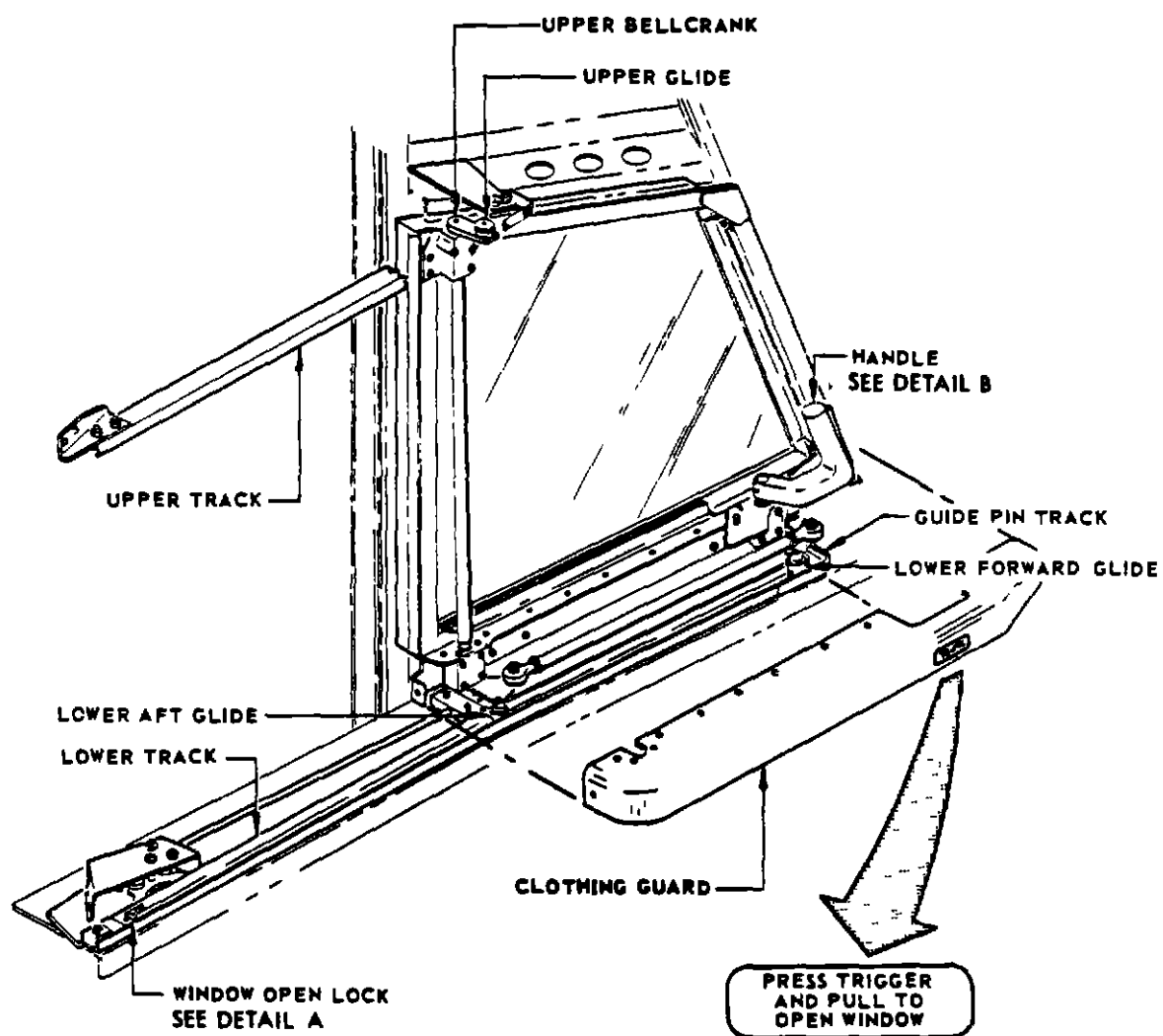
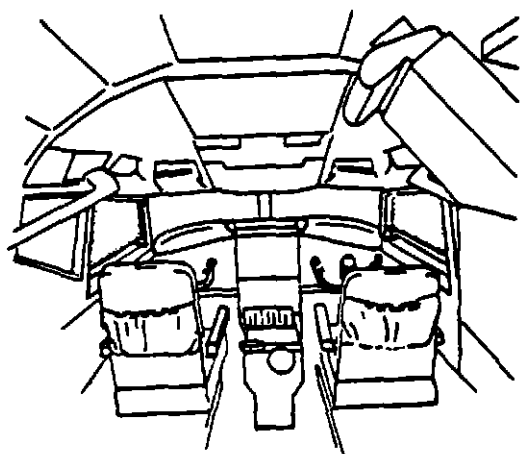
- A The pilots' number 2 windows (figure 3) are mounted on tracks so that they may be rolled back to permit ventilation and communication in ground handling cases. The laminated window pane, inner and outer glass separated by a vinyl core, has the conductive film between the outer pane and the core where it is most effective for anti-icing. The temperature sensing device is not used in the sliding windows since the heat supply for these windows is controlled from the temperature sensing device in opposite number 1 window. The window panes are pressure sealed in frames which, in turn, have a rubber bulb seal preventing cabin pressure leakage when the windows are closed and latched. Mounted on the window frame, at top and bottom, are glides which are guided along tracks attached to the airframe above and below the window. The window handle can be latched with the window closed or in the sliding condition. In the latter case, latching the handle prevents the window from swinging inboard and outboard as it slides along the tracks. There is a separate latching mechanism at the aft end of the lower track for holding the window in its fully open position. A clothing guard covers the link mechanism along the lower edge of the window.
- B The window is unlocked from its locked open position by pulling forward on the latch mechanism rod located between the bottom track and the inner skin, midway along the track. This withdraws the window open latch plate and allows the window to be moved forward. As window moves forward, it resets the window open latch plate. The window can be drawn forward by its handle until it contacts the forward stops. By squeezing the trigger on the window handle the trigger bolt, which kept the window in the rolling position, is withdrawn from the lock plate. This permits the handle to be rotated in a forward and outboard manner. As the handle is so rotated the window is moved outboard, guided by a guide pin in a track, until the window is closed tightly against the window frame. Releasing the trigger, which is spring-loaded, forces the trigger bolt down into another hole in the locking plate thus latching the window in the closed position. To open the window, the trigger is squeezed and the handle rotated back and inboard. This rotates a bellcrank, which is linked to other bellcranks at rear top and bottom of window, drawing the window inboard. The guide pin for the inboard-outboard movement prevents any rearward movement of the window until sufficient clearance is obtained to allow free movement back to the latched open position. Having completed necessary inward travel the window may be moved to the rear until the lower rear glide travels past the window open latch plate which is spring loaded to lock the window in the open position.



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- C On cargo airplanes an external release mechanism at the right sliding window allows it to be operated from the outside as an emergency exit. An external hinged access door just below the right sliding window provides access to an external release handle. When the external release handle is pulled, it operates a bellcrank which is connected by a turnbuckle to a spring-loaded lower camshaft. A pin projecting from the upper end of the lower camshaft engages a lower cam on the upper camshaft. Rotation of the lower camshaft is transmitted to the upper camshaft which rotates, causing its upper cam to bear on an idler cam and depress a pin assembly in the sliding window handle. This causes the trigger to press against the bolt and disengage the lock plate. When the handle bolt has moved 0.18 inch, the moving lower cam on the upper camshaft contacts and rotates the lower forward bellcrank. This forces the rod assembly pivot "over center" in relation to the lower forward glide and operates the bellcranks at the rear top and bottom of the window, drawing the window inboard. The guide pin at the right handle, permits inboard movement until sufficient clearance is obtained to allow free backward movement of the sliding window. An operator outside the airplane can pull the external release handle, unlock the sliding window and slide the window aft to provide an emergency exit from the control cabin. Except for the external release mechanism, the right sliding window is similar in description and operation to the left sliding window.

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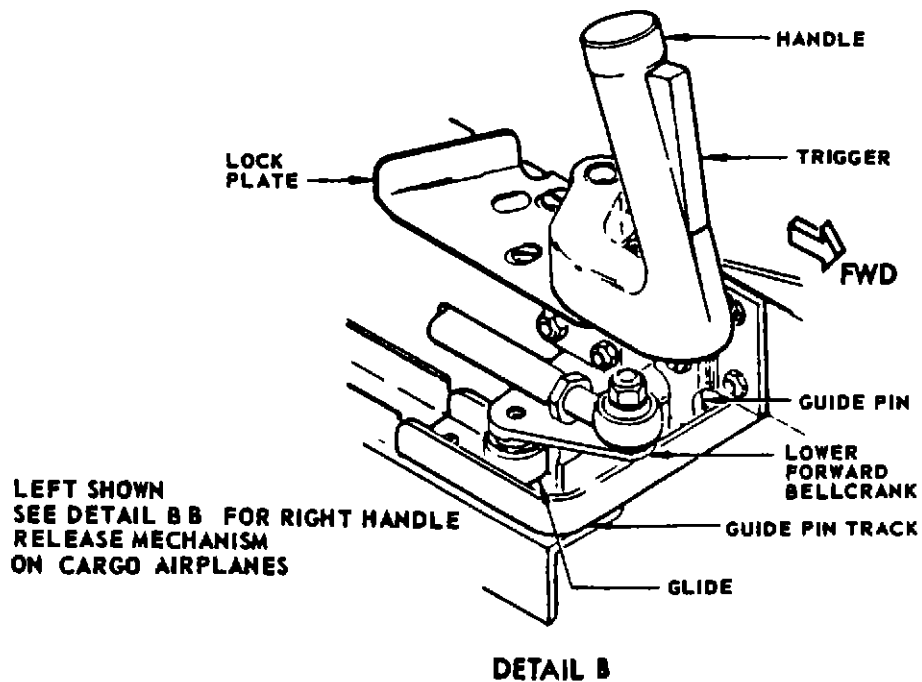
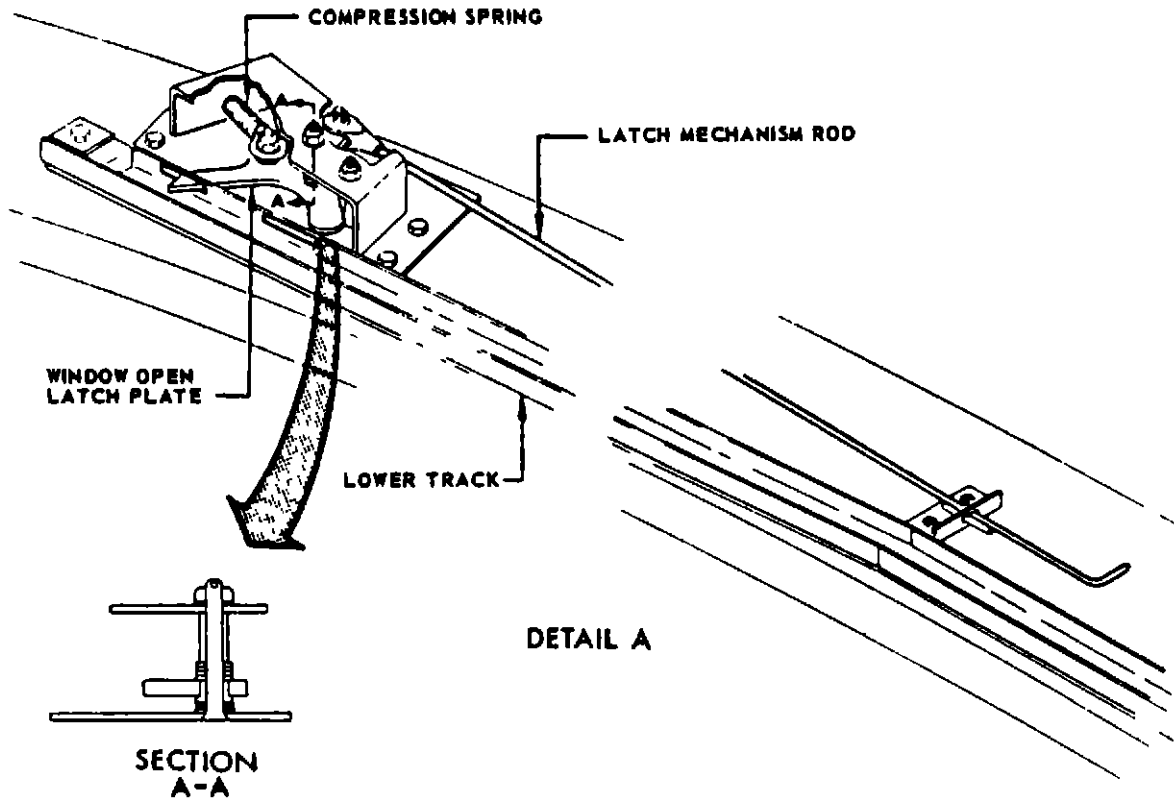


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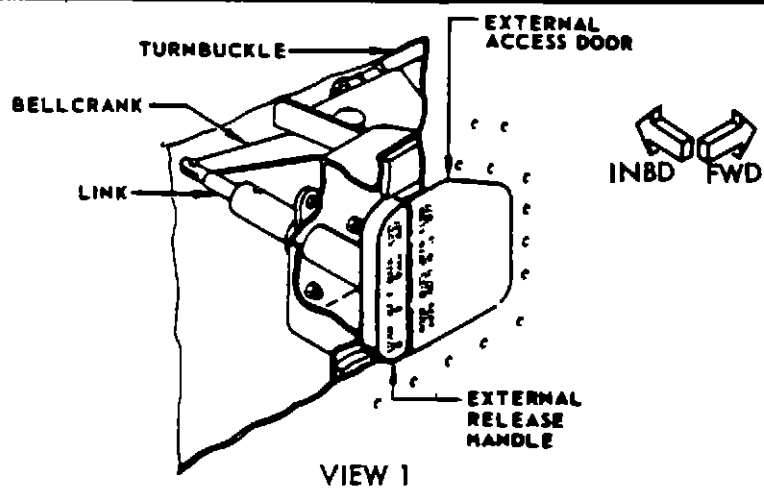
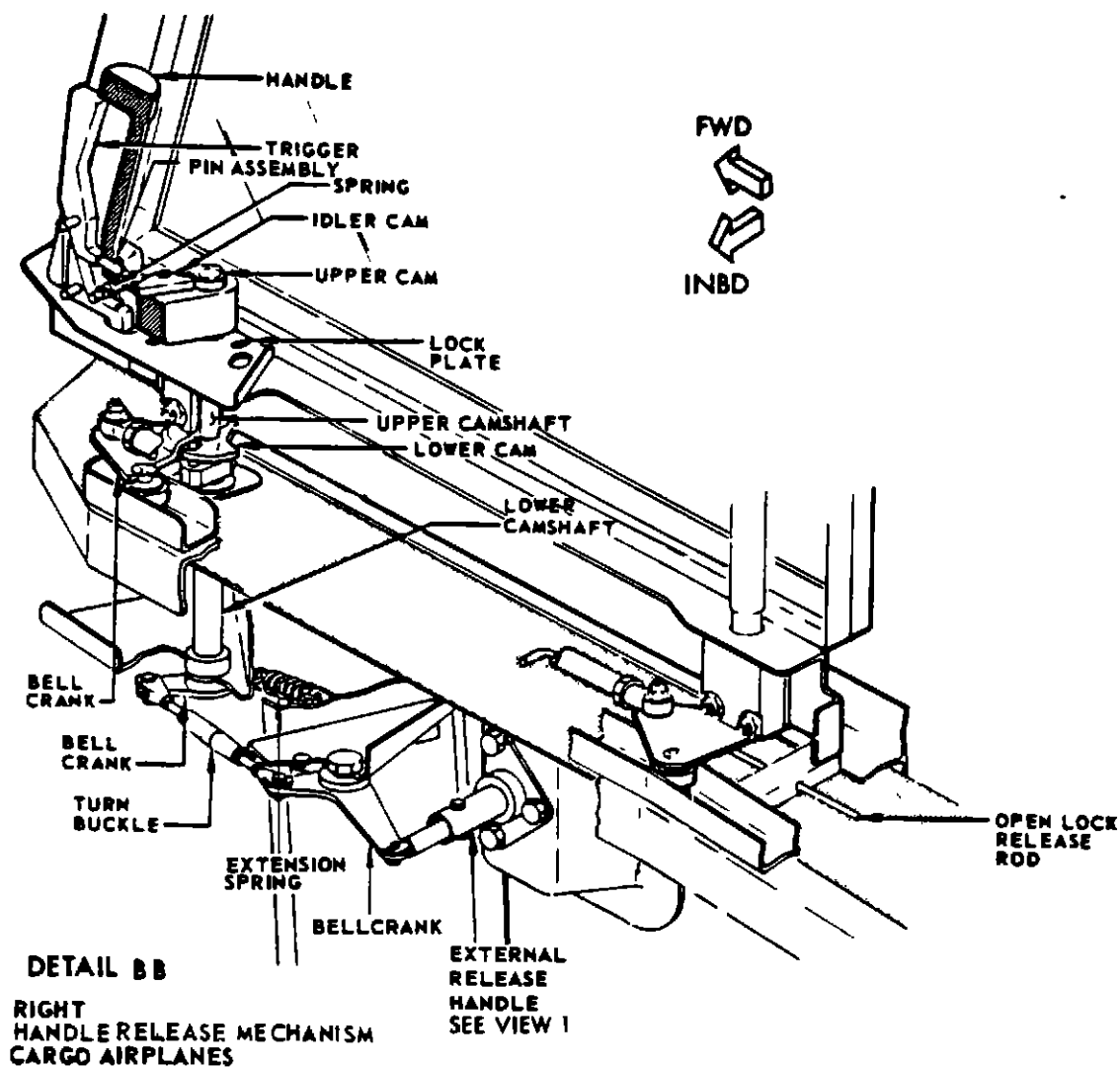
Pilots' Sliding Window
Figure 3 (Sheet 1 of 3)

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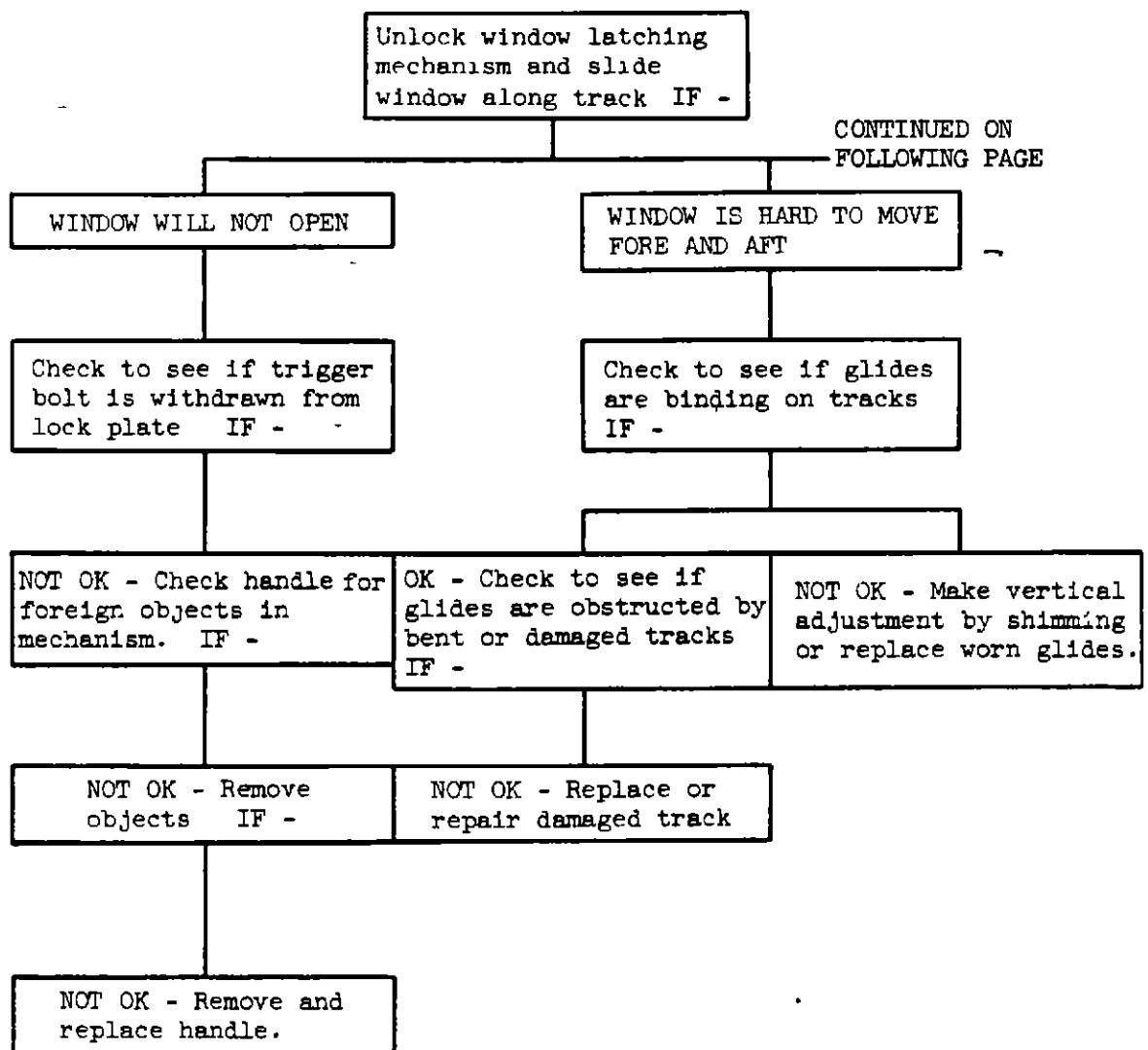


CONTROL CABIN WINDOWS - TROUBLE SHOOTING

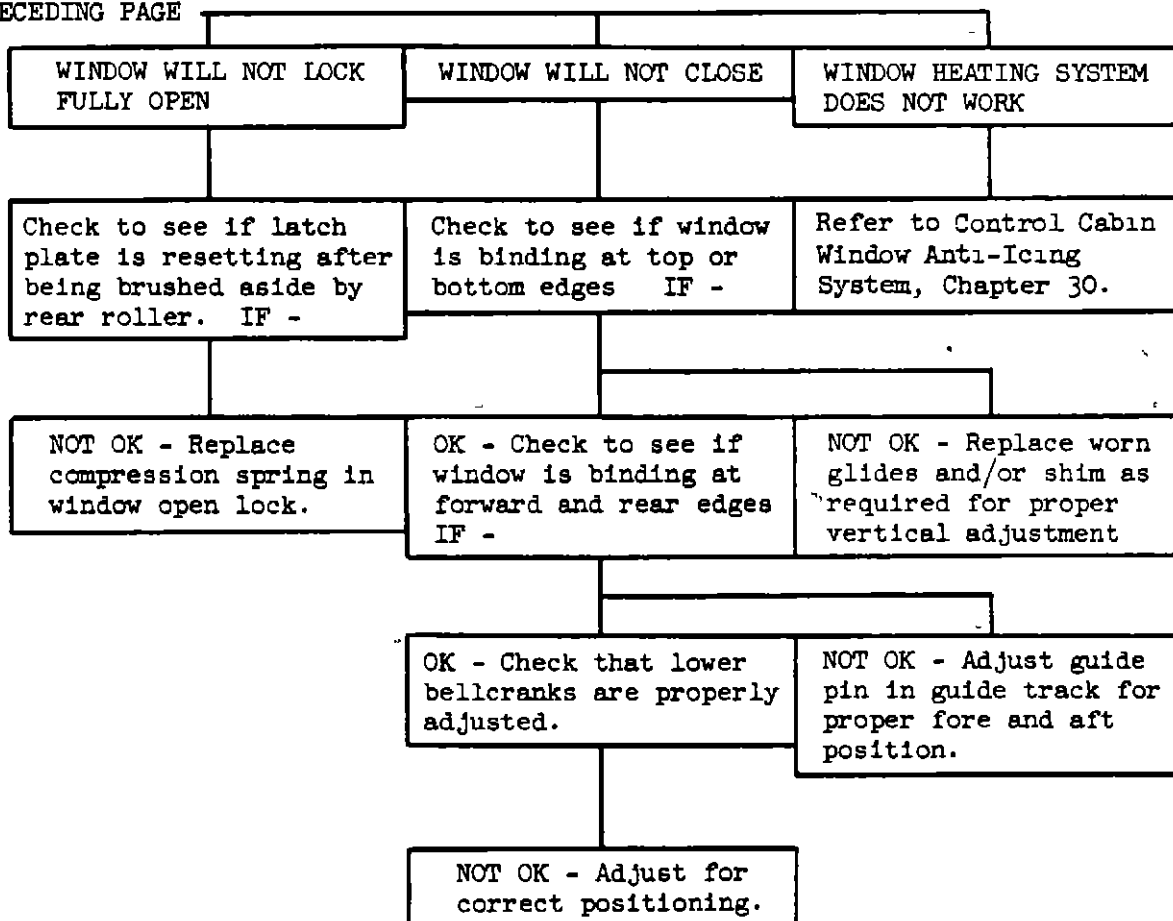
1 Fixed Windows Trouble Shooting

A Trouble shooting of the control cabin fixed windows will be confined to the window heating circuits Refer to Control Cabin Window Anti-Icing System, Chapter 30.

2 Sliding Window Trouble Shooting Chart



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 PRECEDING PAGE



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CONTROL CABIN WINDOWS - MAINTENANCE PRACTICES

1 Unit Servicing Control Cabin Windows

A General

- (1) The items requiring lubrications on are shown on figure 201
- (2) Rain repellent is applied to all control cabin windows except windshields which are equipped with a rain repellent system for in flight application of rain repellent solution. The only other servicing required is the reapplication of the rain repellent at intervals which may vary from 10 to 70 flight hours depending on the weather, windshield wiper use, ground handling and foreign objects encountered in flight. A procedure for application of the rain repellent is given in paragraph C. In the event that removal of the rain repellent is required, the method set out in paragraph D is recommended. This removal does not necessarily precede the reapplication. Normally reapplication is all that is necessary for servicing. Check whether reapplication of repellent is necessary by sprinkling water on the glass panel. The drops should form beads which run rapidly off the glass. If the water forms flat drops or wets the glass the repellent should be reapplied.

B. Equipment and Materials

- (1) Rain Repellent Kit (Formula 2911 C-1728.S) - Foster D. Snell Inc
New York, New York
- (2) Aluminum Polish MIL-P-6888A
- (3) Isopropyl Alcohol MIL-F-5566
- (4) Cheesecloth - must be lintless and positively free of oil.

C Application of Rain Repellent

- (1) Wash the window thoroughly with soap and water, using a clean cloth. Rinse with clean water and wipe dry.

NOTE In sub-freezing temperatures, if the windows cannot be prewarmed using the electrical heating circuits, commence with step (2).

For this and subsequent steps avoid touching the glass or turning the cloth over because the fingers usually have foreign materials adhering to them. Start at the center of the window and work out toward the edges. Do not return to the center with the cloth since the areas around the window edge are always dirty and will soil the cloth. Do not attempt to use a cloth for more than one step in any procedure.



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- (2) Clean the window with a clean cloth soaked with 901 cleaner (Snell Rain Repellent Kit), or isopropyl alcohol.

CAUTION: THESE CLEANERS ARE FLAMMABLE

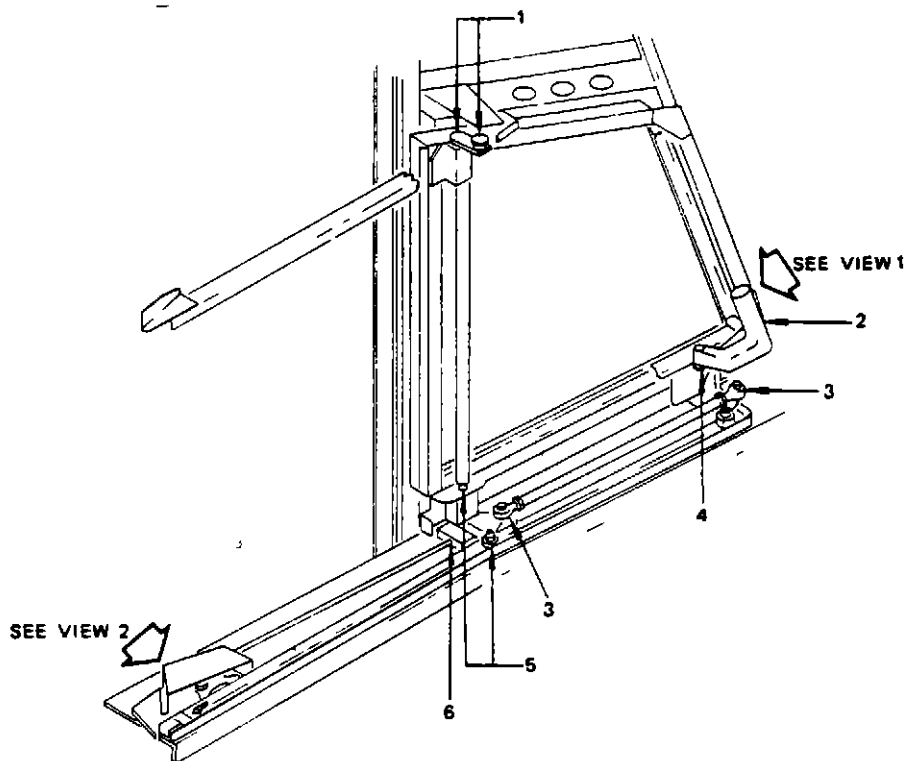
- (3) Polish with a clean, soft cloth when window is dry.
- (4) Squeeze approximately 1/4 inch of paste, from the 1730 bond paste tube, onto a clean, soft cloth and spread over the entire window surface.
- (5) Polish hard with a clean, soft cloth until all the black material is removed. For best results expose clean surfaces of the cloth frequently
- (6) Apply 1728.S wax repellent stick by rubbing over the entire window surface
- (7) Polish with a clean, soft cloth until the window is clear and free of streaks.
- (8) Check the repellency by sprinkling the window with water. The drops should form beads which run rapidly off the glass. If the water forms flat drops or wets the glass, the repellent should be reapplied.

D. Removal of Rain Repellent

- (1) Apply scouring powder (Bon Ami or equivalent) to a pad of clean, wet cloth and scrub the window for 2 or 3 minutes.

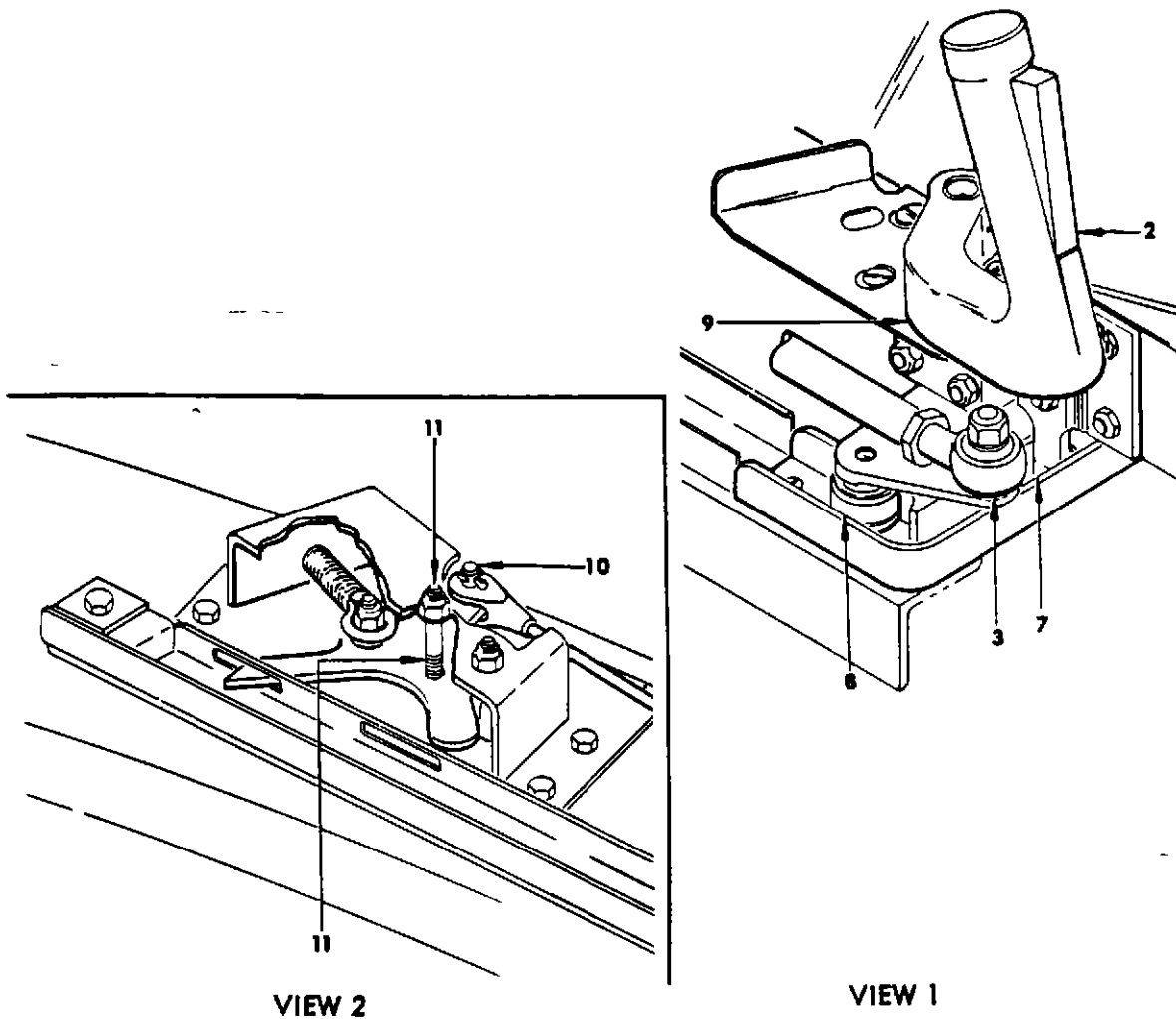
NOTE: Repellent can also be removed using aluminum polish MIL-P-6888A in place of scouring powder.

- (2) Rinse the window surface free of all cleaner by flooding with clean water while scrubbing with a clean pad of cloth. Make a final rinse by flooding with clean water.
- (3) Check that when the window is flooded for rinsing it wets uniformly and several seconds elapse before the water begins to leave the surface. If the window is not uniformly wetted it is not clean enough and all steps must be repeated.
- (4) Dry the window with a clean cloth when step (3) is satisfied.



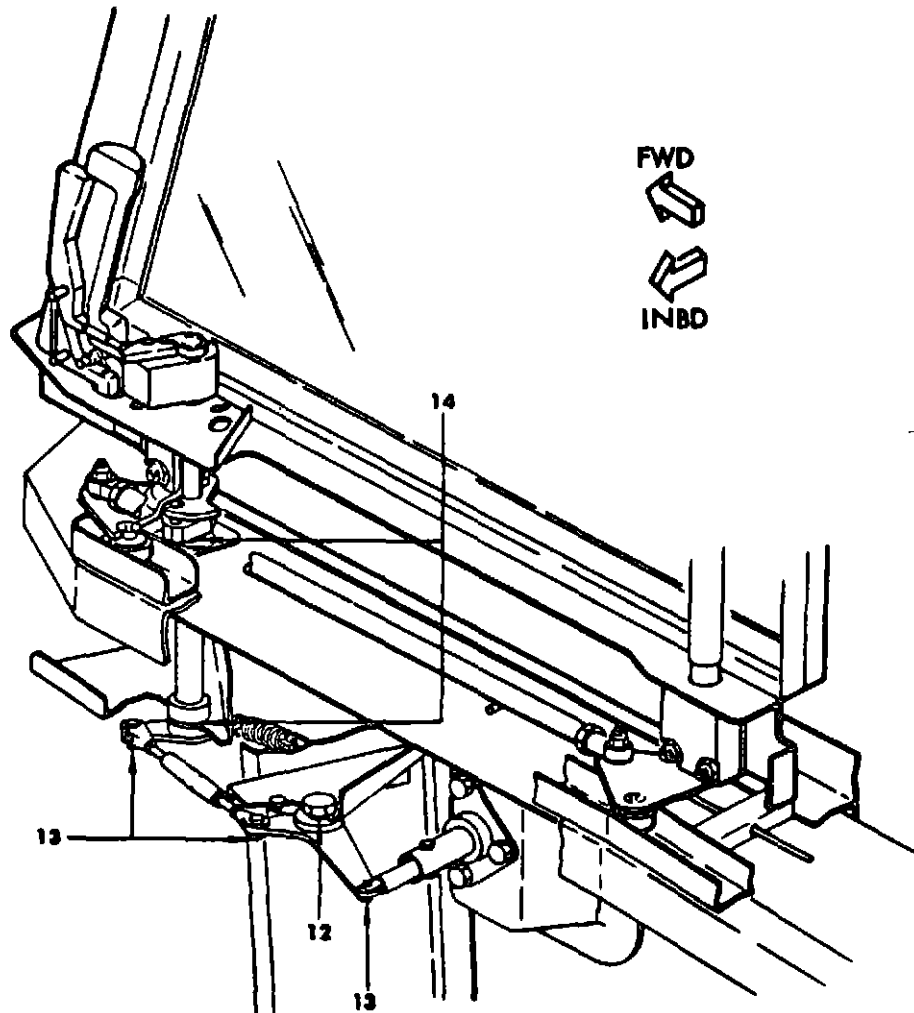
INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1.	UPPER BELLCRANK	Apply light oil, MIL-L-7870
2.	TRIGGER	Apply light oil, MIL-L-7870
3.	ROD END BEARING	Apply grease, MIL-G-23827 (2 places)
4.	HANDLE SHAFT	Apply light oil, MIL-L-7870
5.	LOWER AFT BELLCRANK	Apply light oil, MIL-L-7870
6.	LATCH MECHANISM ROD GUIDE	Apply light oil, MIL-L-7870

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INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
7	GUIDE PIN AND TRACK	Apply light oil, MIL-L-7870
8.	LOWER FORWARD GLIDE	Apply light oil, MIL-L-7870
9.	TRIGGER BOLT	Apply light oil, MIL-L-7870
10.	LATCH MECHANISM ROD END	Apply light oil, MIL-L-7870
11.	LATCH PLATE PIVOT	Apply light oil, MIL-L-7870

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INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
12	BUSHINGS	Apply light oil, MIL-L-7870
13	PIVOT PINS	Apply light oil, MIL-L-7870 (3 places)
14	BEARINGS	Apply light oil, MIL-L-7870 (2 places)

EFFECTIVITY

CARGO AIRPLANES



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2. Inspection/Check Control Cabin Windows

A. General

- (1) 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 which is sandwiched between the inner glass pane and the vinyl core around the periphery of each window.

NOTE Delaminations of a windshield do not affect the structural integrity of the window assembly.

- (2) Chips are flakes or layers of glass broken from the surface. (See figure 202.) 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. Conchoidal 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" shape which appears to propagate toward the interior of the glass. These chips occur only rarely in tempered glass.
- (3) Small bubbles within the vinyl core 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. 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. See Chapter 30 "Control Cabin Window Anti-Icing."
- (4) 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 in paragraph C. A V-shaped chip is likely to propagate and is definite cause for window replacement.



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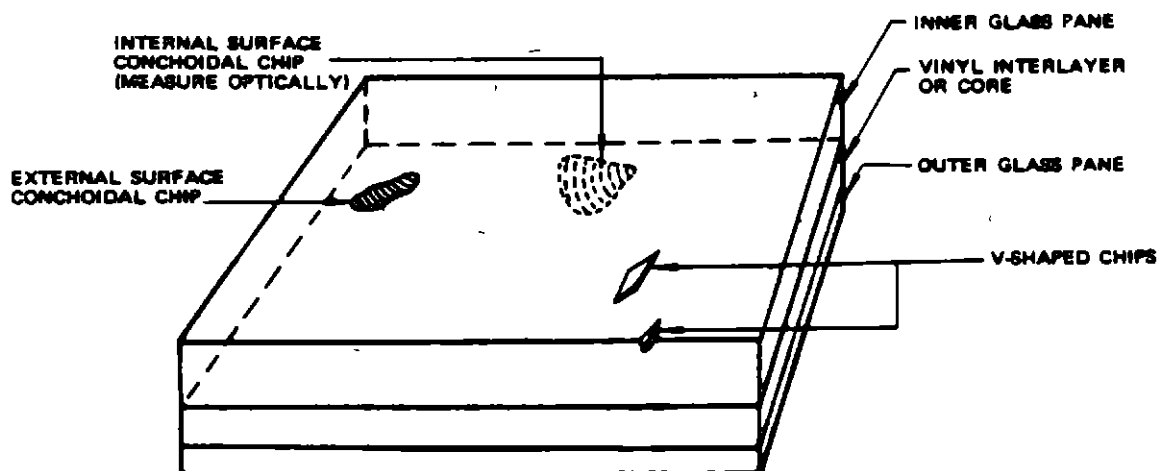
- (5) Glass windows are structurally unpredictable by nature. One that appears in good condition may fail unexpectedly, while one that has scratches, chips or delaminations may endure for a long time before failure. This unpredictability makes it almost impossible to establish infallible rules for window replacement, and each window should be considered individually. Operational experience, however, has justified the establishment of the criteria in paragraph C, and these may be used as a guide in determining the necessity for window replacement.

B. Examine for the following

- (1) Scratches, cracks, delamination or chipping as described in paragraph C, Window Replacement Criteria.
- (2) Binding of sliding windows, positive locking and releasing of locking mechanisms, deterioration of seals, wear of glides and bushings as described in paragraph E.
- (3) Deleted.
- (4) Loose or missing fasteners in window frames.

NOTE: To reduce the possibility of window breakage, torque loose or replacement bolts to torque values described in Fixed Windows - Maintenance Practices, 56-1-41.

- (5) Window heating system for correct functioning. See Control Cabin Window Anti-Icing, Chapter 30.



Control Cabin Window Inner Pane Chip Identification
Figure 202



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C. Window Replacement Criteria

NOTE: 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 the following paragraphs. Chipped corner areas of panes retained in service should be sealed to exclude moisture.

- (1) No. 1 and No. 2 windows. Replace any of these windows if any of the following is found.

(a) Outer Pane

- 1) Arcing, cracks or electrical discontinuity rendering window heating system inoperative.
- 2) Chips or delaminations causing noticeably uneven window heating.
- 3) Deleted.

(b) Inner Pane

- 1) Cracks of any kind.
- 2) Scratches deeper than 0.015-inch.
- 3) Conchoidal chips in either surface, deeper than 0.015-inch. (See figure 202.)
- 4) V-shaped chips of any kind.
- 5) Arcing, chips or electrical discontinuity rendering window heating system inoperable.

(c) Middle Vinyl Pane (No. 1 Window)

- 1) Cracks of any kind.

NOTE: Properly functioning heating is essential on these windows.

- (2) No. 3 windows. Replace either of these windows if the inner pane is found to have the same defects as those listed in paragraph (1)(b).

NOTE. If arcing is apparent, or if delaminations of the inner pane within the heated area cause noticeably uneven heating, the window may be left in provided that the electrical leads to the windows are disconnected.



- (3) No. 4 windows. Replace either of these windows if the inner pane has any of the following defects:

- (a) Cracks of any kind.
- (b) Conchoidal chips in either surface, deeper than 0.015-inch
- (c) V-shaped chips of any kind.
- (d) Arcing, chips, delaminations or electrical discontinuity rendering window heating system inoperable.

NOTE. Properly functioning heating is essential on these windows. When examining the inner glass pane, care should be taken to avoid confusion with the adjacent inner vinyl layer, the condition of which is not critical.

- (4) No. 5 windows. Replace either of these windows if the inner pane has any of the following defects:

- (a) Cracks of any kind.
- (b) Conchoidal chips in either surface, deeper than 0.015-inch
- (c) V-shaped chips of any kind.
- (d) Delaminations which cause noticeably uneven heating.

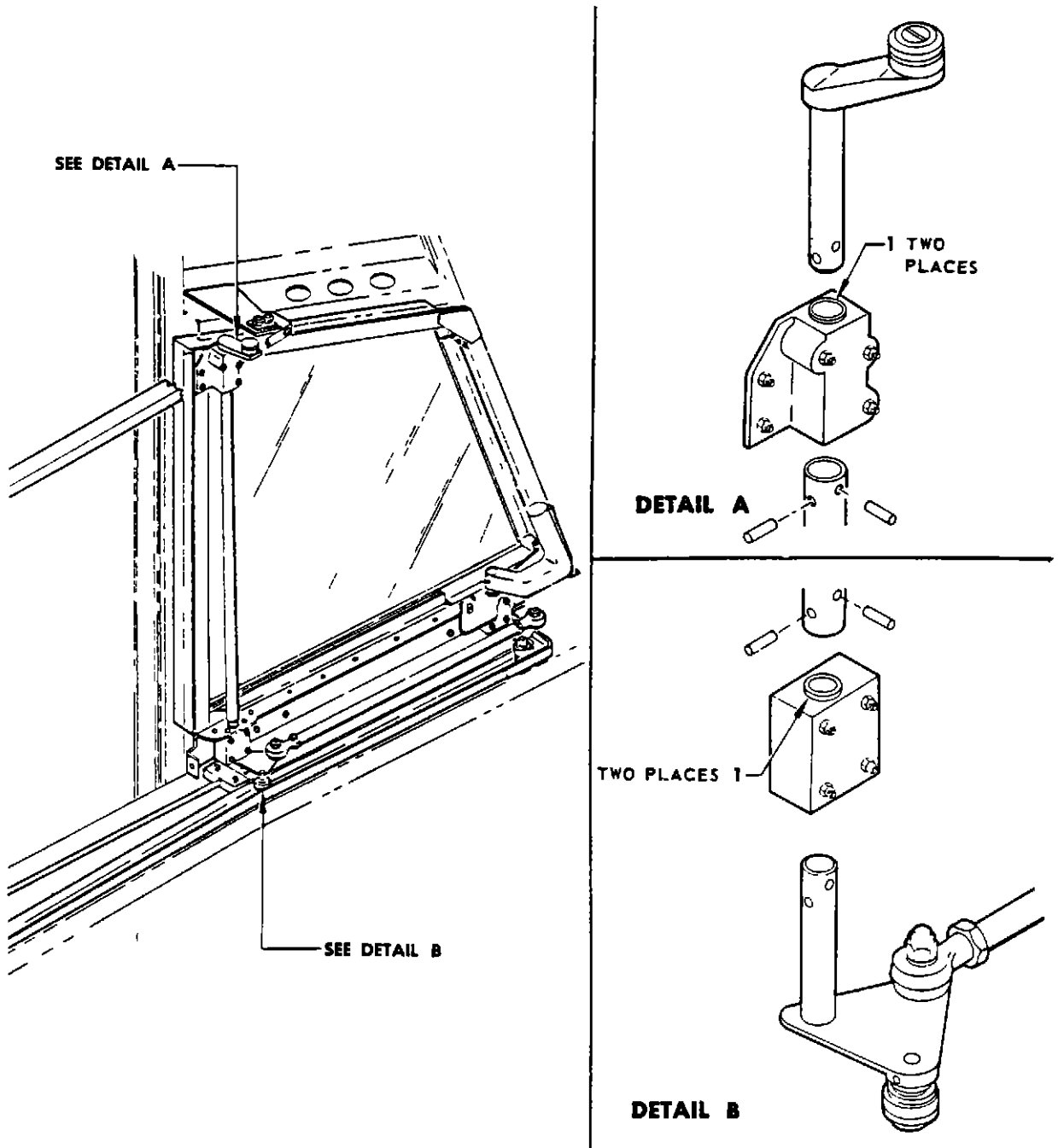
NOTE: Properly functioning heating is necessary on these windows because they are wired in series with the adjacent No. 4 windows.

D. Deleted.

E. Allowable Wear and Rework

- (1) Items requiring checking for wear are shown on figure 203.
- (2) Removal of window scratches of any length, on any control cabin window, is permitted provided that rework does not exceed a depth of 0.015-inch on an inner pane, or cause optical distortion.

CAUTION. DO NOT REWORK ANY PART OF ANY PANE THAT HAS BEEN SIMILARLY REWORKED ON A PREVIOUS OCCASION. SUCH PRACTICE WOULD CAUSE THE PANE THICKNESS TO BE REDUCED BELOW THE ALLOWABLE MINIMUM



		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 INTERFERENCE	
		MIN	MAX.			YES	NO	MTL		MIN.	MAX.
1.	1/D	500	.501	.531	.05			(Replace)			



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FIXED WINDOW - MAINTENANCE PRACTICES

1. General

- Various sealing methods are used to install the fixed cabin windows. Figure 201 shows a typical installation. The methods are described as windows installed with:

- sealant and parting strips (view 1)
- molded-in-place pressure seal (view 2)
- Z-channel pressure seal (view 3)

The layers of different materials which together comprise the seals are defined as follows:

- (1) 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.
- (2) Sealant is applied to the surface of the windowpane edge integral with the bumper strip, which is described in a following paragraph.
- (3) A parting strip or rubber gasket is installed on the mating surface between window glass and window frame. The parting strip or gasket provides a cushion and accommodates irregularities in the frame structure.
- (4) On later models and replacement windows, a molded-in-place silicone rubber pressure seal replaces the sealant and gasket method described in 1.A.(2) and 1.A.(3).

On No. 1 and No. 1 replacement windows, a Z-channel pressure seal replaces the molded-in-place silicone rubber pressure seal.
- (5) The bumper strip is a rubber cushion around the edge of the outer glass lamination at the interface surface between windowpane and frame. The strip provides for differential expansion while maintaining a seal against moisture penetration. On windows installed with molded-in-place pressure seal or Z-channel pressure seal the bumper strip is an integral part of the seal.
- (6) Aerodynamic smoother is installed in the gap between the window frame and the window outer pane or 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.

- E. replacement windows are supplied complete with the necessary parts for installation and usually with both sides of the pane covered with a protective plastic coating which should be removed after installation.

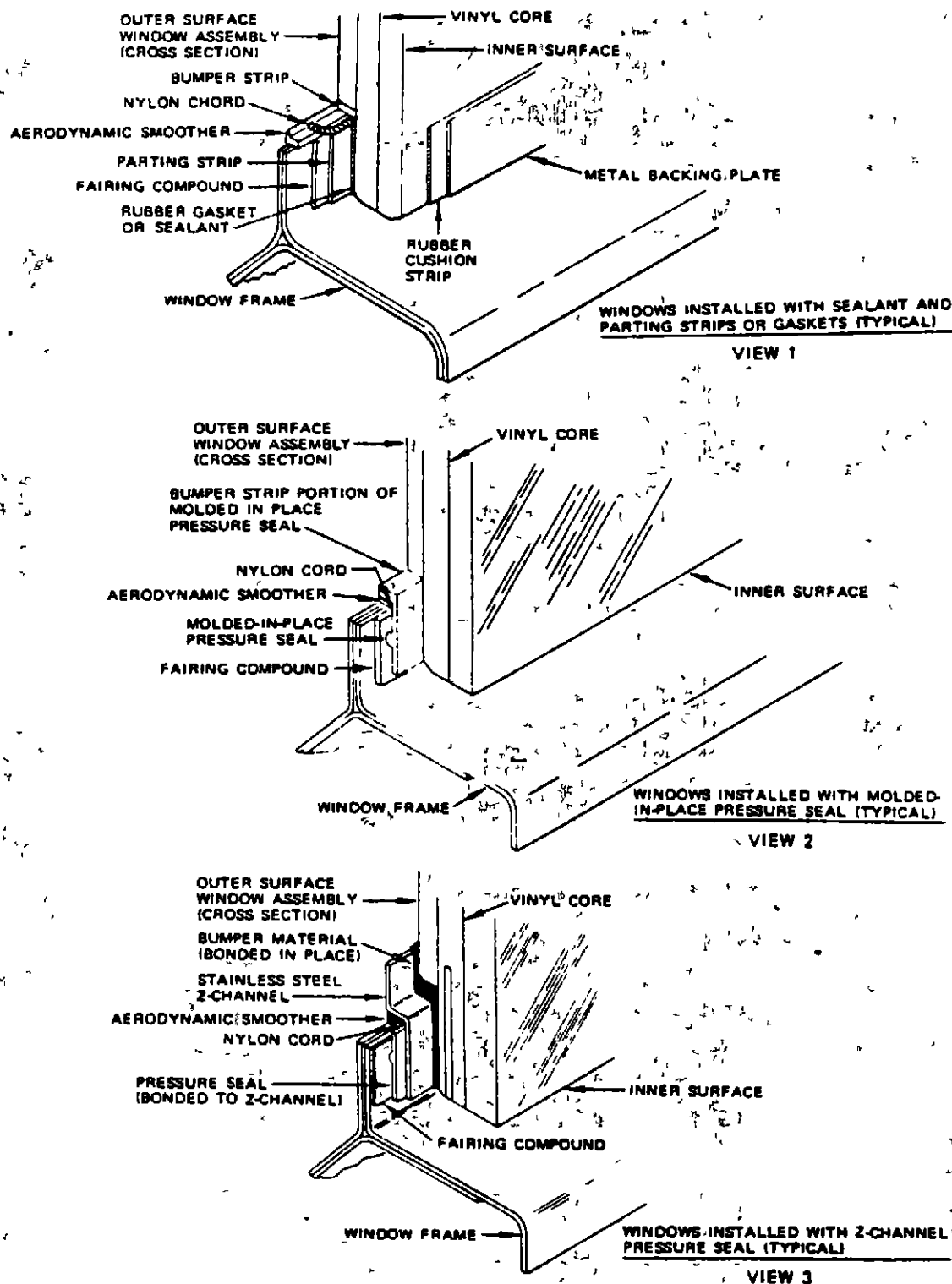
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Fixed Window Seal Details
Figure 201

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2. Removal/Installation Fixed Windows

A. Equipment and Materials

- (1) Protective covering for windows not already protected: Polyester Transparent Tape (No. 850, Minnesota Mining and Manufacturing Co.), or equivalent
- (2) Masking Tape No. 221, Minnesota Mining and Manufacturing Co.
- (3) Window frame fairing compound. Tereco 175, Technical Research Company, Seattle, Washington, or equivalent
- (4) Parting strip: Teflon Pressure Sensitive Tape (3.5 mils thick); Permacel 422, Permacel Tape Corporation, or Scotch Brand No. 549, Minnesota Mining and Manufacturing Company
- (5) Aliphatic Naphtha - TT-N-95, type 2
- (6) Sealant - BMS 5-79, class B
- (7) Corrosion Preventative Compound - MIL-C-11790, class 3
- (8) Nylon Cord - MIL-C-5040, type 1, or Nylon Thread, V-T-295a, type 1, class 2, No. 9
- (9) Aerodynamic Smoother - BMS 5-79, class B, Q-93007-2 Two-Part Aerosmoother, or Dow Corning 30-121, Dow Corning Corporation
- (10) Spatula or flow gun
- (11) Cheesecloth, lint and oil-free, or equivalent
- (12) Nonmetallic block to support bumper strip
- (13) Wire Mesh - Tubular, 20-21112 per AMS 4182, Technical Wire Products, Inc., 427 Olive Street, Santa Barbara, California 93101

B. Remove Fixed Windows

- (1) 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.

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- (2) Remove trim panels and crash padding where necessary. Refer to Control Cabin Equipment - General, Chapter 25.
- (3) Remove lightshield. Refer to Pilots' Station, Chapter 25.

NOTE Steps (3) and (4) are only necessary for removal of number 1 windows (main windshield).

- (4) Remove sunshade support rod above window, drain tube clamps and, if installed, pilots' gasper outlet at window post on aircraft centerline, and drain pan.

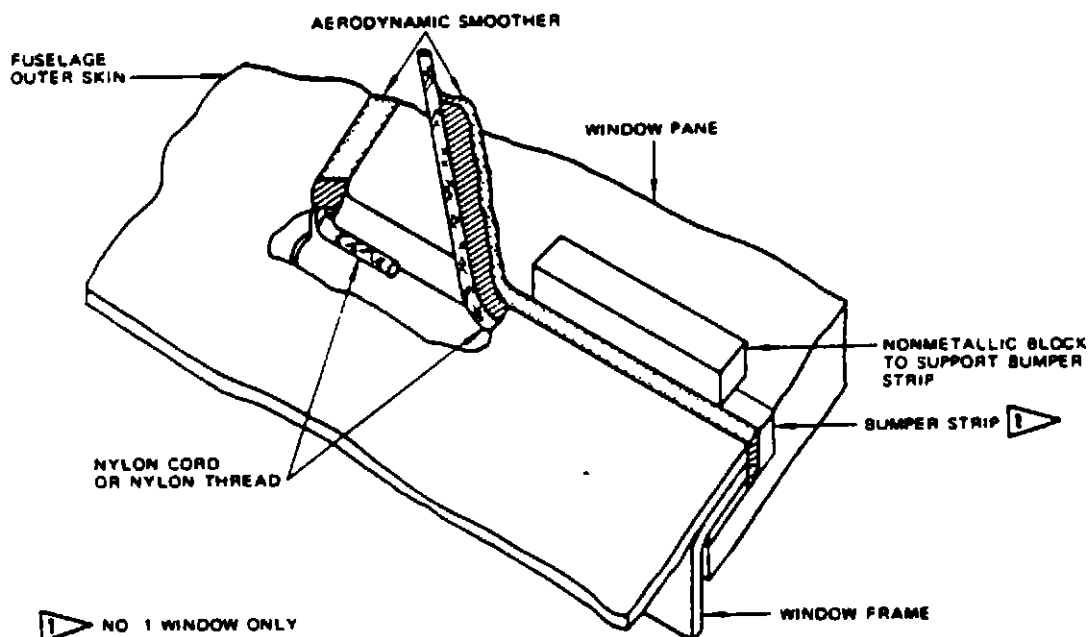
NOTE Drain tube must be pushed as far as possible to allow window removal.

- (5) Disconnect power leads at window bus bar terminals.
- (6) Remove thermal switch and bracket from window frame.

NOTE Only necessary for removal of windows number 3 and 5.

- (7) Strip aerodynamic smoother from gap around outside edge of window

NOTE. On most airplanes a nylon cord or nylon thread is provided to facilitate this step. The free end of the nylon cord or nylon thread is located in the upper aft corner of the window. Having uncovered the free end, pull steadily while supporting the edge of the adjacent bumper strip. (See figure 202.) On airplanes without the nylon cord or nylon thread the smoother must be dug out all around, care being taken not to damage the window sealant.



Removal of Window Gap Filler
Figure 202

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- (8) Remove window retaining bolts (Fig. 203).

NOTE: On number 4 windows, this step may be simplified in area of map light by snapping off map light housing and removing lamp. On number 1 windows, at the aft edge, a row of bolts attach a retaining angle to the frame. Access to these bolts is obtained by opening the sliding window (Fig. 204).

- (9) Remove backing plates and felt (or rubber) strips. On the No 1, 4 and 5 windows installed with a beaded silicone rubber molded-in-place pressure seal, and Z-channel seal remove flat washers and O-rings (on later model airplanes), and on No. 1 windows the seal washers and wire clamps.
- (10) 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. On windows installed with sealant, the sealant is removed with the window assembly. On windows installed with the silicone rubber molded-in-place pressure seal and Z-channel seal the seal and the bolt spacers are removed with the window assembly.

NOTE: Some spare windows have a beaded silicone rubber molded in place pressure seal, but do not have aluminum spacers or ethylene propylene O-rings (detail A).

- (11) Remove any remaining aerodynamic smoother from window frame.

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

C. Install Fixed Windows

- (1) 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.

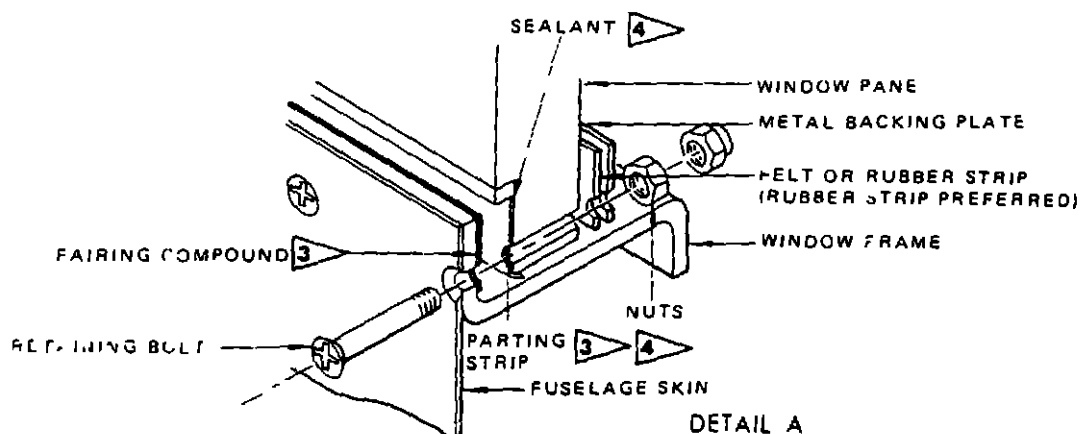
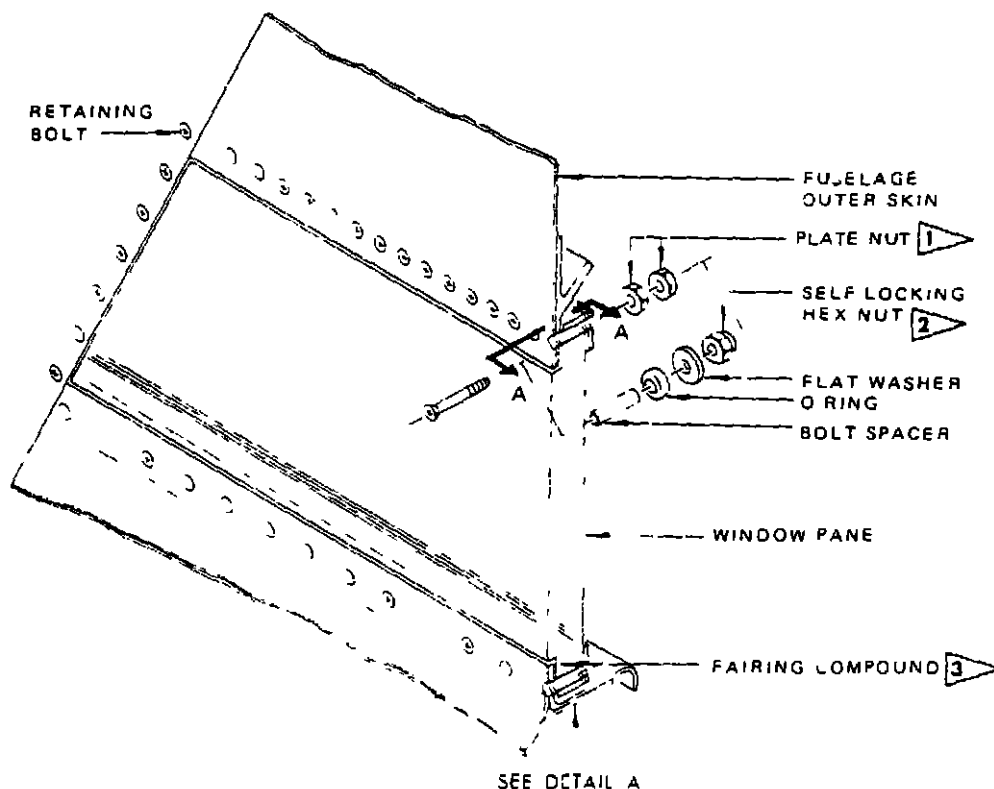
- (2) Examine window frames.

- (a) Examine No. 4 and 5 window frame and window assembly.

- 1) On windows installed with sealant and parting strip or gasket, examine window frame and the window assembly to determine if fairing compound requires repair or to replace rubber gasket or parting strip.

- a) If fairing compound is cracked, chipped, broken away, or damaged in any way, repair it as described in par. 3, Fixed Windows - Approved Repairs

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1 PLATE NUTS OR SELF-LOCKING NUTS ARE OPTIONAL. CHECK NUTS ON EACH RETAINING BOLT.

2 ON NO 1, 4 AND 5 WINDOWS INSTALLED WITH A BEADED SILICONE RUBBER MOLDED-IN PLACE PRESSURE SEAL AND SPACERS.

3 DELETED ON NO 3 WINDOWS INSTALLED WITH A RUBBER GASKET.

4 REPLACED BY MOLDED IN-PLACE SEAL ON REPLACEMENT WINDOWS.

DETAIL A
 (APPLICABLE FOR ALL WINDOWS EXCEPT NO 1, 4 AND 5 WINDOWS INSTALLED WITH BOLTS, BOLT SPACERS, O RINGS, FLAT WASHERS AND SELF LOCKING HEX NUTS.)

Fixed Window Installation
 Figure 203 (Sheet 1)

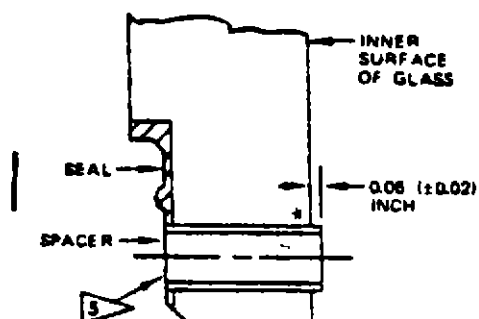
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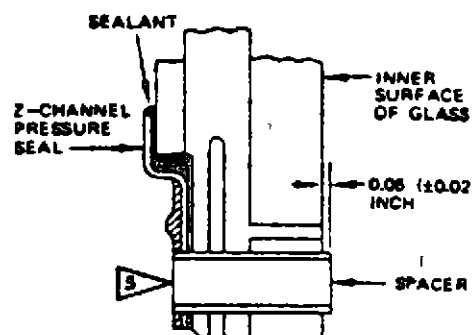
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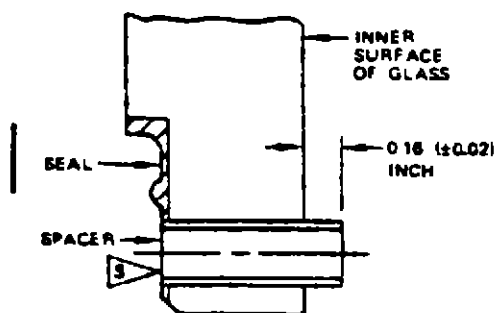
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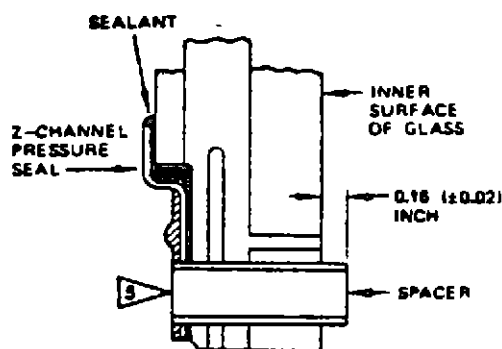
APPLICABLE TO SPACER
5-89354-44 AND -45



APPLICABLE TO SPACER
5-89354-3044 AND 3045



APPLICABLE TO SPACER
5-89354-40 AND 41



APPLICABLE TO SPACER
5-89354-3041 AND 3042

NOTE RETAINING BOLT AND WINDOW FRAME
REMOVED FOR CLARITY

SECTION A-A

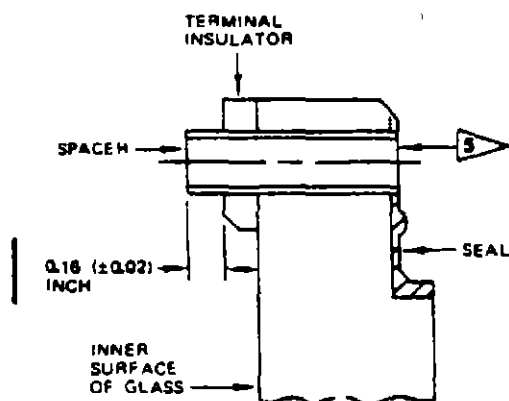
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Fixed Window Installation
Figure 203 (Sheet 2)

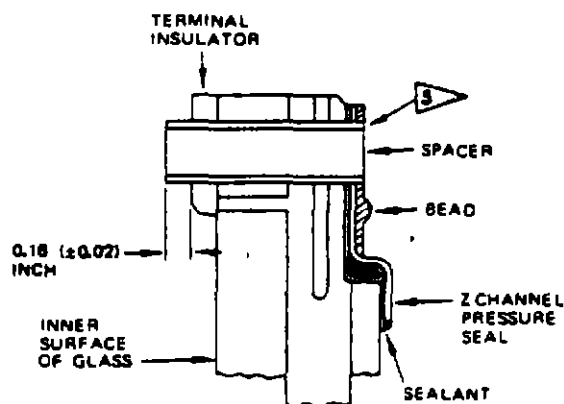
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APPLICABLE TO SPACER S-89354-43



APPLICABLE TO SPACER S-89354-3043

NOTE RETAINING BOLT AND WINDOW FRAME REMOVED FOR CLARITY

SECTION A A

S END OF SPACER SHALL BE FLUSH WITH SEAL SURFACE WHEN MEASURING PROJECTION OF OPPOSITE END.



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- b) Replace parting strip or rubber gasket if torn or damaged.
 - c) Examine sealant and fill in any voids with fresh sealant.
- 2) On windows installed with a beaded silicone rubber molded-in-place pressure seal, examine window frame to determine if fairing compound requires repair.

NOTE A bolt spacer will crush the fairing compound on structure locally around the end of the spacer. Compound should not be repaired on subsequent window installations.

- a) Except for the area that comes into contact with the end of the spacer, if the fairing compound is cracked, chipped, broken away, or damaged in any way, repair it as described in paragraph 3, Fixed Windows - Approved Repairs.

NOTE: Replacement windows are provided with the beaded silicone rubber molded-in-place pressure seal and on some airplanes, aluminum bolt spacers.

(c) Examine No. 3 window frame and window assembly

- 1) On windows installed with sealant and parting strip or gasket, examine fairing compound to determine if repair is required. If compound is cracked, chipped, broken away, or damaged in any way, repair it as described in paragraph 3, Fixed Windows - Approved Repairs
- 2) Replace parting strip or gasket if torn or damaged.
- 3) Examine sealant and fill in any voids with fresh sealant

NOTE On windows No. 3 installed with a rubber gasket, the gasket replaces the fairing compound. If the rubber gasket is to be used, all the fairing compound must be removed.

(c) Examine No. 1 window frame and window assembly.

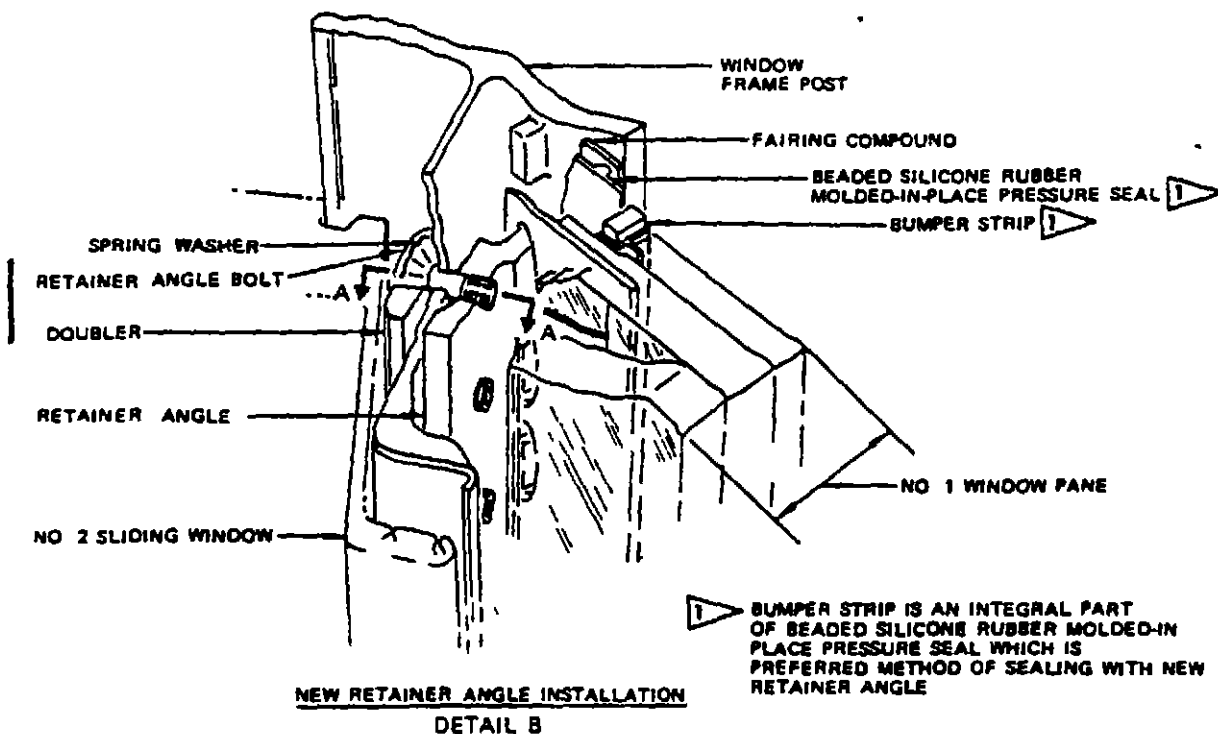
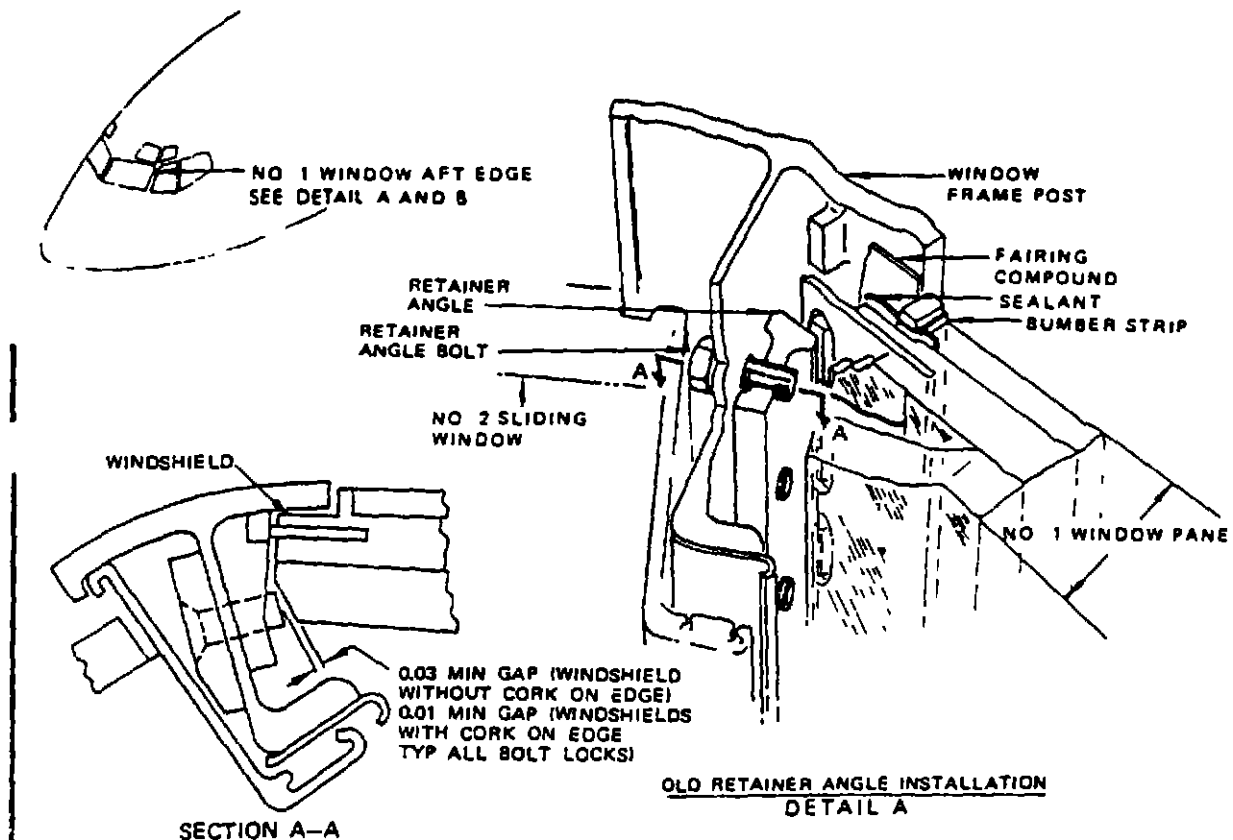
- 1) On windows No. 1 installed with sealant and parting strip, examine fairing compound to determine if repair is required. If compound is cracked, chipped, broken away, or damaged in any way, repair it as described in paragraph 3, Fixed Windows - Approved Repairs.

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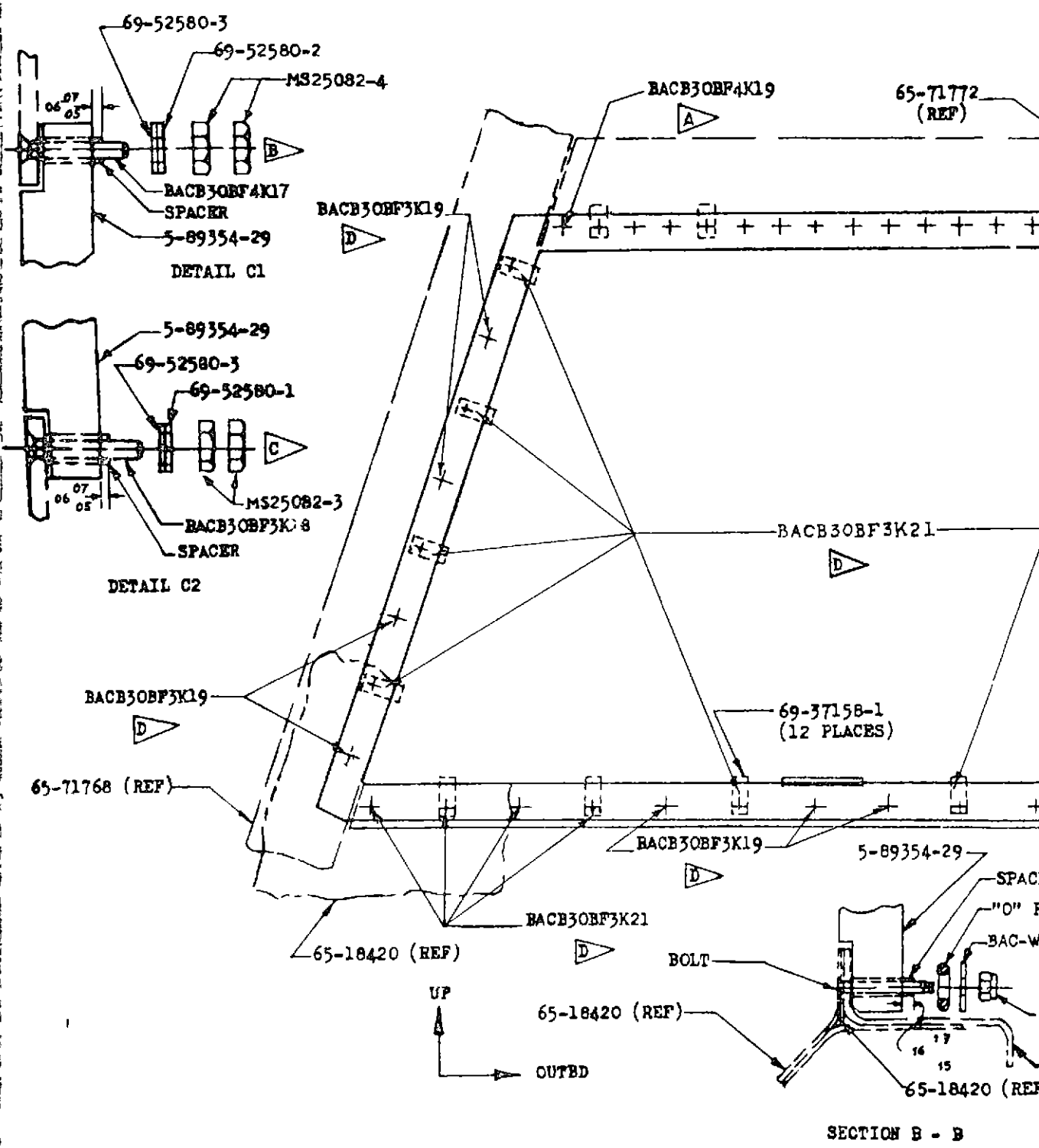
Number One Window Aft Edge Installation

Figure 204

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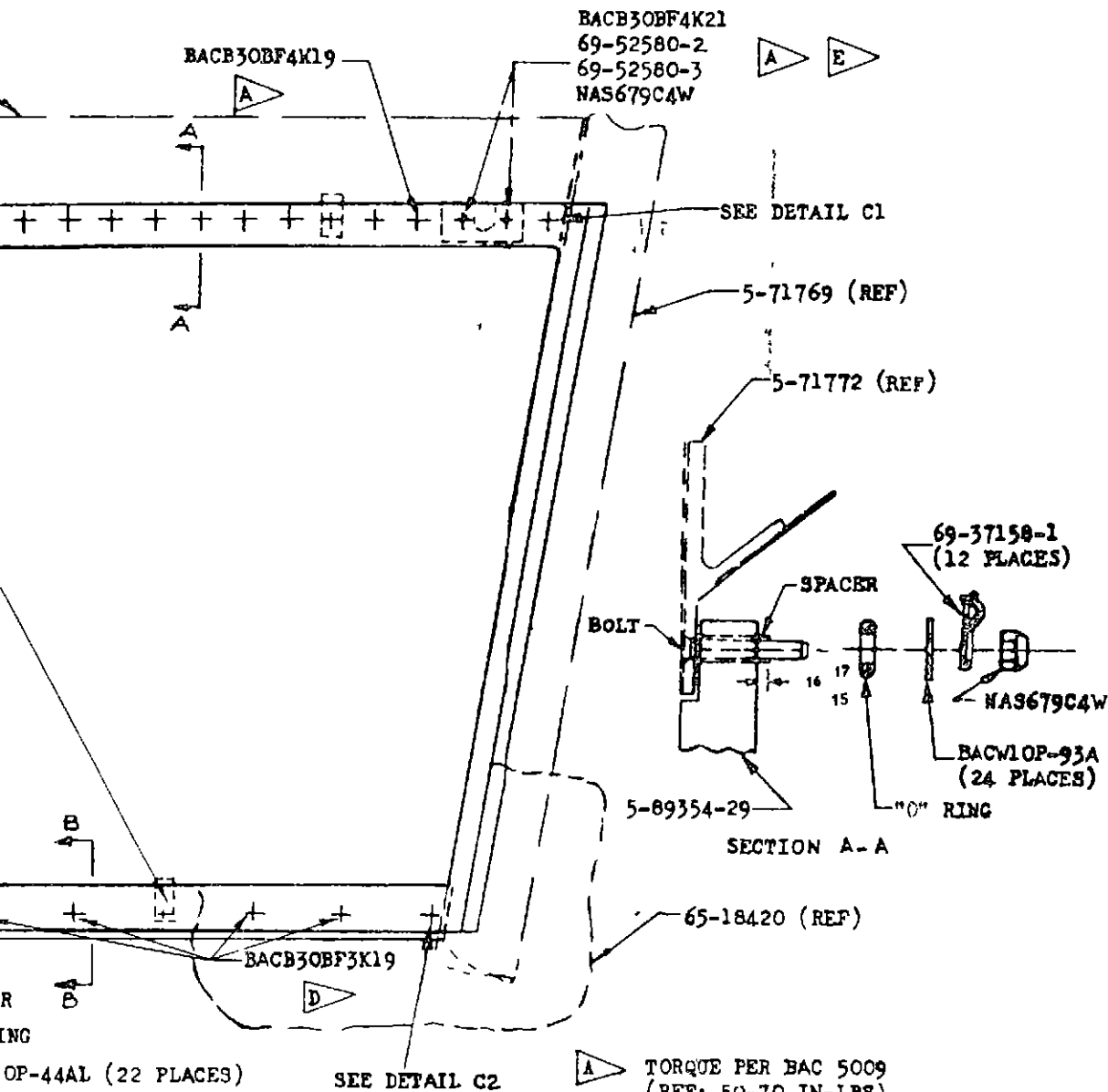


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WINDSHIELD INSTALLATION PANE No. 1
PILOT AND COPILOT
SH 1 OF 1

5-71761-35

ATTACHMENT TO LETTER
6-7132-3714



- A TORQUE PER BAC 5009
(REF: 50-70 IN-LBS)
- B TORQUE PER BAC 5009
(REF: 30-45 IN-LBS)
- C TORQUE PER BAC 5009
(REF: 20-25 IN-LBS)
- D TORQUE PER BAC 5009
(REF: 20-25 IN-LBS, 40 IN-LBS MAX.)
- E REFER TO SECTION C1
FOR SPACER PROTRUSION



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- a) Replace parting strip or gasket if torn or damaged.
 - b) Examine sealant and fill in any voids with fresh sealant.
- 2) On windows No. 1 installed with a beaded silicone rubber molded-in-place pressure seal and Z-channel seal, examine fairing compound to determine if repair is required. If compound is cracked, chipped, broken away, or damaged in any way, repair it as described in par. 3., Fixed Windows - Approved Repairs.

NOTE: Either the old or new retainer angle may be used.
See retainer angle chart.

RETAINER ANGLE CHART

RETAINER ANGLE PART NO.	WINDOW SEAL MATERIAL	DOUBLER PART NO.
(OLD) 66-1666-1 (LH) (OLD) 66-1666-2 (RH)	• FAIRING COMPOUND AND BEADED SILICONE RUBBER MOLDED-IN- PLACE PRESSURE SEAL.	NOT USED
(NEW) 66-1666-3 (LH) (NEW) 66-1666-4 (RH)	• FAIRING COMPOUND AND Z-CHANNEL SEAL. 1	5-71769-3013 (LH) 5-71769-3014 (RH)
(NEW) 65-99358-2 (LH) 2 (NEW) 65-99358-3 (RH) 2		5-71769-3013 (LH) 5-71769-3014 (RH)

1 The Z-channel pressure seal is preferred method of sealing with new retainer angle.

2 Installed by Boeing SB No. 2114.

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- (3) Examine corner of window near bus bar terminal for window resistance code

NOTE: This is etched in the window and filled in red. Note the code at this stage because it may get covered when window is installed, and it is necessary to know it when connecting window heating wiring (Ref Chapter 30, Control Cabin Window Anti-Icing System)

- (4) Apply protective cover of cellulose acetate sheeting to both window surfaces, aligning tape with edges of glass panes.

NOTE: This procedure is unnecessary for replacement windows which are supplied with a protective covering already applied.

- (5) Clean faying surface and outside gap edge of both window pane and window frame 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

- (6) Position window in frame and check that a uniform gap exists between outside edge of window and fuselage outer skin.
- (7) On windows installed with sealant, parting strip or gasket or molded in place seal and fairing compound or rubber gasket, install the rubber (or felt) strip and backing plate, wire clamps, and window retaining bolts. Treat the bolt shanks with corrosion preventative compound just prior to installation. 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 3/16-inch size nuts to torque of between 10 and 15 pound-inches, and 1/4-inch size nuts to between 15 and 20 pound-inches except as follows: On No. 3 and 5 windows torque the 3/16-inch

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size attaching nuts 20 to 25 pound-inches only and on No. 4 windows torque the 1/4-inch size self-locking attaching nuts 55 to 60 pound-inches only. (See Fig. 206 for typical tightening sequence.) Install checknuts, as required, which may be plain or self-locking nuts

CAUTION: OBSERVE THE SPECIFIED TORQUE FOR BOLTS AS DAMAGE CAN RESULT IF THE TORQUE IS EXCEEDED. USE ONLY NONMAGNETIC MATERIALS WITHIN A 20-INCH RADIUS OF THE STANDBY COMPASS. NONMAGNETIC BOLTS HEAT-TREATED TO 140,000 PSI SHALL BE USED ALONG THE TOP, BOTTOM AND FORWARD EDGES OF THE NO. 1 WINDOW. BOLTS ATTACHING WINDOW RETAINING ANGLE AT AFT EDGE ARE NOT STANDARD AND MUST BE REPLACED ONLY BY IDENTICAL BOLTS.

NOTE. On number 1 windows, the adjacent sliding window must be open to permit insertion of the special bolts attaching the window retaining angle along the aft edge (Fig 204). These bolts should be installed while the window is retained by one finger-tight bolt in each remote corner, thus allowing some shift for proper alignment and easy installation of the remaining bolts. The torque applied to the old retainer angle bolts (detail A) should be between 63 and 77 pound-inches on the upper two, and between 22.5 and 27.5 pound-inches on the remainder. The new retainer angle bolts (detail B) should be tightened to the bolt standard torque value.

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.

- (8) On windows No. 1, 4 and 5 with the beaded silicone rubber molded-in-place pressure seal, spacers and Z-channel seal, install bolt spacers in the bolt holes in the window assembly and check that bolt spacers are not too short and are free to move in bolt holes (Fig. 203). Retain the spacers by friction or other means until the attaching nuts are installed. Do not bond the bolt spacers in place. Treat bolt shanks with a corrosion preventative compound just prior to installation. Install retaining bolts, O-rings, flat washers, wire clamps and self-locking hex head nuts. On No. 1

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windows, on the upper aft three retaining bolts and the lower aft retaining bolt, install a silicone rubber seal washer under the aluminum nut washer, instead of an O-ring. Install a plain, thin, attaching hexnut only on the upper and lower aft retaining bolts. 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), torque each nut to the correct torque value. Torque the upper aft 1/4-inch size plain nut 30 to 45 pound-inches, the 1/4-inch size self-locking hexnuts 50 to 70 pound-inches, the lower aft 3/16-inch size plain nut 20 to 25 pound-inches only, and the 3/16-inch size self-locking hexnuts 20 to 25 pound-inches (40 pound-inches, maximum). (See Fig. 205 for typical tightening sequence.) Install plain, thin, hex checknuts only on the upper and lower aft retaining bolts while the attaching nuts are being held. On No. 4 windows, torque each bolt 55 to 60 pound-inches and on No. 5 windows, torque each bolt 20 to 25 pound-inches (40 pound-inches maximum). On each window installed, torque each nut to the correct torque value using a staggered sequence (diagonally back and forth across window in a criss-cross pattern). (See Fig. 205 for typical tightening sequence.)

CAUTION: DAMAGE TO WINDOW MAY OCCUR IF BOLT SPACER IS TOO SHORT OR TOO TIGHT IN BOLT HOLE. OBSERVE THE SPECIFIED TORQUE FOR BOLTS AS DAMAGE CAN RESULT IF THE TORQUE IS EXCEEDED. USE ONLY NONMAGNETIC MATERIALS WITHIN A 20-INCH RADIUS OF THE STANDBY COMPASS. NONMAGNETIC BOLTS HEAT-TREATED TO 140,000 PSI SHALL BE USED ALONG THE TOP, BOTTOM AND FORWARD EDGES OF THE NO. 1 WINDOW. BOLTS ATTACHING WINDOW RETAINING ANGLE AT AFT EDGE ARE NOT STANDARD AND MUST BE REPLACED ONLY BY IDENTICAL BOLTS.

NOTE: When installing number 1 windows, the adjacent sliding window must be open to permit insertion of the special bolts attaching the window retaining angle along the aft edge (Fig. 204). These bolts should be installed while the window is retained by one finger-tight bolt in each remote corner, thus allowing some shift for proper alignment and easy installation of the remaining bolts. The torque applied to the old retainer angle bolts (detail A) should be between 63 and 77 pound-inches on the upper two, and between 22.5 and 27.5 pound-inches on the remainder. The new retainer angle bolts (detail B) should be tightened to the bolt standard torque value. Maintain minimum gap requirements between bolts and windshield (Section A-A, Fig. 204)

- (9) 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 by approximately 0.5 inch.

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



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- (10) Remove finish approximately 2.5 inches long from edge of structure at approximate midpoint of one or more sides of window frame. Apply chemical film treatment (alodine or Irodite) to bare metal then install tubular wire mesh to contact unpainted portion of window frame and Z channel.

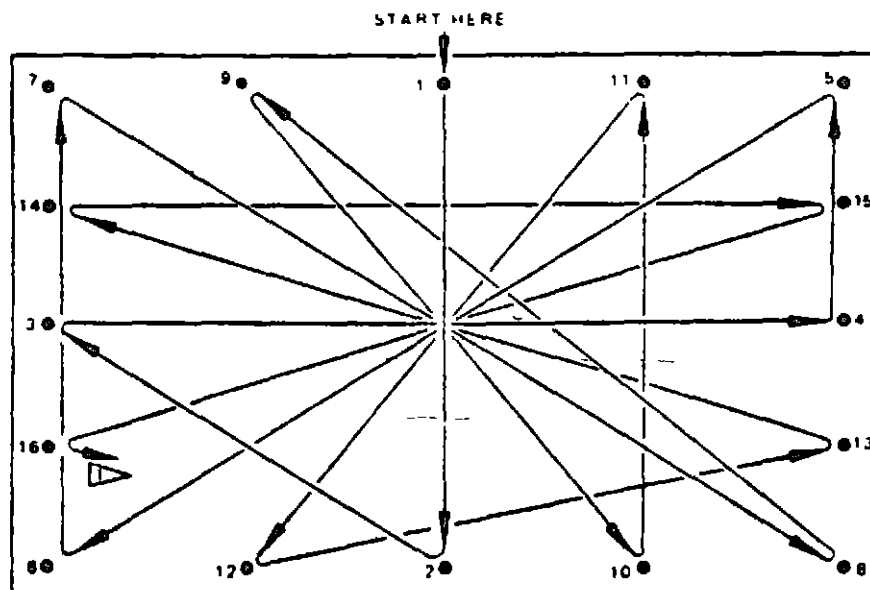
NOTE: Install wire mesh at one or more locations to reduce resistance between Z channel and structure to 1 ohm or less.

- (11) Place a strip of masking tape over gap at outside edge of window. 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.
- (12) Inject aerodynamic smoother into the gap by means of a flow gun or with a spatula until the gap is completely filled (Fig. 206). Do not trap air under the smoother. Remove excess filler, while still wet, with a tool until just level with the masking tape.

CAUTION: SMOOTHER IS AVAILABLE WITH SEVERAL WORK LIVES TO SUIT A VARIETY OF JOBS. STEPS (11), (12) AND (13) MUST BE COMPLETED DURING WORK LIFE SELECTED.

DO NOT ABRASE METAL OR GLASS SURFACES.

- (13) 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.



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 EARLY AS POSSIBLE IN FASTENER INSTALLATION WILL SUFFICE

Pattern for Typical Window Fastener Installation

Figure 205

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- (14) Install thermal switch bracket and thermal switch.

NOTE: -Only necessary on windows No. 3 and 5.

- (15) Install map light lamp and housing on No. 4 window frame, if it was removed.

- (16) Connect power leads to window bus bar terminals.

CAUTION: CHECK THAT THE TRANSFORMER TAPS CONNECTED TO THE LEADS MATCH THE WINDOW RESISTANCE (REF CHAPTER 30, CONTROL CABIN WINDOW ANTI-ICING SYSTEM).

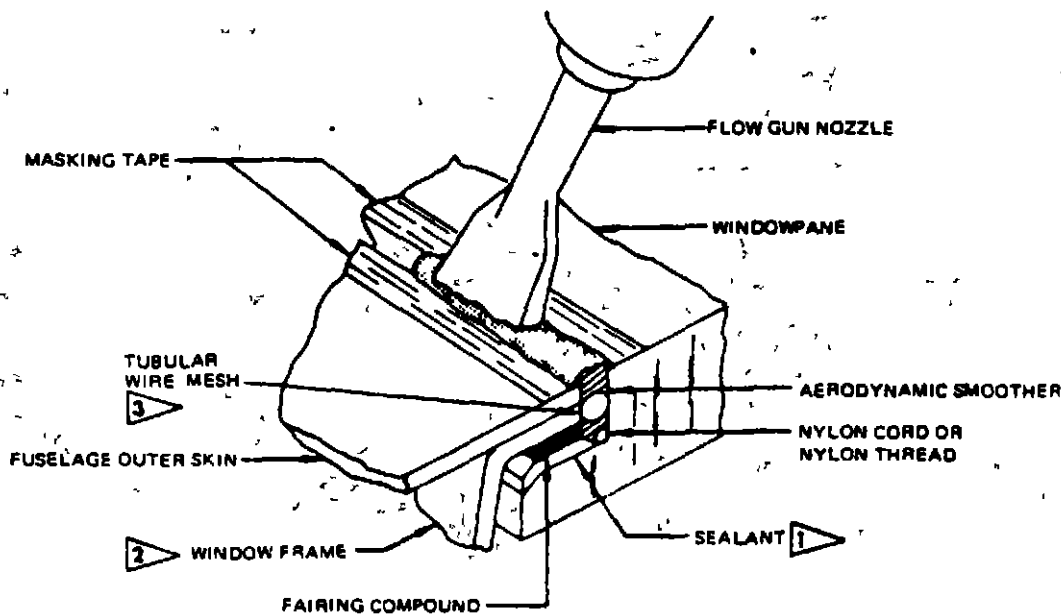
- (17) Install drain pan, drain tube clamps and, if applicable, pilots' gasper outlet at window post on airplane centerline, and sunshade support rod above window.

NOTE: Steps (17) and (18) are necessary only for installation of No. 1 windows.

- (18) Install lightshield (Ref Chapter 25, Pilots' Station).

- (19) Install trim panels and crash padding where necessary (Ref Chapter 25, Control Cabin Equipment - General).

- (20) Remove protective cover from inside surface of window.



1 DELETED ON NO 1 4 AND 5 WINDOWS
INSTALLED WITH A BEADED SILICONE
RUBBER MOLDED IN PLACE PRESSURE SEAL
AND NO 1 WINDOWS WITH
2-CHANNEL PRESSURE SEAL

2 DELETED ON NO 3 WINDOWS
INSTALLED WITH A RUBBER GASKET

3 NO 1 WINDOWS
WITH 2 CHANNELS

Application of Gap Filler
Figure 206

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- (21) Test window heating system (Ref Chapter 30, Control Cabin Window Anti-Icing System).
- (22) Clean window (Ref 56-1-0, Maintenance Practices - Unit Servicing Control Cabin Windows).
- (23) Rerig windshield wiper blade as required (Ref 30-8-11, Maintenance Practices).

3. Fixed Windows - Approved Repairs

A. General

- (1) Window frames on which the fairing compound is cracked, chipped, broken or damaged in any way should have the compound repaired before installation of the window.
- (2) In the case of a repair covering a large part of the fairing compound surface the replacement window could be used as a face plate. The advantage here is that the surface produced would be a perfect mate with the window and no other tools are necessary. Disadvantages include the weight of the window and the possibility of damaging the glass during handling. The alternative method, used in manufacture, is to make up a face plate, 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.
- (3) In the case of all partial repairs the window frame should be prepared as described in par. C.(1)(a). If the old fairing compound has been completely removed, new compound should be applied to the window frame as described in par. C.(1)(b).
- (4) A new replacement No. 3 window is provided with a continuous silicone rubber gasket with prepunched undersize bolt holes. The seal replaces the fairing compound on the No. 3 window frame. Whenever window replacement is made the fairing compound on the window frame should be completely removed.

B. 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
- (5) Window Frame Fairing Compound - Tereco 175, Technical Research Company, Seattle, Washington, or equivalent

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- (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 face plate (for large repairs)

C. 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 face plate 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. Continue cleaning and drying until no soil is visible on the final drying cloth.

- (c) Wipe faying surface of face plate 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 face plate with one of the following: Teflon tape, baked on teflon, room temperature cured teflon, or a brush coat of ivory soap applied with a soft bristle brush.
- (2) Prepare Fairing Compound
 - (a) The fairing compound, Tereco 175, is supplied by the manufacturer either in premeasured ready-to-mix, two-part packages or in one-part premixed, ready-to-use, frozen cartridges. The application time, cure characteristics, and properties of the two-part freshly mixed material are the same as that of the one-part premixed material. The manufacturer's instructions must be followed in preparing the fairing compound selected for use.

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

D. Repair Fairing Compound on Window Frame

- (1) Apply freshly mixed or thawed Tereco 175 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 face plate in window frame immediately after application of the fairing compound. Press the face plate gently against the window frame until high spots on the window frame are in contact with the face plate.

CAUTION: STEPS (1) THROUGH (5) MUST BE COMPLETED DURING THE APPLICATION TIME OF THE COMPOUND - THREE HOURS AT 74° ($\pm 5^\circ$) F.

- (3) Apply a sample bead of compound, from batch used in step (1), to a piece of scrap metal and cure under the same atmospheric conditions.

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

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

CAUTION: DO NOT OVERTIGHTEN BOLTS AND WARP FACE PLATE OR WINDOW FRAME BECAUSE SPRING BACK MAY NECESSITATE FURTHER FAIRING.

- (5) Remove excess compound from bolt holes by inserting bolts and from around frame with spatula or wedge-shaped wooden block.
- (6) Remove the face plate after 24 hours at 74° ($\pm 5^\circ$) F or 2-1/2 hours at 120° ($\pm 5^\circ$) F. The compound will reach a hardness of 55 Shore D and will be sandable after 48 hours at 74° ($\pm 5^\circ$) F or 5 hours at 120° ($\pm 5^\circ$) F. After the ultimate cure, of 10 days at 74° ($\pm 5^\circ$) F or 24 hours at 120° ($\pm 5^\circ$) F, a Shore D hardness of 70 will be reached.

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 because if flight is allowed with a window installed on fairing compound of which large areas are wet, cabin pressure may blow leaks around the window edge.

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



SLIDING WINDOWS - MAINTENANCE PRACTICES

1 Removal/Installation, Sliding Windows

A Equipment and Materials

- (1) Kerosene VV-K-11 or Stoddard Solvent P-S-661.
- (2) Oil MIL-L-7870.
- (3) Rain Repellent Kit (Formula 2911.C-1728.S) Foster D. Snell., Inc. New York, New York.

B Remove Sliding Window

- (1) Check power off in window heating system.

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

- (2) Remove trim panels or crash padding where necessary. Refer to Control Cabin Equipment - General, Chapter 25
- (3) Disconnect power leads at window bus bar terminals and remove clips holding lead to aft edge window frame. (See figure 202.)
- (4) Open window to a position about 2 1/2 inches short of locked open stop (step 5, figure 201). 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). 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 (step 4).
- (5) With lower forward glide outside the track, slide window assembly forward until lower aft glide (1) lines up with cut out (step 3). 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 (step 2).
- (6) Remove window by lifting so that lower aft glide comes through cut out in lower track (step 1).
- (7) Lay window on suitable support.

C Install Sliding Window

- (1) Check power OFF in window heating system.

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

- (2) Clean tracks, glides and surrounding areas with a rag moistened with Kerosene, VV-K-211, or Stoddard Solvent P-S-661.
- (3) Apply a light film of oil, MIL-L-7870, to tracks and to surfaces of glides and mechanism that contact tracks.
- (4) Hold window with front of clothing guard (4, figure 201) level with guide pin track (2) and insert lower aft glide (7), through cut out (5), into lower track (step 1). This can be accomplished by resting lower aft glide on top of track and sliding gently back and forth to locate cut out.
- (5) Lift lower front corner of window assembly so that upper glide (1) goes aft and can be slipped into its track (steps 2 and 3)
- (6) Slide window aft, with lower forward glide (3), resting on top of track, until glide drops through cut out in track lip (step 4)
- (7) Close window and check for complete opening and closing cycles See Adjustment/Test, Sliding Window.
- (8) Connect power leads at bus bar terminals and install clips holding leads to aft window frame. (See figure 202.)

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.

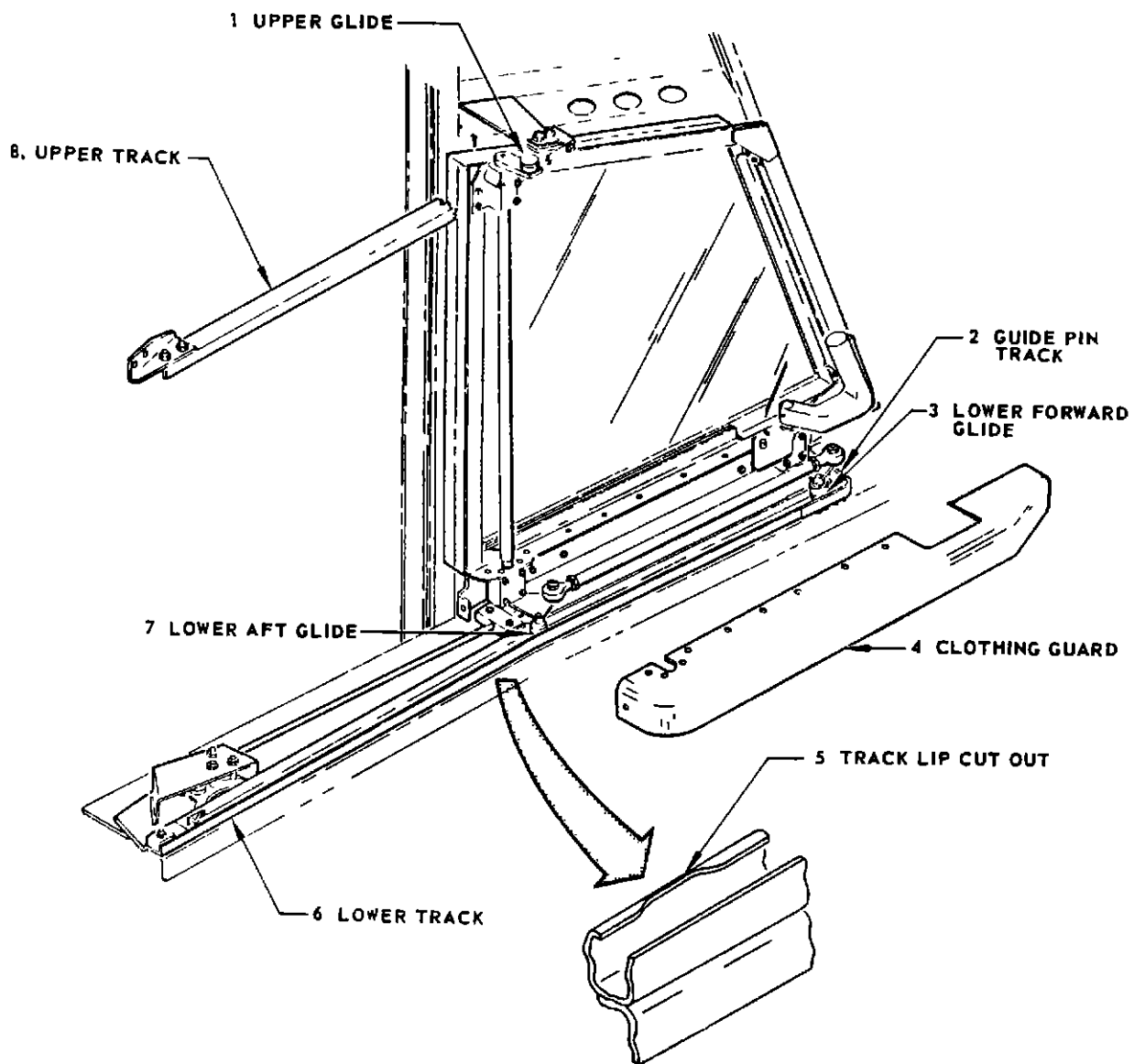
NOTE Window resistance code is usually etched in red near one of the bus bar terminals.

- (9) Clean windows and apply rain repellent. Refer to Unit Servicing Control Cabin Windows.

2. Adjustment/Test Sliding Windows

A General

- (1) Minor vertical adjustments can be made by varying the number of shim washers between the mechanism bellcranks and glide bearings. Changing the number or thickness of shim washers at one of the lower glides will probably necessitate a similar change at the other lower glide to prevent window tilt



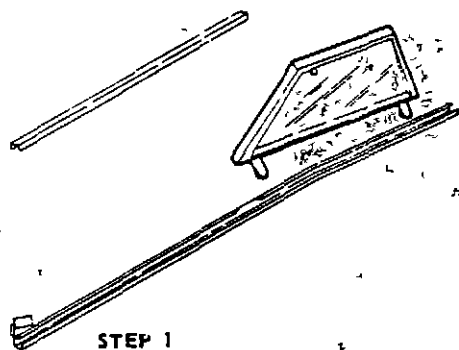
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Installation of Sliding Window
Figure 201 (Sheet 1 of 2)

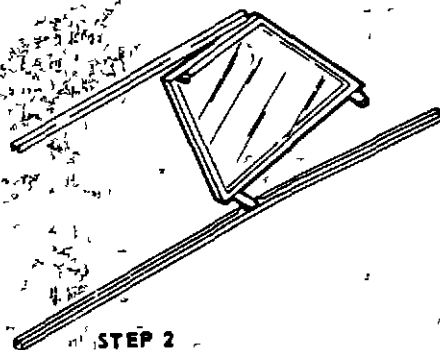
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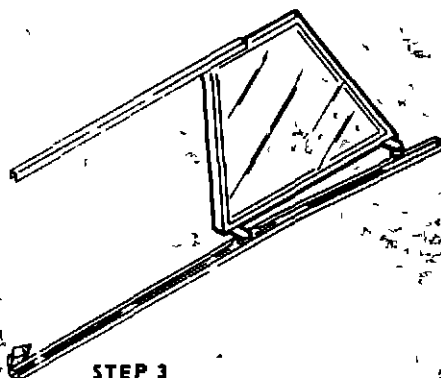
WINDOWS
Sliding Windows
Maintenance Practices



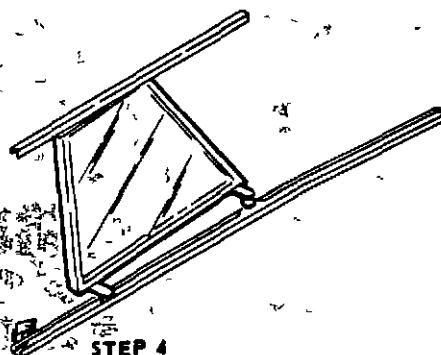
STEP 1



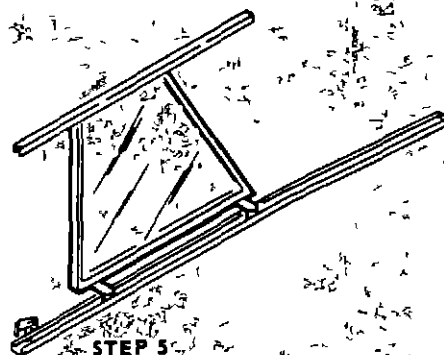
STEP 2



STEP 3



STEP 4



STEP 5

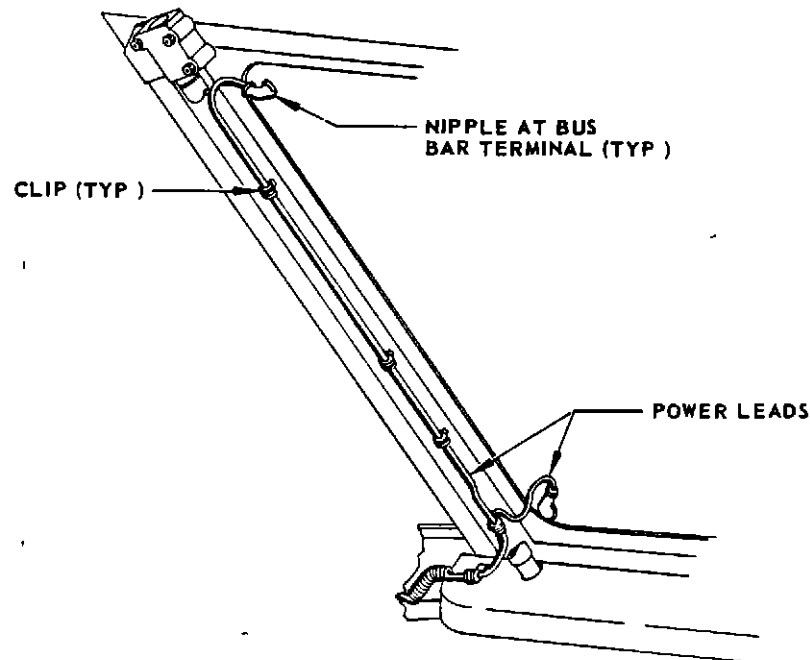
Installation of Sliding Window
Figure 201 (Sheet 2 of 2)

B Adjustment, Vertical, Sliding Windows

- (1) Remove window assembly from airplane. See Sliding Windows, Removal/Installation
- (2) Loosen set screw in bellcrank and remove glide screw.
- (3) 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 the original dimensions between glide faces. If adjustment is being made to correct a binding condition, removal of shims from the upper glide only will be necessary.

- (4) Reinstall glide screw and tighten bellcrank set screw.
- (5) Reinstall window assembly in airplane See Sliding Windows, Removal/Installation.



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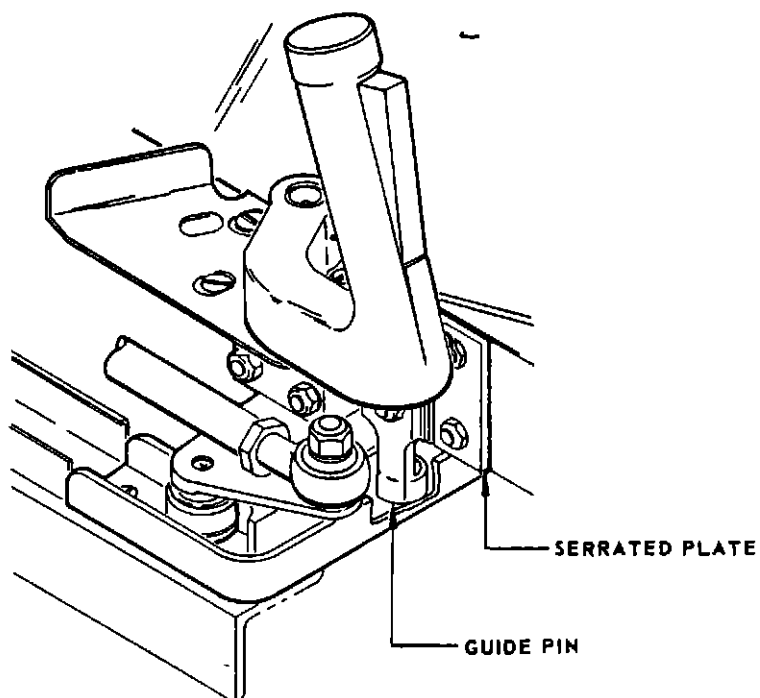
Attachment of De-Icing Leads or Sliding Windows
Figure 202

C Adjustment, Fore and Aft, Sliding Window

- (1) Remove clothing guard.
- (2) Having determined approximately what adjustment is required to get window centered in fore and aft directions, open window and adjust position of guide pin on serrated plate (see figure 203). Make adjustment by slackening off the screw attaching guide pin to the serrated plate, reposition guide pin, and tighten screw.

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

- (3) Reinstall clothing guard

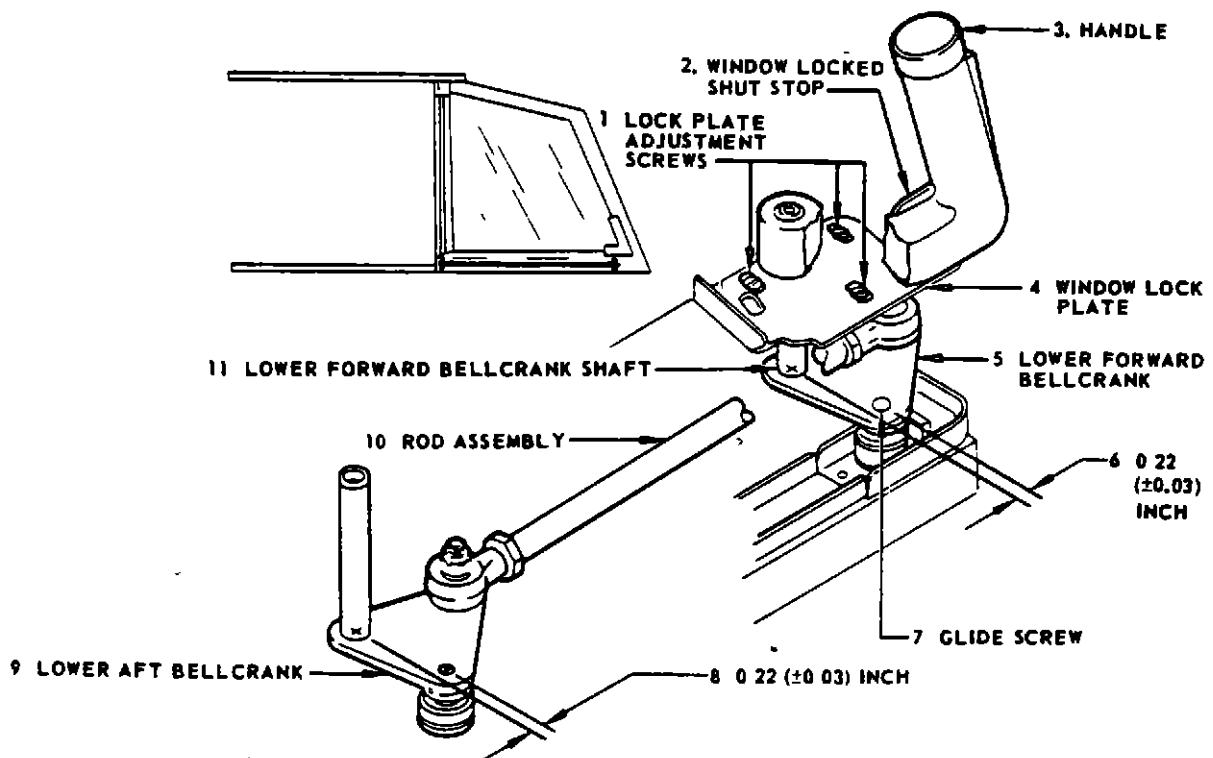


Adjustment of Guide Pin
Figure 203

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D. Adjustment, Inboard and Outboard, Sliding Windows

- (1) Remove window assembly from airplane. See Sliding Windows, Removal/Installation.
- (2) Remove clothing guard from window assembly.
- (3) Adjust window lock plate (4, figure 204) so that, with handle (3) against the window locked shut stop (2), the center of the glide screw (7) in the lower forward bellcrank (5) is 0.22(± 0.03) inch forward of the center of the lower forward bellcrank shaft (11). Make the adjustment by loosening the three lock plate adjustment screws (1) which secure the lock plate to the stiffening angle and move lock plate in or out as needed. Tighten the adjusting screws. The serrated tie plate secures the lock plate in place.
- (4) With the handle still held against the window locked shut stop adjust the length of the rod assembly (10) so that the center of the glide screw on lower aft bellcrank (9) is 0.22(± 0.03) inch forward of the center of the lower aft bellcrank shaft. Make adjustment by slackening lock nuts at ends of rod, rotate rod to adjust length and tighten lock nuts.
- (5) Reinstall clothing guard on window assembly.
- (6) Reinstall window assembly in airplane. See Sliding Windows, Removal/Installation.



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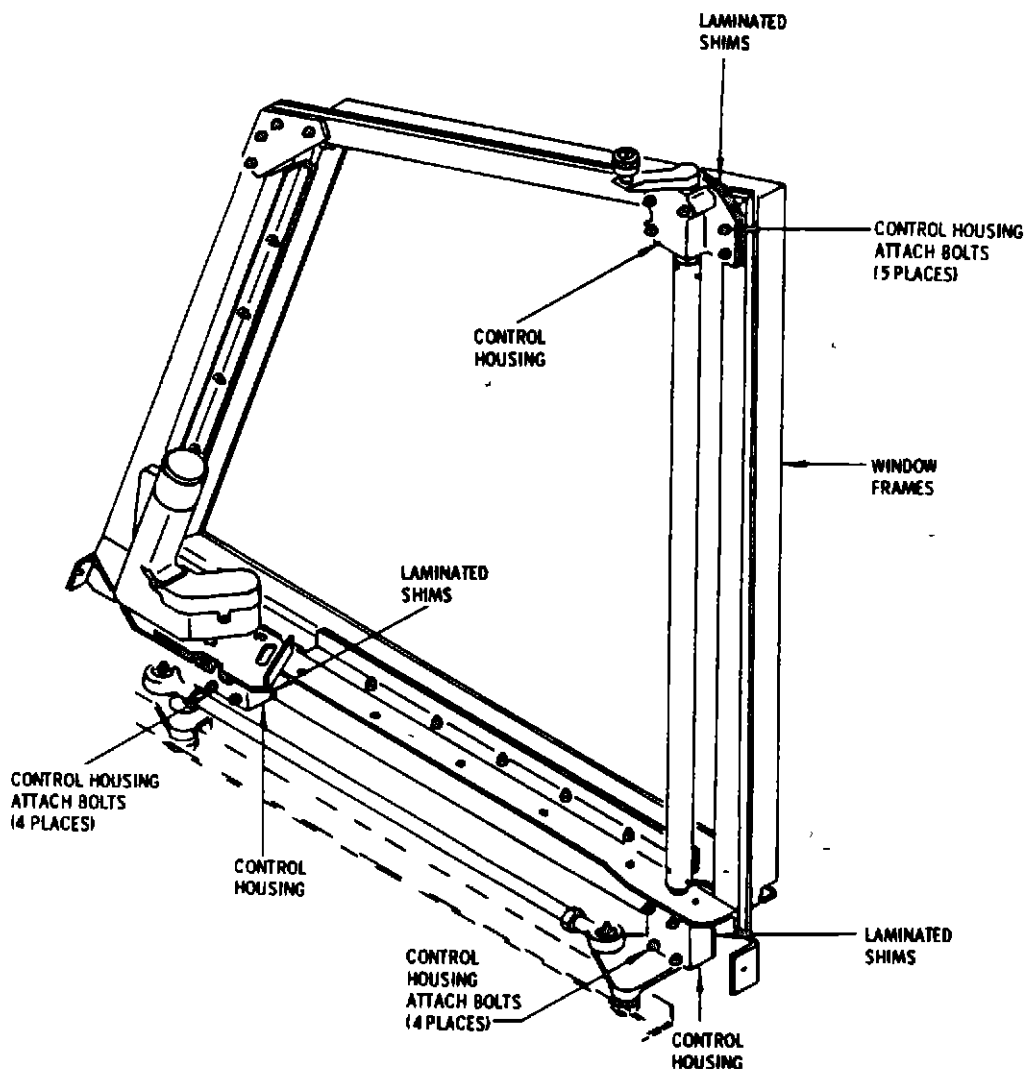
Adjustment of Lower Bellcranks
Figure 204

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E. Adjust Force Required to Close Sliding Window

- (1) Remove window assembly from airplane. See Sliding Windows, Removal/Installation.
- (2) Unscrew nuts attaching window control housings to window frame and remove three control housings at window corners. (See figure 205.)
- (3) Add or remove shims as required to increase or decrease the force necessary to close the window.

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



Adjustment of Force Required to Close Sliding Window
Figure 205

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F. Test Sliding Window Operation

- (1) Check that the window unlocks from closed position and that handle can be rotated freely when the handle trigger is depressed.
- (2) Check for freedom from binding or obstruction when sliding to full aft position with the handle unlocked.

NOTE: If the window operating force is excessive, refer to trouble shooting chart to remedy defect.
- (3) Check that the open latch securely holds window in open position and releases window when latch mechanism is operated.
- (4) Check that window slides to full forward position without obstruction or binding when the open latch mechanism is operated.
- (5) Check that force required to close the window is 45 ($\pm$ 15) pounds.
- (6) Check that bolt hole in lock plate is not worn and that window locks shut when the handle is fully forward and outboard, with trigger released.
- (7) Check that lock plate is not distorted or bent.
- (8) Ensure by manually pulling on handle, with trigger not depressed, that window cannot be opened when the window is locked closed.

G. Test Sliding Window Heating

- (1) For test of window heating refer to Control Cabin Window Anti-Icing System, Chapter 30.

H. Test Handle Emergency Release Mechanism on Right Sliding Window (Cargo Airplanes)

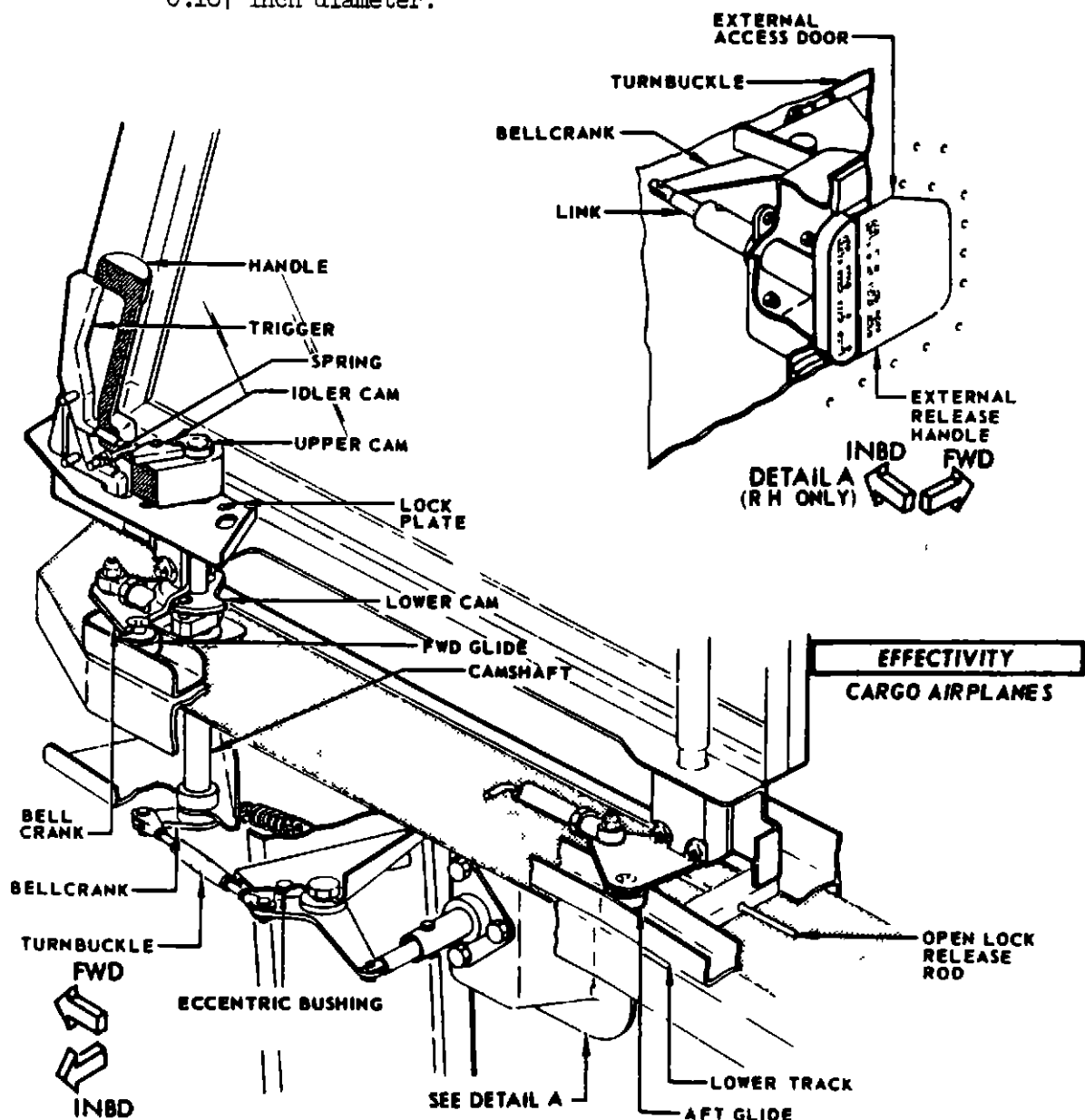
- (1) Check that right sliding window handle (figure 206) unlocks when handle is manually pulled 3.50 inches with a maximum force of 90 pounds
- (2) Check that turnbuckle and eccentric bushing are adjusted, to make the handle fit flush with outside contour of skin in stowed position.
- (3) Check that right sliding window operates freely when release mechanism is in stowed position.
- (4) Check that trigger protrudes from handle when window is locked closed.

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3. Approved Repairs Sliding Windows

A. Approved Repair, Sliding Window Handle Trigger Spring. (See figure 206.)

- (1) Open window to take load induced by compressed bulb seal off spring pin through handle and bellcrank shaft.
- (2) Remove handle from bellcrank shaft by driving out handle spring pin 0.187 inch diameter.
- (3) Remove trigger bolt from handle by driving out lower spring pin 0.187 inch diameter.

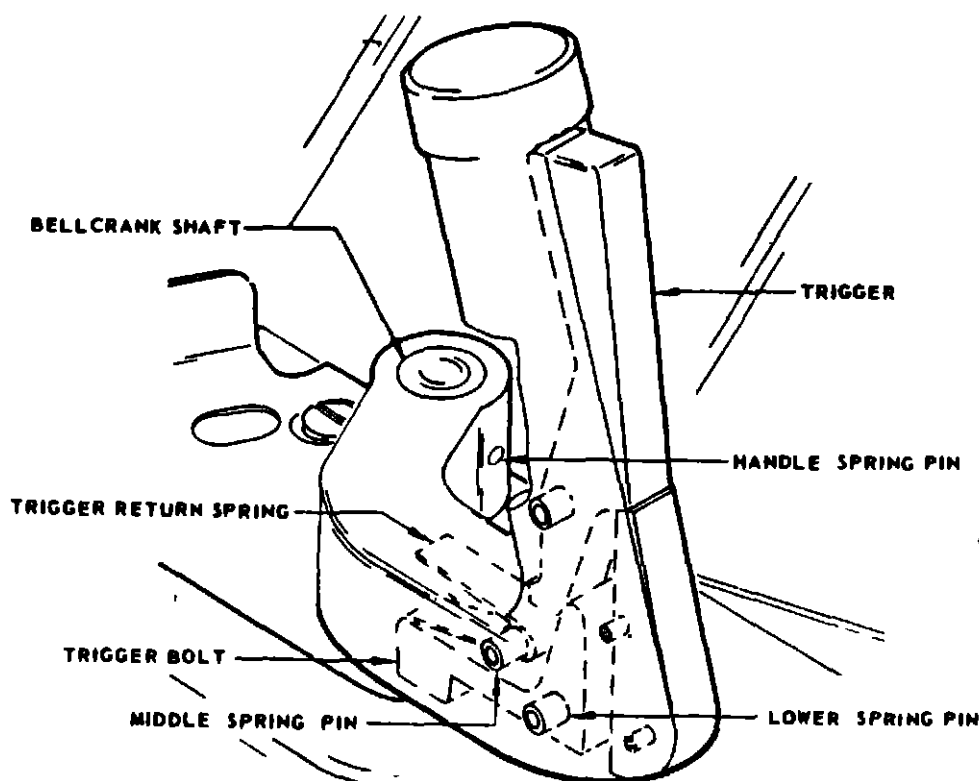


Pilot's Sliding Window Emergency Release Mechanism
Figure 206

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- (4) Remove trigger return spring from handle by driving out middle spring pin 0.187 inch diameter.
- (5) Place new trigger return spring in position opposite middle spring pin hole and drive in spring pin.
- (6) Place trigger bolt in position opposite lower spring pin hole and drive in spring pin.
- (7) Check trigger for full return when released.
- (8) 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.



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B. Approved Repair, Sliding Window Glide (See figure 207.)

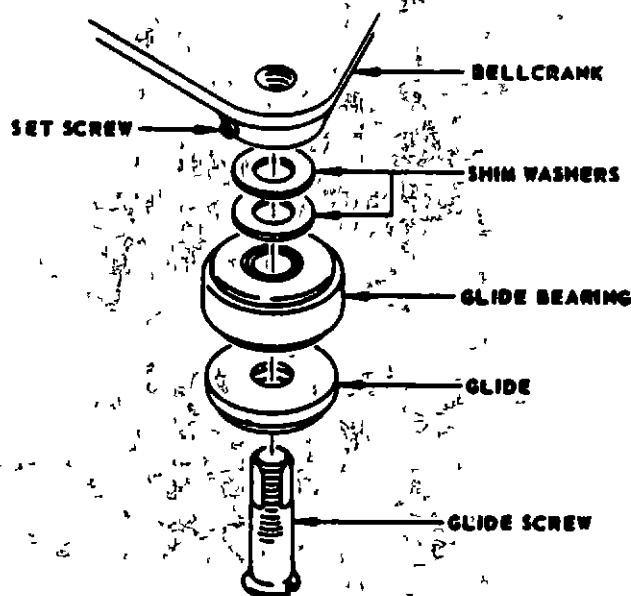
- (1) Remove window assembly from airplane. See Sliding Windows, Removal/Installation.
- (2) Loosen set screw in bellcrank.
- (3) Remove glide screw from bellcrank.

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

- (4) Reinstall glide screw complete with bearing, shim washers, and new glide.

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

- (5) Reinstall window assembly in airplane. See Sliding Windows Removal/Installation.



WINDOW N° 2 (PILOTS' SLIDING WINDOW) - REMOVAL/INSTALLATION

1 Equipment and Materials

- A Solvent, Kerosene - VV-K-11 or equivalent
- B Oil - MIL-L-7870

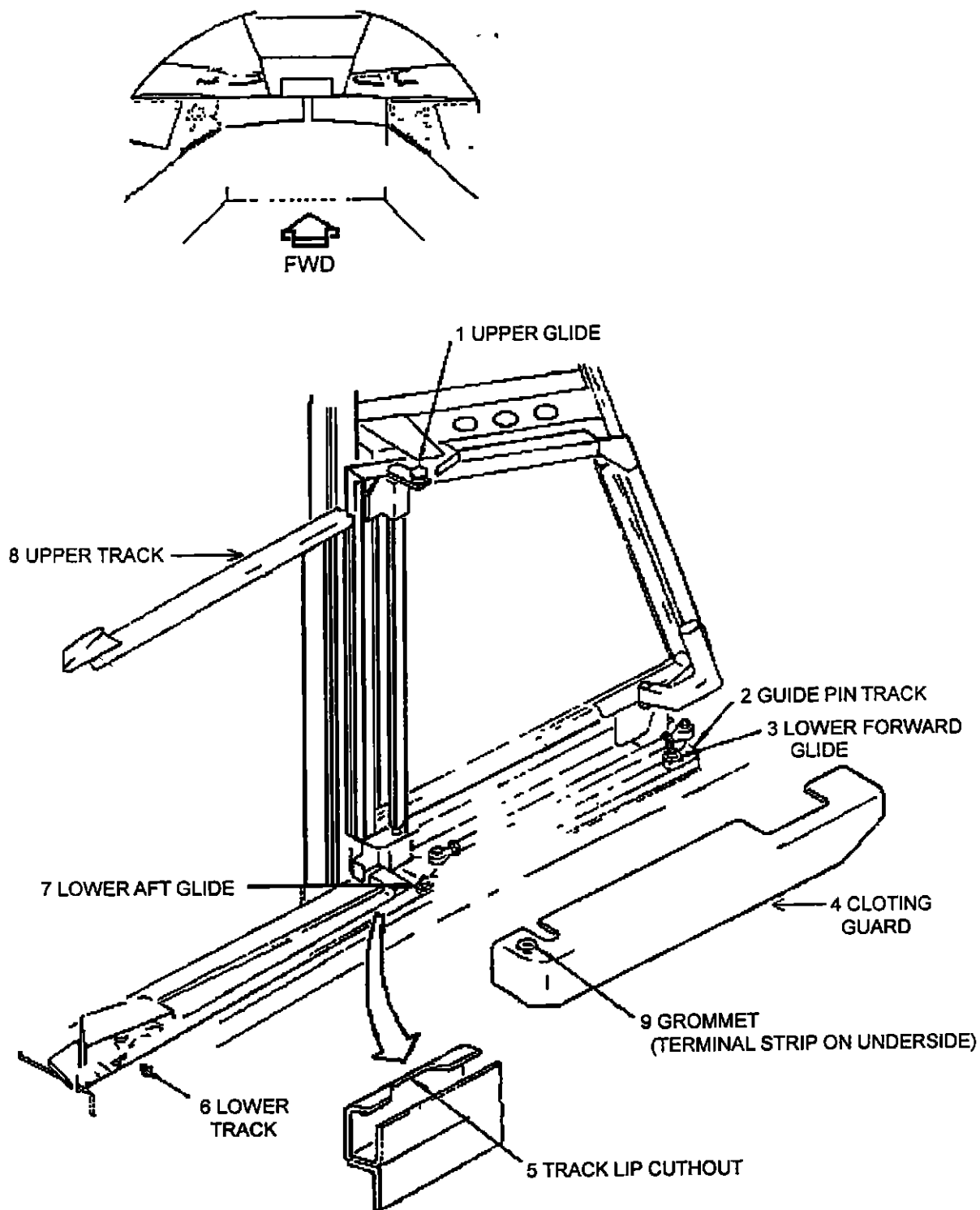
2 Remove Window N° 2 (Pilots' Sliding Window) (See figure 401)

- 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 cutout in the lower track lip (5). When the lower forward glide (3) is opposite the cutout, lift the lower front corner of the window and 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 cutout (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 cutout (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.

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Window N° 2 (Pilots' Sliding Window) Installation
 Figure 401

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3 Prepare Window N° 2 (Pilot's Sliding Window) for Installation

- A Check that power is off in window heating system

CAUTION OUTPUT VOLTAGE OF AUTOTRANSFORMER RANGE 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

4 Install Window N° 2 (Pilots' Sliding Window) (See figure 401)

- A Connect deicing electrical leads to terminal strip (9) on clothing guard (4)

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) level with guide pin track (2) and insert lower aft glide (7) through cutout (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 cutout
- C Lift lower front corner of window assembly so that upper glide (1) goes aft and can be slipped into its track
- D Slide window aft, with lower forward glide (3) resting on top of track until glide drops through cutout in track lip
- E Test and adjust window if required See Window N° 2 (Pilots' Sliding Window) - Adjustment/Test
- F Ensure that placard "Caution, P18-3 panel must be closed prior to opening window" is removed from left hand window



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EFFECTIVITY
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WINDOW N° 2 (PILOTS' SLIDING WINDOW) - ADJUSTMENT/TEST

1 Window N°2 (Pilots' Sliding Window) Adjustment

A Prepare for Adjustment

- (1) With the window in closed and locked 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. Refer to step B (2)
 - (b) Determining that window closing force does not exceed 45 (+/- 15) pounds. Refer to step B (4)
- (2) Unlatch window and check for smooth operation. Refer to step B (1)
- (3) Remove window N° 2 from track and place on a suitable support (See Window N° 2 (Pilots' Sliding Window) - Removal/Installation)

B Adjust Window (See figure 501)

- (1) Adjust vertical position of window

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

- (a) Loosen set screw in bellcrank and remove glide screw
- (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 the original dimensions between glide faces and to prevent window tilt. If adjustment is being made to correct a binding condition, remove shims from only the upper glide

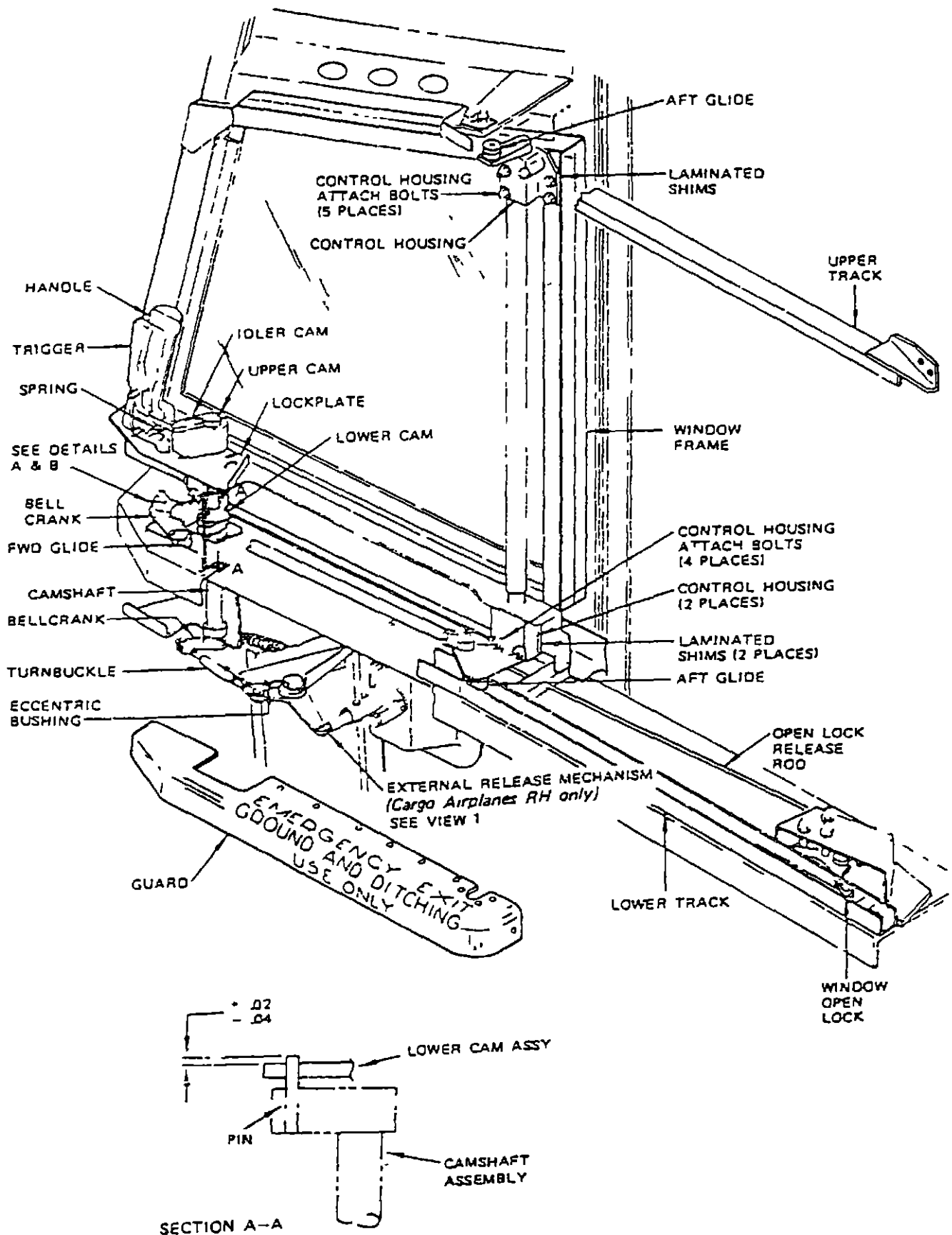
- (c) Install glide screw and tighten bellcrank set screw

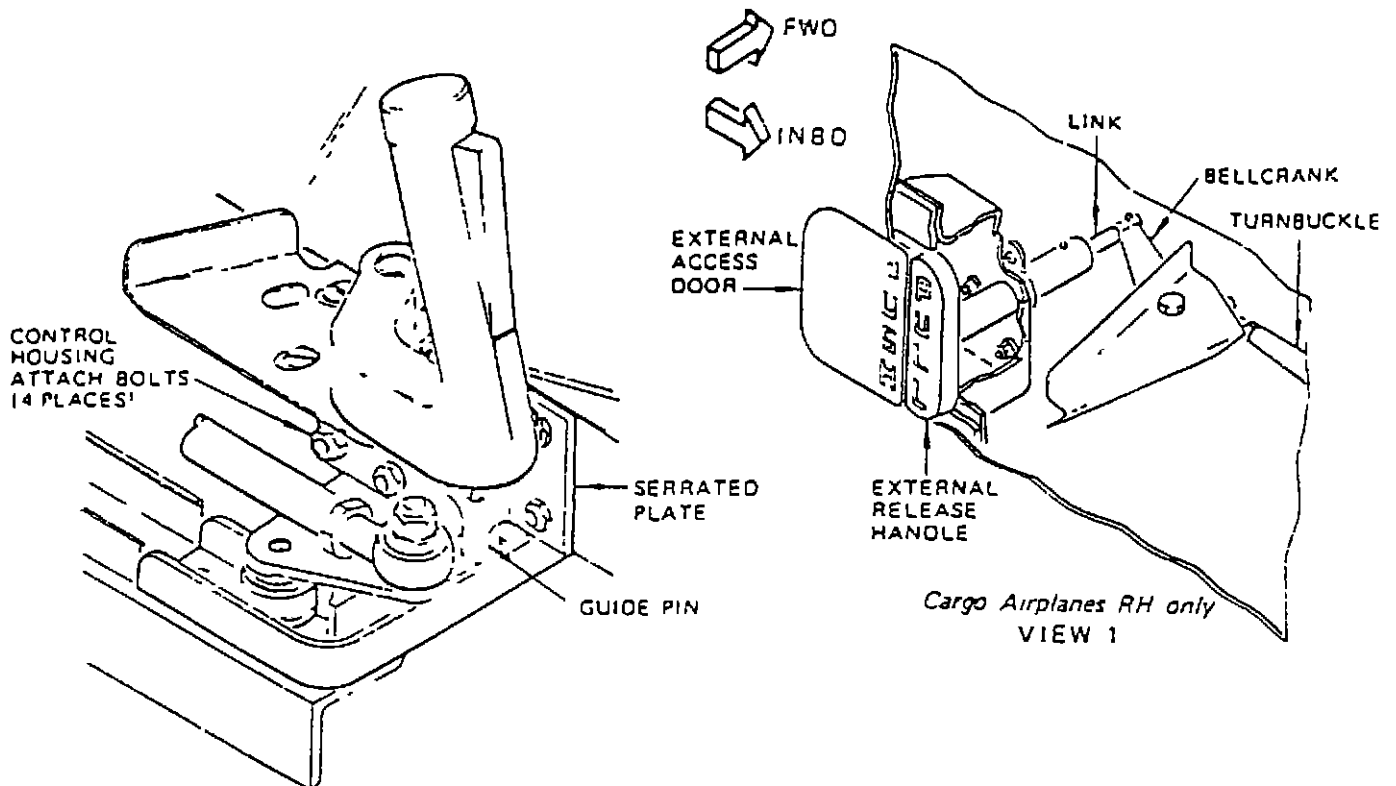
- (2) Adjust fore and aft position of window

- (a) Adjust position of guide pin on serrated plate (See detail A)

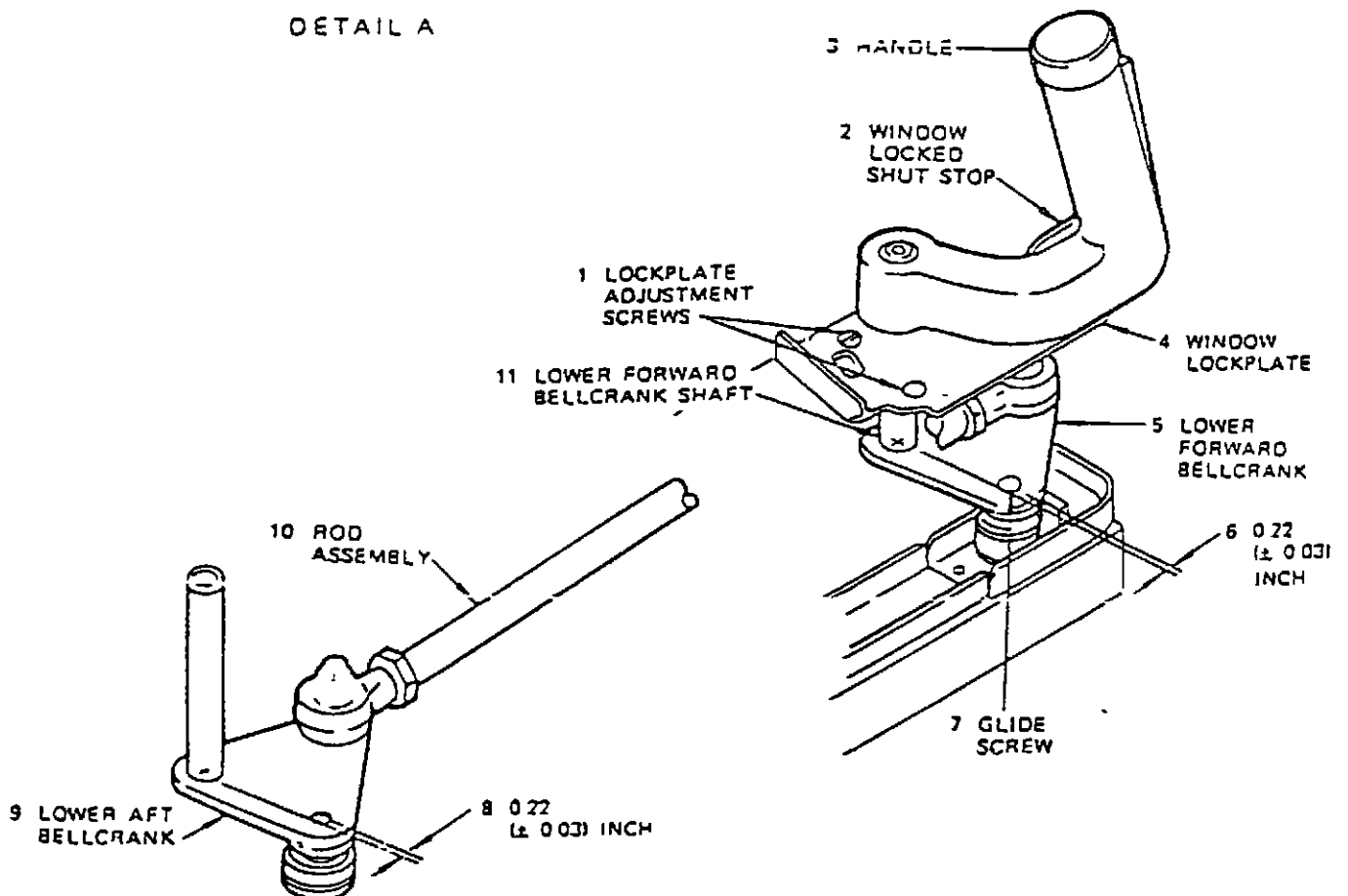
- 1) Slack off two screws attaching guide pin to serrated plate

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





DETAIL A



DETAIL B



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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 the window locked shut stop (2), the center of the glide screw (7) in the lower forward bellcrank (5) is 0.22 (+/- 0.03) inch forward of the center of the lower forward bellcrank shaft (11). Make the adjustment by loosening the three lockplate adjustment screws (1) which secure the lockplate to the stiffening angle and move lockplate in or out as needed. Tighten the adjusting screws. The serrated tie plate secures the lockplate in place.

(b) With the handle still held against the window locked shut stop, adjust the length of the rod assembly (10) so that the center of the glide screw on lower aft bellcrank (9) is 0.22 (+/- 0.03) inch forward of the center of the 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 the force necessary to close the window.

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

(c) Install window control housings on window frame.

(5) Install window N° 2 (See Window N° 2, (Pilots' Sliding Window) - Removal/Installation)

(6) Adjust emergency exit release mechanism exterior handle (Right sliding window on Passenger/Cargo Convertible Airplanes)

(a) Adjust exterior handle to fit flush with outside contour of skin when handle is in stowed position (See view 1)

1) Adjust turnbuckle and eccentric bushing until handle, in stowed position, is flush with exterior skin.

(7) Test sliding window per paragraph 2



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- (8) With window closed and latched, verify engagement of camshaft assembly pin with lower cam assembly (Fig 501, Section A-A)
 - (a) Look between lower edge of guard 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 the 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 locked 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.

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- G Place trigger bolt in position opposite lower spring pin hole and drive in spring pin
- H Check trigger for full return when released
- I Place handle on lower forward bellcrank shaft and drive in spring pin through handle and shaft
- J. On Cargo Airplanes right-hand window install upper cam and cam cover on handle by driving one spring pin attaching cam to camshaft and two spring pins attaching cover to handle

2 Repair Window N° 2 (Pilots' Sliding Window) Glide (See figure 802)

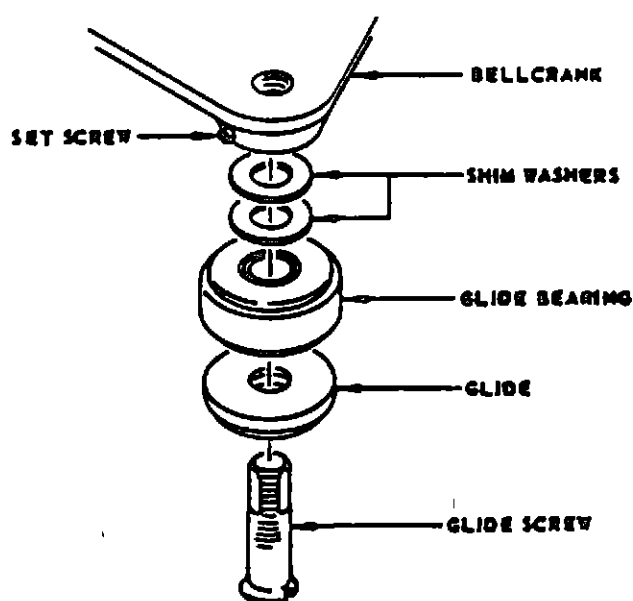
- A Remove window N° 2 See Window N° 2 (Pilots' Sliding Window) - Removal/Installation
- B Loosen set screw in bellcrank
- C Remove glide screw from bellcrank

NOTE Be prepared to catch parts as screw is removed

- D Reinstall glide screw complete with bearing, shim washers, and new glide

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

- E Reinstall window N° 2 See Window N° 2 (Pilots' Sliding Window) - Removal/Installation



Window N° 2 (Pilots' Sliding Window) Glide Installation
Figure 802



MAINTENANCE MANUAL

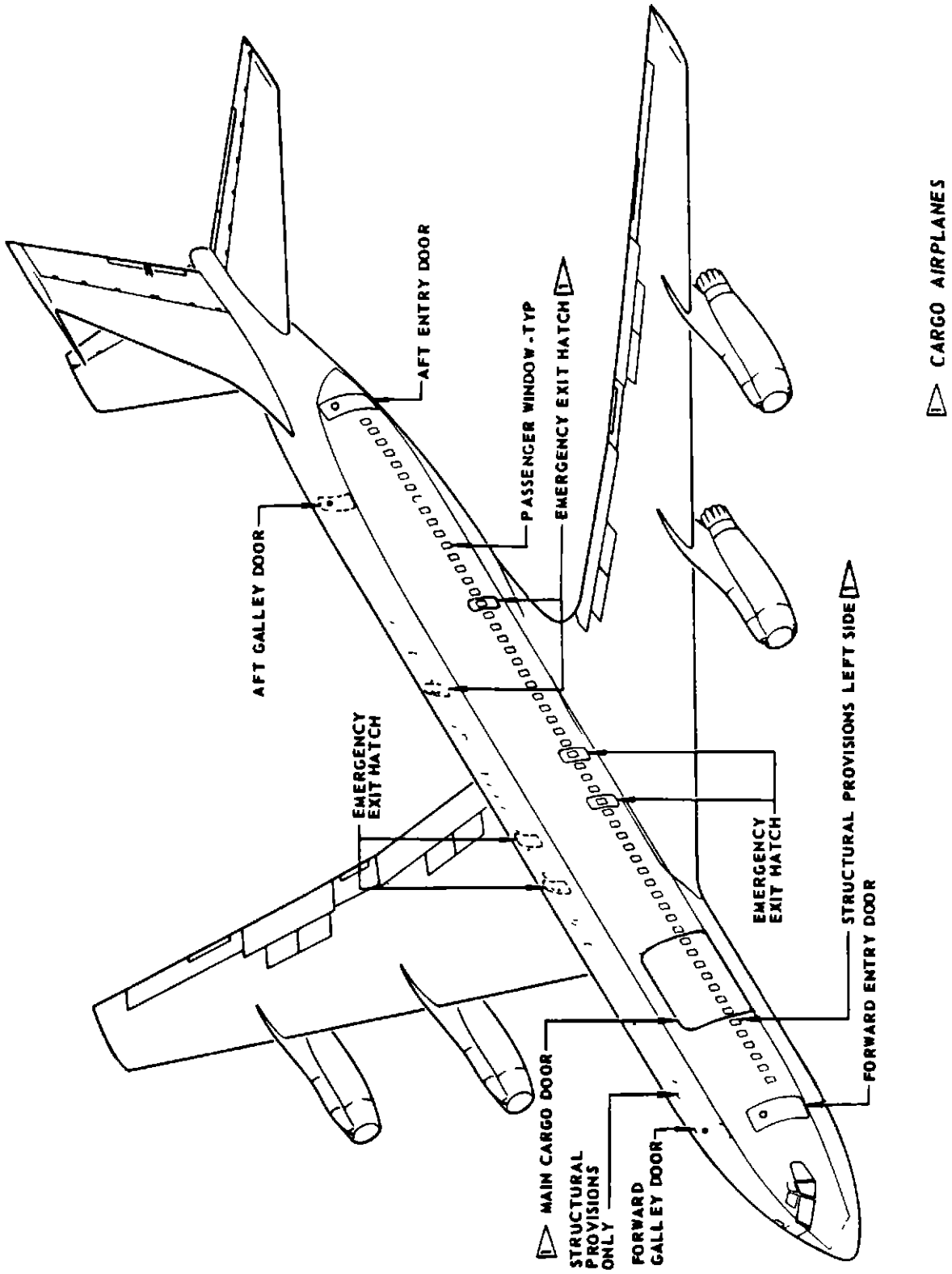
PASSENGER CABIN WINDOWS - DESCRIPTION AND OPERATION

1. General

- A. Passenger windows (figure 1) are located between the fuselage frames in those areas of the cabin where passenger seating is provided. Circular windows are provided in the entry and galley service doors.

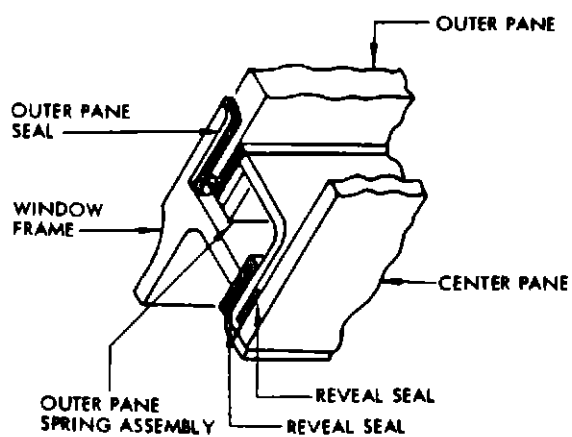
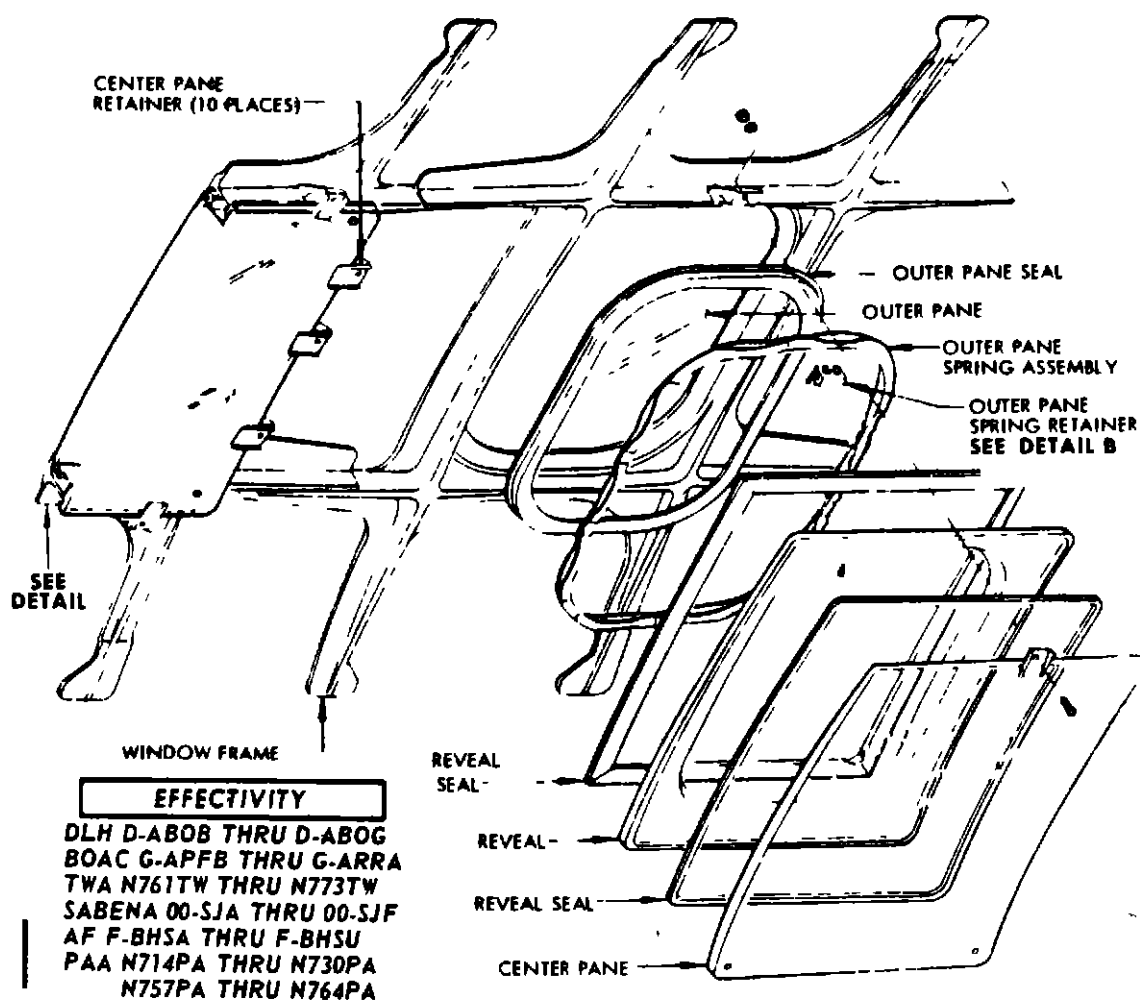
2. Passenger Windows

- A. The passenger windows (figure 2) consist of outer, center, and inner panes. 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 center panes are each capable of taking the full cabin pressurization load. Fail-safe structure is ensured by the center pane which can take shock loadings subsequent to outer pane failure. All three panes are acrylic, the structural panes being stretched and formed to improve resistance to crazing and to provide greater strength over previous manufacturing methods.
- B. The outer pane, which is rectangular in shape with rounded corners, is curved to suit the fuselage contour and has a peripheral seal of silicone rubber. A steel spring assembly holds the outer pane against the window frame forging. Spring retainers, which slip over special shouldered screws mounted on the window frame forging, hold the spring assembly and outer pane in position. (See figure 2, details A and B.) On airplanes OO-SJG thru OO-SJK, the spring assembly and retainer assembly have been replaced by 10 spring retainer clips. (See detail C.) On airplanes OO-SJL and on, an improved method of installing and sealing the outer pane on each passenger window is provided through the use of a molded ethylene propylene seal. The seal has staggered beads and an integral masking feature. Adjustable window retainer clips secure the outer pane and seal to the window frame. (See detail D.) The center pane seats in a plastic reveal which is pressure sealed, and both pane and reveal are held in position on the window frame forging by brackets and retainer clips.
- C. The emergency exit hatch window installations are very similar to those for the outer and center panes of the passenger windows. The only differences lie in the method of securing the panes. The outer pane spring retainers are screwed to the surrounding structure and cannot be as easily slipped off as the passenger window spring retainers. The center pane installation is secured by screws all around the reveal periphery, whereas the passenger window center pane installation is secured by 10 separate retainer clips.

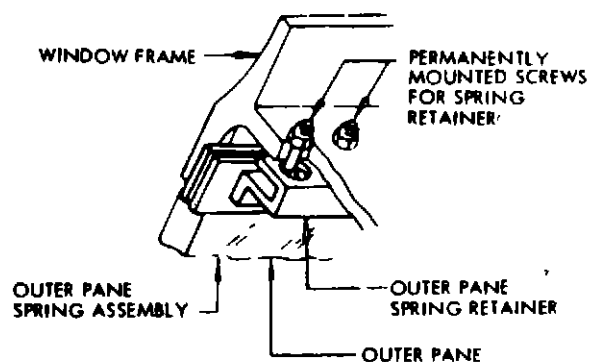


Passenger Cabin Windows Location
Figure 1

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DETAIL A

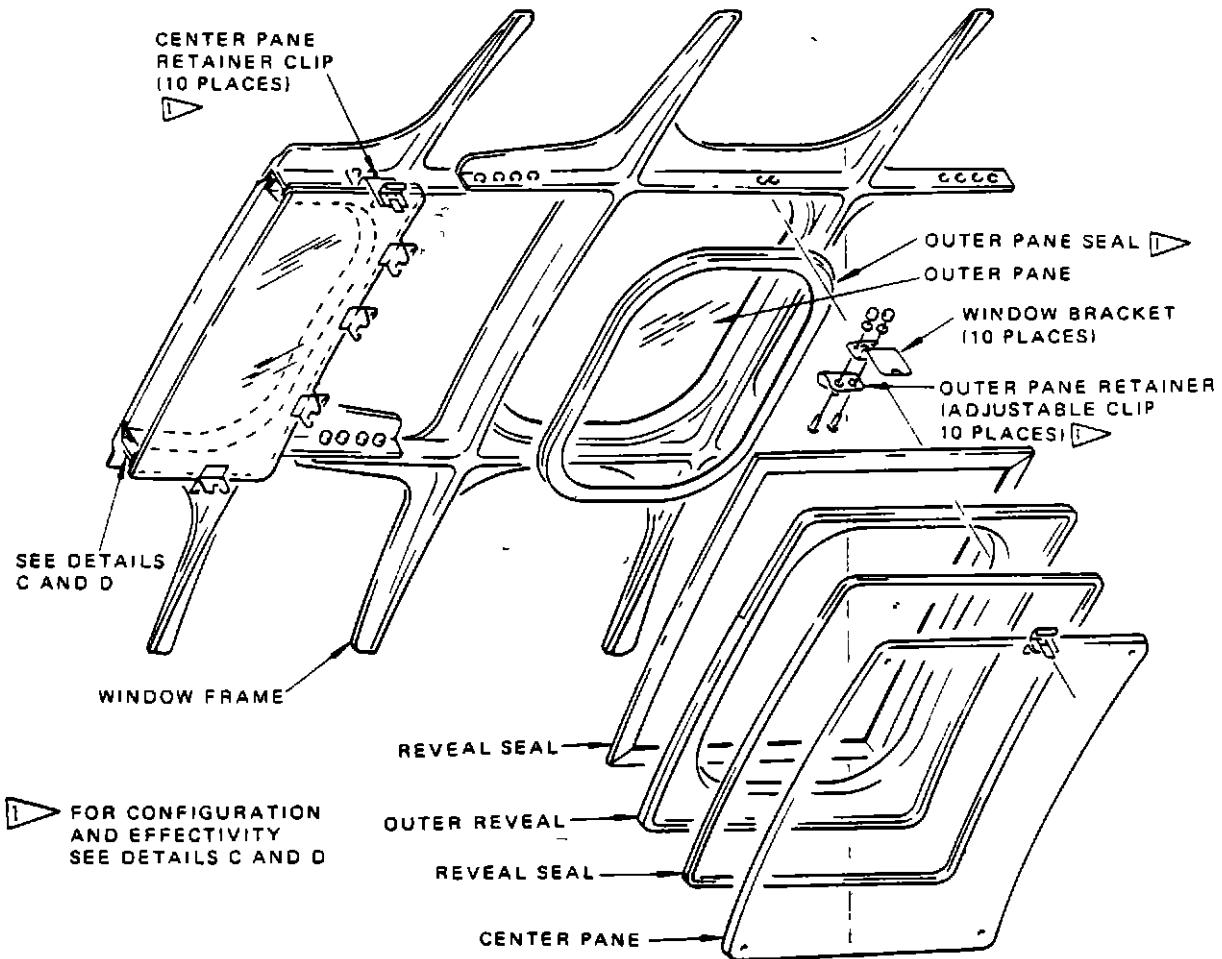


DETAIL B

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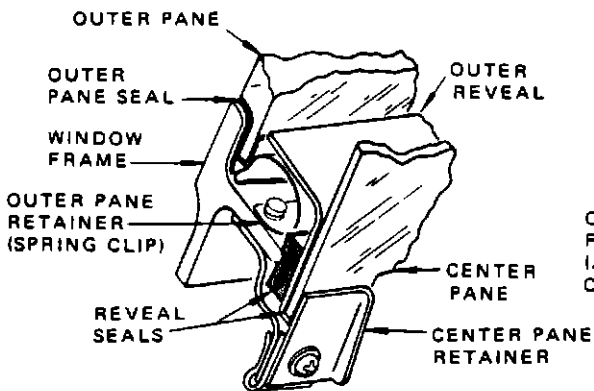
Passenger Cabin Window Details
Figure 2 (Sheet 1 of 2)

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Page 3



EFFECTIVITY

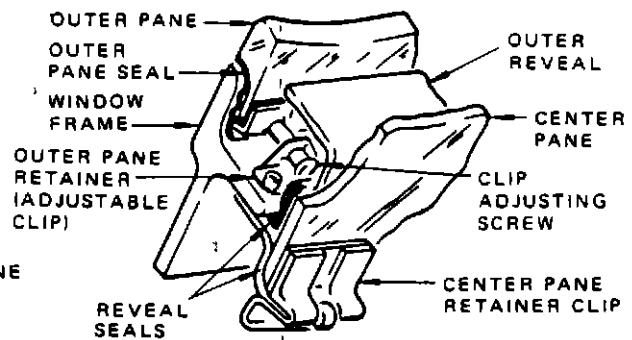
00 SJG thru 00 SJK



DETAIL C

EFFECTIVITY

00 SJL and on



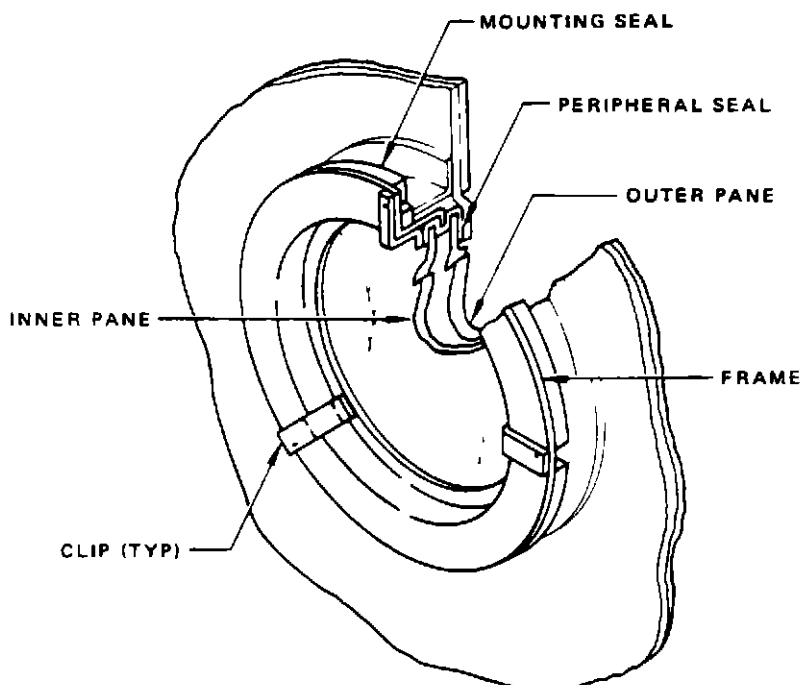
DETAIL D

MAINTENANCE MANUAL

- D. Part of the conditioned air passing through the air distribution risers below the window flows between the window panes. This air enters and leaves by way of small holes in the center pane and inner reveal and flows at a rate just sufficient to prevent condensation on window panes. On airplanes OO-SJG and on, conditioned air is not directed between the outer and center panes. See Air Conditioning, Chapter 21 Breather holes in the center panes permit enough airflow to prevent fogging on window panes.

3. Entry and Galley Service Door Windows

- A. The entry and galley service door windows (figure 3) are circular and consist of two separate panes of acrylic sheet. The two panes have a common peripheral seal of synthetic rubber and are curved to suit the fuselage contour. The window assembly is pressure sealed in the door structure by means of a sponge rubber mounting seal. The outer pane is retained by a circular frame held in the door structure by three screws. The inner pane is retained by three clips attached to the circular frame.





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PASSENGER CABIN WINDOWS - MAINTENANCE PRACTICES

1. Unit Servicing Passenger Cabin Windows

A General

- (1) Reapplication of the anti-static agent should not be required for several months provided that the treated surfaces remain inaccessible to weather and human contact. Activol solution is water soluble, therefore care should be taken not to wet or mar window pane surface after treatment.

B. Equipment and Materials

- (1) Activol 1390-M (Anti-static agent), manufactured by Harry Miller Corp., 4th and Bristol Streets, Philadelphia 40, Penna.
- (2) Boiled Cheesecloth Boil and drain three times.
- (3) Castile soap

C Application of Anti-Static Agent, Passenger Cabin Windows

- (1) Remove side wall lining. Refer to Passenger Cabin Equipment, Chapter 25
- (2) Remove center pane See Removal/Installation, Passenger Cabin Windows
- (3) Clean inner surface of outer pane, both surfaces of center pane, and outboard surface of inner 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 bare hand only, so that any dirt can be quickly detected and removed before it scratches the surface. 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.

NOTE Inner pane referred to is part of sidewall lining removed in step (1).

- (4) Mix 10 parts Activol with 120 parts water by weight
- (5) Soak boiled cheesecloth with Activol solution and apply to inner surface of outer pane, both surfaces of center pane, and outer surface of inner pane.



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- (6) Allow surfaces to dry, then polish with boiled cheesecloth using brisk straight motions of the hand and maintaining as light a pressure as possible.

CAUTION: DO NOT WET OR MAR WINDOW SURFACES AFTER TREATMENT.
ACTIVOL SOLUTION IS WATER SOLUBLE.

- (7) Install windowpanes. See Removal/Installation, Passenger Cabin Windows.
- (8) Install sidewall lining. Refer to Equipment and Furnishings, Chapter 25.

2. Removal/Installation Passenger Cabin Windows

A. Equipment and Materials

- (1) Cellulose acetate sheeting, Permacel Tape No. 76, Minnesota Mining and Manufacturing Tape No. 221 or Transparent Cellophane No. 600, Spraylat SC-1058R, or equivalent
- (2) Masking tape
- (3) Wooden or plastic scraper
- (4) Cheesecloth or equivalent
- (5) EC 1128 - Minnesota Mining and Manufacturing Co.
- (6) 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.

- (7) Castile soap
- (8) ST1876-R, passenger window spring clip tool

B. Remove Passenger Cabin Windows

- (1) Remove sidewall lining. Refer to Passenger Cabin Equipment, Chapter 25.
- (2) Apply protective covering, of cellulose sheeting or equivalent, to accessible surfaces of windowpanes which are to be removed and reinstalled. Secure cover with masking tape if necessary.
- (3) On center pane retainers installed with screws, loosen screws and rotate retainer (9, figure 201, detail C) so that pane can be removed. On center panes installed with center pane retainer clips (9, detail D), remove the clips.



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- (4) Remove center pane (8) and outer window reveal (6).

CAUTION: IF PANE IS TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE SHEETING OR EQUIVALENT 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.

- (5) Strip seals (5 and 7) from outer window reveal. This step is only necessary if the seals are torn or damaged in any way. To strip seal, scrape carefully using a wooden or plastic scraper, and clean up with aliphatic naphtha.

WARNING: ALIPHATIC NAPHTHA IS FLAMMABLE.

- (6) On windows fitted with a spring assembly (3, figure 201, details A and B), remove outer pane spring retainers (4) by pushing each retainer outboard against the spring assembly (3) and lifting so that it slips over heads of special shouldered bolts. Take off spring assembly (3) and outer pane (2).
- (7) On windows fitted with spring clips (3, figure 201, detail C), remove spring clips (3) using spring clip tool and remove outer pane (2).
- (8) On windows fitted with adjustable clips (3, detail D), loosen the clip adjusting screws, remove adjustable clips (3) and remove outer pane (2).

CAUTION: IF PANE IS TO BE REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE SHEETING OR EQUIVALENT SHOULD BE APPLIED TO SURFACES TO PREVENT DAMAGE DURING HANDLING.

C. Preinstallation Procedures

- (1) Clean faying surfaces of new seal and outer reveal, if seal is being replaced, with aliphatic naphtha applied with a clean, oil-free, absorbent material.
- (2) Wipe off cleaner before it has evaporated with a clean, oil and lint-free, absorbent material such as Finetex, new cheesecloth or equivalent.
- (3) Repeat applications of cleaner as necessary.
- (4) Mix EC 1128, Minnesota Mining and Manufacturing Company, thoroughly before using.
- (5) Brush adhesive onto both faying surfaces.



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- (6) 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.

- (7) Press seal and reveal 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. EC 1128 shall not be heat cured.

- (8) Clean up as necessary with aliphatic naphtha, TT-N-95.

D. Install Passenger Windows

- (1) On windows fitted with a spring assembly (3, figure 201, sheet 1), install outer pane (2) and spring assembly (3). Install outer pane spring retainers (4) by pushing each retainer outboard against the spring, and slipping the retainer down over the heads of the special bolts.
- (2) On windows fitted with spring clips (3, figure 201, sheet 2, detail C), install outer pane (2) and spring clips (3) using spring clip tool.
- (3) On windows fitted with adjustable clips (3, detail D), install outer pane (2) and adjustable clips (3). Torque clip adjusting screws 4 to 6 inch-pounds.
- (4) Remove protective cover from inner surface of outer pane.
- (5) Clean, and apply antistatic agent to, inner surface of outer pane. See Servicing, Passenger Windows.
- (6) Remove protective cover from outer surface of center pane (8).
- (7) Clean, and apply antistatic agent to, outer surface of center pane. See Servicing, Passenger Windows.
- (8) Install outer window reveal (6) and center pane.

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

- (9) On center pane retainers (9, detail C) installed with screws, position the retainers to hold center pane in place and tighten screws. On center panes installed with center pane retainer clips (9, detail D), install the clips.

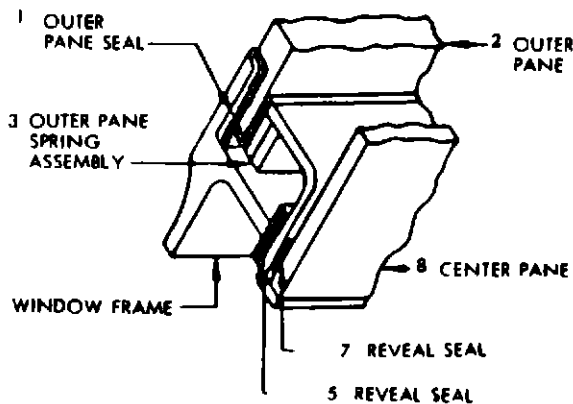
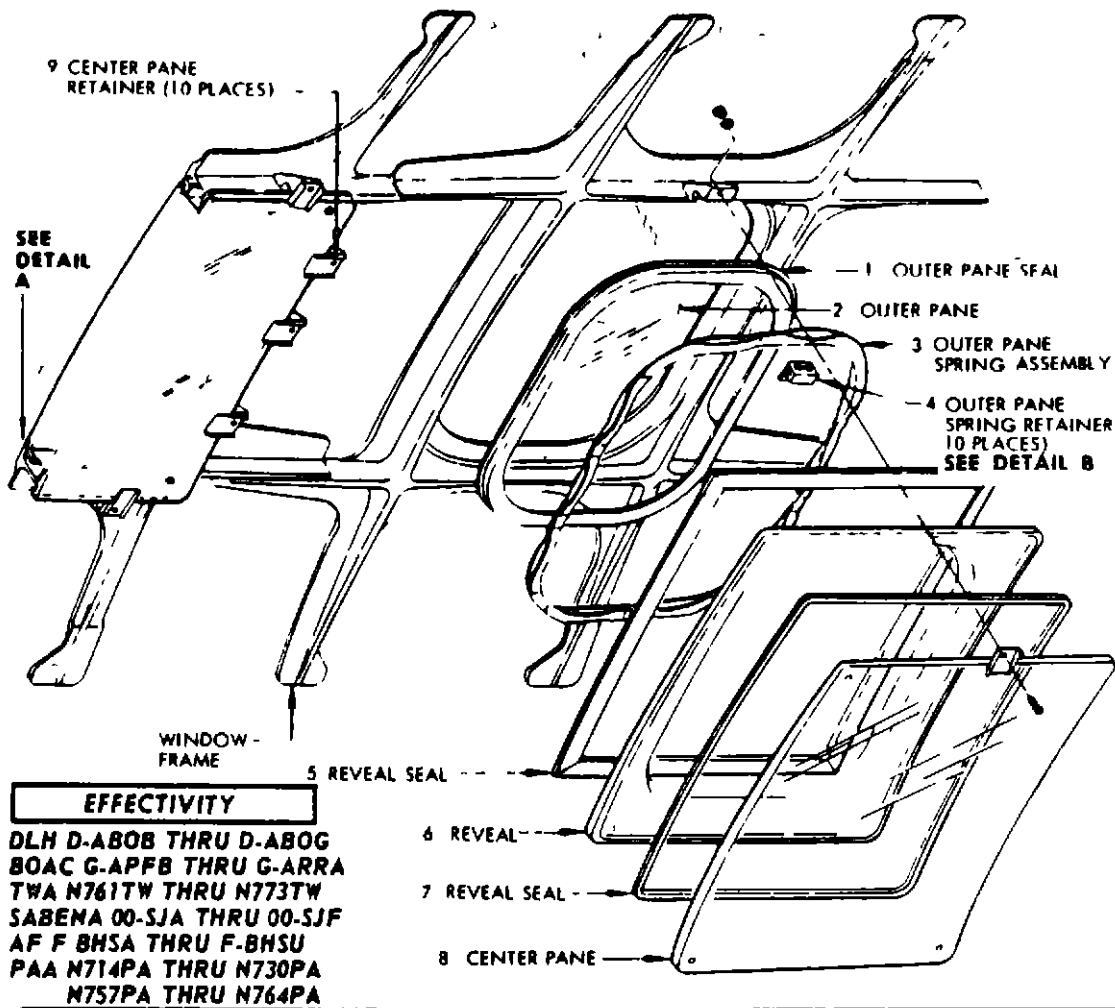


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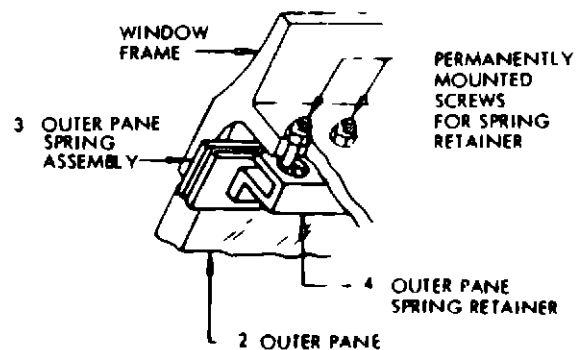
- (10) Remove protective cover from inner surface of center pane.
- (11) Clean, and apply antistatic agent to, inner surface of center pane. See Servicing, Passenger Windows.
- (12) Install sidewall lining. Refer to Passenger Cabin Equipment, Chapter 25.
- (13) Remove protective cover from outer surface of outer pane.
- (14) On outer panes installed with a beaded molded ethylene propylene seal with an integral masking feature, remove the center part of the protective seal cover along the beaded notch line from the outer surface of the outer pane.
- (15) 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.
- (16) 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.

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DETAIL A



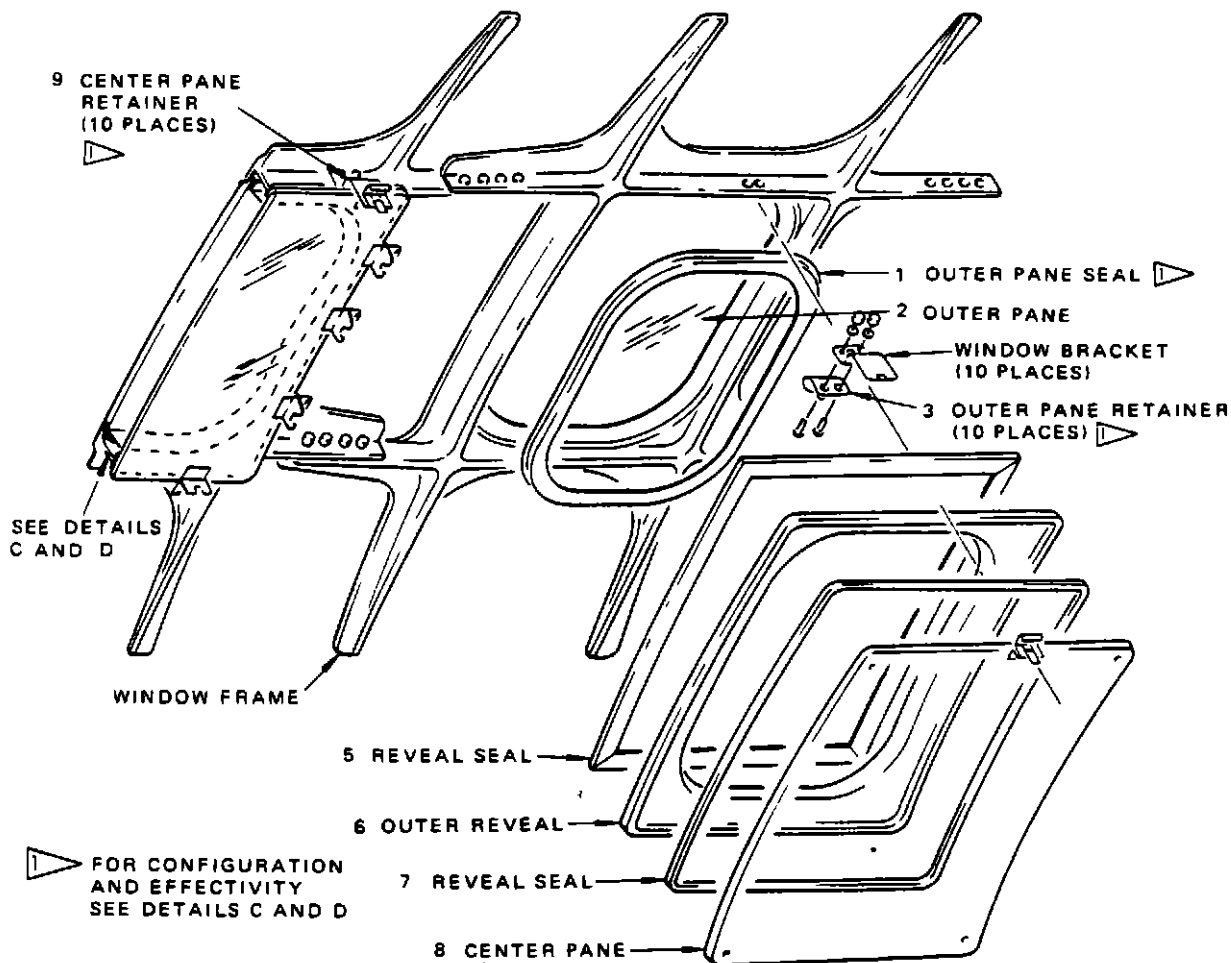
DETAIL B

Passenger Cabin Window Installation
Figure 201 (Sheet 1)

EFFECTIVITY

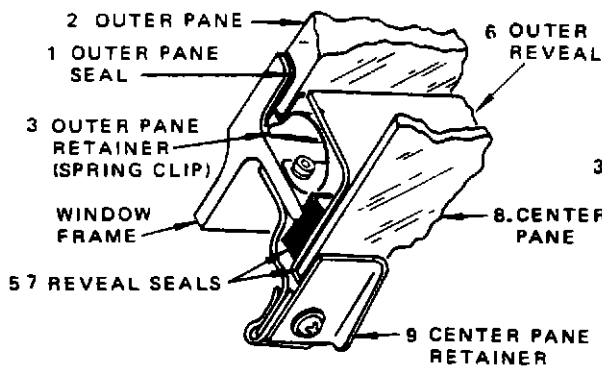
00 SJG and on

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EFFECTIVITY

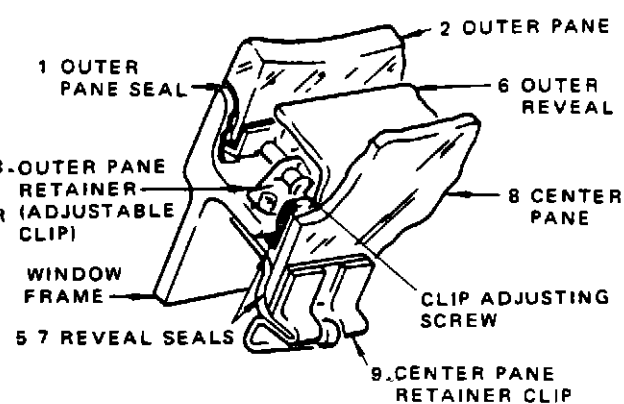
00 SJG thru 00 SJK



DETAIL C

EFFECTIVITY

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DETAIL D

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Passenger Cabin Window Installation
Figure 201 (Sheet 2)

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3. Inspection/Check Passenger Cabin Windows

A. Examine for the following:

- (1) Scratches, cracks and crazing of acrylic panes as described in paragraph B.
- (2) Deterioration of seals.
- (3) Marks, scratches and dents in plastic reveal.
- (4) Loose or missing fasteners at window retaining brackets.

B. Window Replacement Criteria

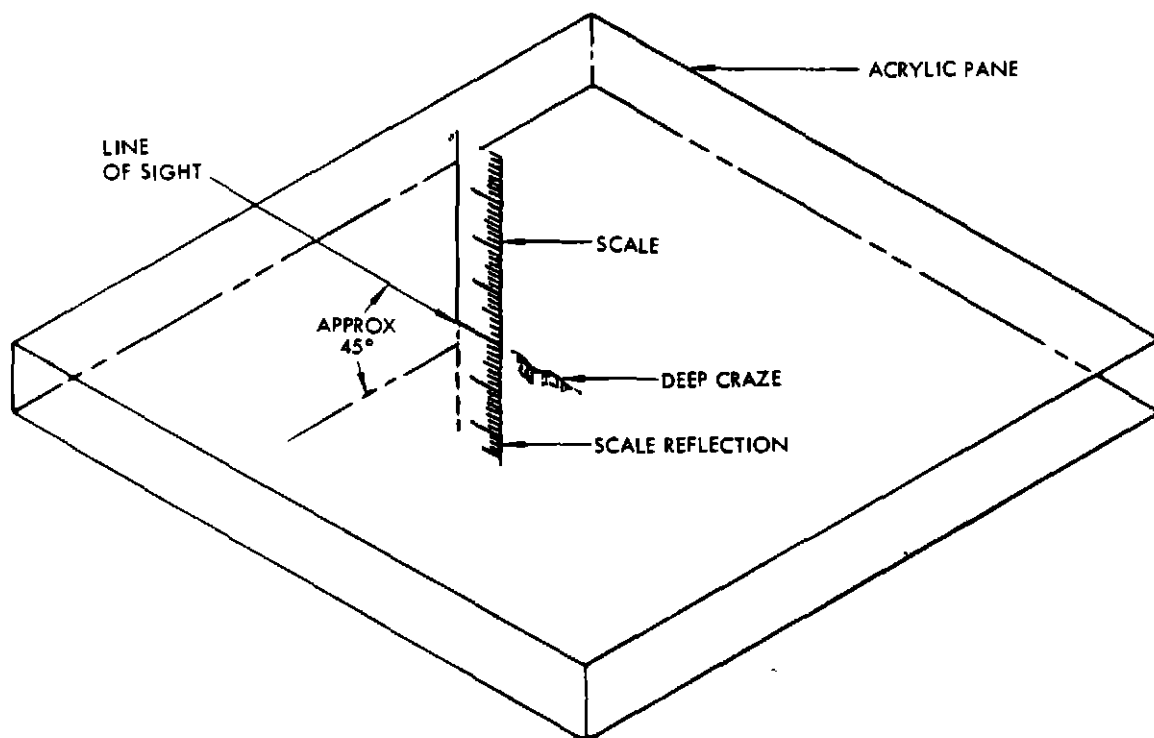
- (1) In attempting to establish window replacement criteria for the normally expected defects as listed below it is assumed that the optical or visibility criterion will be established by individual operators.
- (2) Cracks
 - (a) A crack is a fissure perpendicular to the surface which extends all the way through 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.
- (3) Crazing
 - (a) 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.

- (b) 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.

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- (c) Surface crazing in the outer pane, other than at the routed edge, is permissible within the following limits:
- 1) 0.08 inch maximum depth in local area not over 2 inches in diameter.
 - 2) 0.06 inch maximum depth over entire surface.
 - 3) 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 degrees, determine the apparent depth of craze. Double this apparent depth to get approximation of actual depth. (See figure 202.) The apparent depth cannot be used because of the refractive qualities of the acrylic.
- (d) Routed Radius Crazing
- 1) Crazing in the radius of the routed edge (figure 203) 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



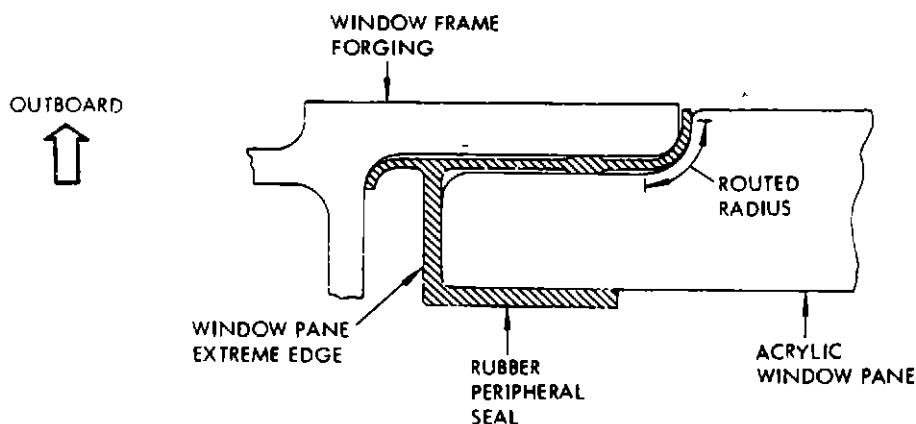
NOTE DOUBLE APPARENT DEPTH TO GET ACTUAL DEPTH



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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.

- 2) The routed edge of the window pane is the most likely part in which crazing may occur. There are two main reasons for this. First, 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 rubber seal might aggravate the situation by soaking up the material and prolonging contact. The second reason is that 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.
- 3) 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 window panes is done on a sampling basis, it follows that some windows will have crazed routed radii and will not get checked. This should not cause undue concern because stretched acrylic has the quality of restraining craze propagation and will probably last until such time as the next overhaul is carried out. However, if crazing is evident in the routed radius above the limits mentioned in paragraph 4), that pane should be replaced and examination of remaining windows instituted.



Joint of Acrylic Pane with Window Frame Forging
Figure 203



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- 4) Crazeing 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. Crazeing around delaminated areas shall not exceed 0.010 inch deep.

(4) Delamination (Outer Pane Only)

- (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. 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 crazeing

CAUTION NO DELAMINATION IS ALLOWED IN THE CENTER WINDOW PANE.

- (b) Outer pane delamination at the extreme edge (figure 203) is permissible within the following limits

Maximum extension in from edge	0.40 inch
Maximum length at edge	1.00 inch
Minimum distance between defects	2.00 inches
Maximum number per edge	2
Maximum number per pane	4

- (c) Large delaminations in the routed radius are definitely more serious than crazeing 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.
- (d) It is not anticipated that a routed radius delamination will occur as often as a crazeing defect in the same place. Whereas the rubber peripheral seal on the outer pane tended to aggravate the crazeing 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.
- (e) Delaminations around the routed edge and routed radius may be more or less continuous, in which case the maximum depth of penetration shall be 0.025 inch. Delaminations resulting from physical contacts to the routed radius and routed edge are usually concentrated about one point. For this case, 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 crazeing around the delaminated area does not exceed 0.010 inch deep.



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- (f) Extreme edge delamination will be impossible to see without first removing the windowpane. In general, it is recommended that evidence of routed radius delamination and crazing in excess of limits mentioned in paragraphs (b) and (e) is reason for replacement of the pane as soon as possible. As with routed radius crazing, spot examination will not reveal all the defects, but it is felt that, although above the limits in paragraphs (b) and (e) would warrant replacement when found, routed radius delamination need not be cause of decrease in length of time between examinations. The examinations of remaining windows should be based on findings of spot checks.
- (g) 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

Maximum chip depth	0.05 inch
Maximum size of delamination	0.50 inch diameter
Minimum distance between defects	Twice maximum damage diameter

(5) 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 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.
- (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 delamination 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 the 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.

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- (f) Scratches in the exterior surface of the outer pane, easily detected by visual examination, are critical if they exceed the limits set out below. This surface of the pane is in tension under the cabin pressurisation load and sever 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 pressurisation loads if the outer pane should fail. Therefore, scratches are critical in the center pane if they exceed the limits described in paragraph (f) above.
- (h) The inner pane, mounted in the cabin sidewall lining, is not structural. Only optical or visibility criteria apply for removal and replacement.

(6) 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 (4)(g).

(7) Concavity

- (a) Concavity of outer pane is the loss of forming contour causing the pane to move inward. Check for the following:
- 1) Extreme localized distortion and thickness variances.
 - a) Check for uneven surface contour and reduced optical quality. Exposure to high temperatures such as a photolamp is cause.
 - b) Replace window with extreme localized distortion or thickness variance.
 - 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.

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- b) Removed outer panes are acceptable for reinstallation provided concavity does not exceed 0.1 inch as measured in the fore and aft direction.
- c) Check seals for leakage into window cavity between outer and middle pane.
- d) Check window edge thoroughly for delamination per (4).
- e) Replace concave windows with leaking seals.

4. Approved Repair Passenger Cabin Windows

A. General

- (1) Areas of the passenger cabin windows most likely to get scratched are the exterior surface of the outer pane, at the fuselage skin line, and the interior surface of the inner pane in the cabin sidewall lining. 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.
- (2) 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.
- (3) 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.
- (4) Care should be used in handling of windowpanes to avoid scratching or otherwise damaging the plastic surfaces.
 - (a) 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.
 - (b) Polished windowpanes should only be handled when wearing clean cotton gloves.
 - (c) The use of harmful cleaners or solvents must be avoided.
 - (d) Care must be taken not to scratch the window surface with finger rings or other sharp objects.

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B Equipment and Materials

(1) Waxes

- (a) Kwykwax
- (b) Simoniz, Simoniz Company, Chicago, Illinois
- (c) Franklins Plexiglas Wax
- (d) Duco No 7

(2) Buffing Compounds

- (a) Learock No 888, Lea Manufacturing Co., 16 Cherry Avenue, Waterbury 20 Connecticut
- (b) Learock No S-30, Lea Manufacturing Co
- (c) No. 962 Matchless Grey, Matchless Metal Polish Co , 726 Bloomfield Avenue, Glen Ridge, New Jersey

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(3) Buffing Wheels

- (a) Stitched flannel buffing wheels 4, 6 and 8 inches in diameter, 1 and 2 inches thick for 0.25 inch arbor
- (b) Grey No. 4M-30 or Red No. B-7, Hanson-Van Winkle - Munning Co., Matawan, New Jersey
- (c) Triple A, Goodison Manufacturing Co.

(4) Polishes and Cleaners

- (a) Plastishine A, Cee-Bee Chemical Co.
- (b) Wilco Anti-Static Plastic Cleaner
- (c) Wilco Scratch Removing Compound No. 35
- (d) Permatex Plastic Cleaner
- (e) Deleted.
- (f) Ken-Glow Polish
- (g) Ken-Nite Polish and Cleaner
- (h) Simoniz Liquid Cleaner
- (i) Aliphatic Maphtha, TT-N-95, Type II

(5) Protective Coating and Tapes

- (a) Spraylat SC-1058R per MIL-C-6799, Item 3.12, Total Light Transmission may be waived
- (b) Spraylat SC-1072 Black
- (c) Permacel No. 76 Tape, Industrial Tape Corp., New Brunswick, N.J.
- (d) No 221 Tape, Transparent Cellophane Tape or 3M No. Y-9044 Tape, Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
- (e) Gizand Protex 20V Tape, Mask-Off Company, Monrovia, California

(6) Sandpaper

- (a) Carborundum Wet-and-Dry paper, 400A and 600A grit

C. Outer Windowpane

- (1) Rework limits on the outer panes should be limited to the minimum dimensions after rework as shown on figure 204.
 - (a) Deleted.

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(b) Deleted.

D. Center Window Pane

- (1) The center window panes, designed to take full pressurization loads and shock loads in the event of outer pane failure, are limited to the following minimum thicknesses after rework
 - (a) Windows of nominal 0.210 inch thickness
Thickness at all locations. 0.185 inch
 - (b) Windows of nominal 0.220 inch thickness
Thickness at all locations. 0.197 inch
 - (c) Windows of nominal 0.168 inch thickness.
Thickness at all locations. 0.151 inch

E. Inner Window Pane

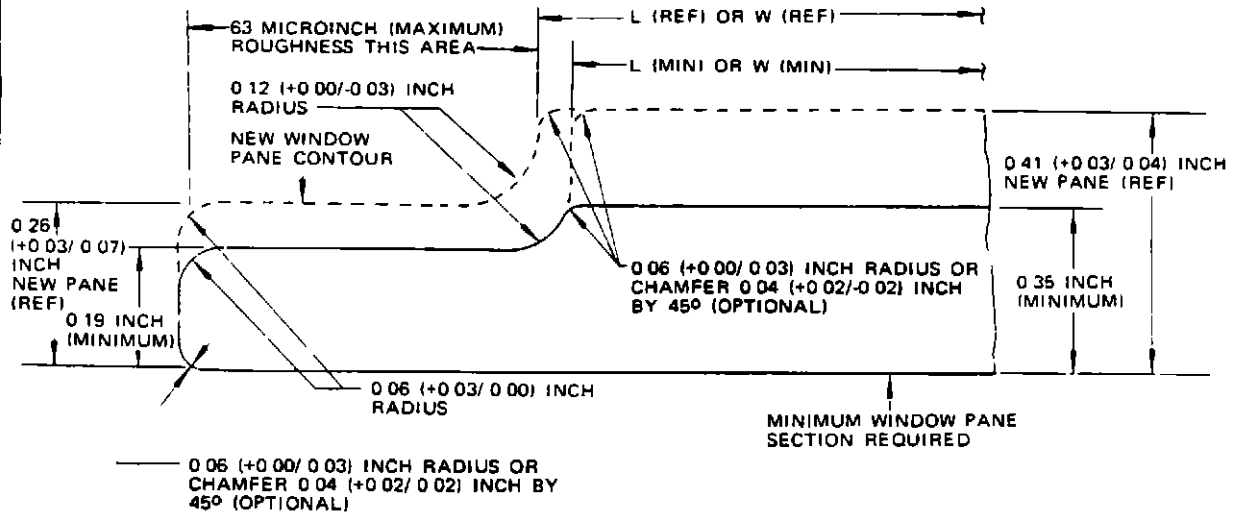
- (1) Each of the inner window panes mounted in the cabin sidewall linings is a nonstructural component and need only be considered from an optical standpoint. Do not attempt to remove defects by polishing small local areas as this causes "bullseye" effects and severe optical distortion. By polishing the complete viewing surface of the window and removing material evenly, defects up to 0.03 inch maximum depth can be removed.

F. Cleaning, Polishing, and Waxing

- (1) Window panes with superficial or minor scratches can be restored to satisfactory condition after removal from the airplane by cleaning, polishing, and waxing.
 - (a) Clean the pane by flushing the surface with plenty of clean water using the 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 as a means of carrying the soapy water to the window. Wash the window with clean water and dry it with clean compressed air or a clean damp chamois. If soap and water do not satisfactorily clean the window, apply a cleaning agent such as Wilco Antistatic 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 THE WINDOW.

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PART NO.	50-11398
L (REF)	12.50 (+0.03/-0.03) INCH
L (MIN)	12.37 INCH
W (REF)	9.00 (+0.03/-0.03) INCH
W-(MIN)	8.87 INCH

NOTE: The rework limits do not include crazing and if crazing occurs the windowpane must be replaced



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- (b) Cover the side of the window not being polished with sprayed or taped protective covering. Polish the window with one of the approved polishes either by hand and suitable cloths or by using a 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 wheels.
- (c) Hand polishing or buffing operations should be done with a circular motion of the hand and cover as large a portion of the window as possible. Start at the pane center and work outwards to the edges. It is preferable to use a clean cloth for each operation in the procedure. Superficial scratches can be removed by applying a polish to a wet clean cloth and rubbing the window, but minor scratches may require rubbing first with cloth and fine buffing compound such as Learock No. 888 and then finishing with one of the listed polishes.
- (d) Machine polishing and buffing are preferred when the 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 THE WINDOW, KEEP THE BUFFING WHEEL IN CONSTANT MOTION OVER THE WINDOW SO THAT THE WINDOW SURFACE TEMPERATURE DOES NOT EXCEED 125° TO 130°F. AT THIS TEMPERATURE, THE WINDOW WILL NOT FEEL HOT WHEN TOUCHED BY THE BACK OF THE HAND WITHIN 2 SECONDS OF REMOVING PANE FROM THE BUFFING WHEEL.

- (e) 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 discs and reduce half of them to 1/2 the original diameter. Reassemble the wheel, alternating the large discs with the 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 the 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 the wheel speed or by buffing the entire surface of the window.



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- (f) After the window has been polished, it should be carefully measured to ensure that it complies with the minimum thickness requirements and then waxed. One of the approved waxes should be applied to the window and lightly polished with a flannel cloth. Finally the window faces should be brushed or sprayed with Spraylat or masked with an approved tape for storage.
- (2) Hand sanding should be used to remove the buildup material on major scratches. The 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 the window.
 - (a) Before hand sanding the damaged area, the window should be cleaned and masked as described in paragraphs F.(1)(a) and (b).
 - (b) Start sanding with wet-or-dry No. 400-A sandpaper which has been soaked in water for a few minutes. Wrap the 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. The surface should be rubbed across the scratch at a 45° angle using light hand pressure with frequent applications of water. Change the sandpaper as required. The affected area should be sanded with No. 400-A sandpaper until the scratch buildup material is removed. The sanding abrasions are then reduced by repeating the sanding with No. 600-A wet-or-dry sandpaper which has been soaked in water.
 - (c) After sanding, the scratches should be in the minor category and the sanded area takes on a frosted appearance. Apply Learock S-30, or its equivalent, to a buffing wheel and buff the affected area as detailed in paragraph F.(1)(d) until the 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 distortion.
 - (d) Apply Learock 888 buffing compound to a clean buffing wheel and polish the window surface to a high gloss, as described in paragraph F.(1)(d).
 - (e) Following the repair, check that the window thickness complies with the minimum thickness requirement, lightly polish it with one of the approved waxes and protect the faces with Spraylat or an approved tape.

WINDOW OUTER PLATE - REMOVAL/INSTALLATION

EFFECTIVITY

Airplanes with window outer plate (plug)

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. Aliphatic Naphtha TT-N-95
- E. ST1876R, Passenger Window Spring Clip Tool

2. Remove Window Outer Plate

- A. Remove protective sidewall lining to gain access to window.
- B. On windows fitted with spring clips, use the spring clip tool and remove the ten window retaining spring clips (Fig. 201, detail A).
- C. On windows fitted with adjustable clips, loosen clip adjusting screws and remove the ten window retaining adjustable clips (detail A).
- D. Disconnect grounding strap (if installed) from plate (plug).
- E. Remove window outer plate.

CAUTION. UNLESS THE PLATE IS TO BE IMMEDIATELY REINSTALLED, A PROTECTIVE COVERING OF CELLULOSE SHEETING SHOULD BE APPLIED TO PLATE SURFACES TO PREVENT DAMAGE DURING HANDLING.

- F. Remove seal from outer plate. This step is only necessary if the seal is torn or damaged in any way.

3. Prepare Window Outer Plate for Installation

- A. Remove protective cover if installed, from window outer plate.
- B. Clean facing surfaces of seal and window frame with aliphatic naphtha applied with a clean, oil-free, absorbent material.

WARNING. ALIPHATIC NAPHTHA IS FLAMMABLE.

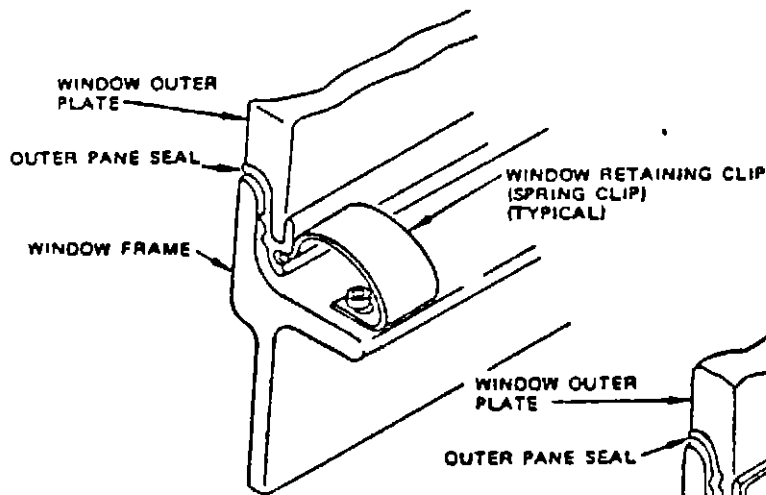
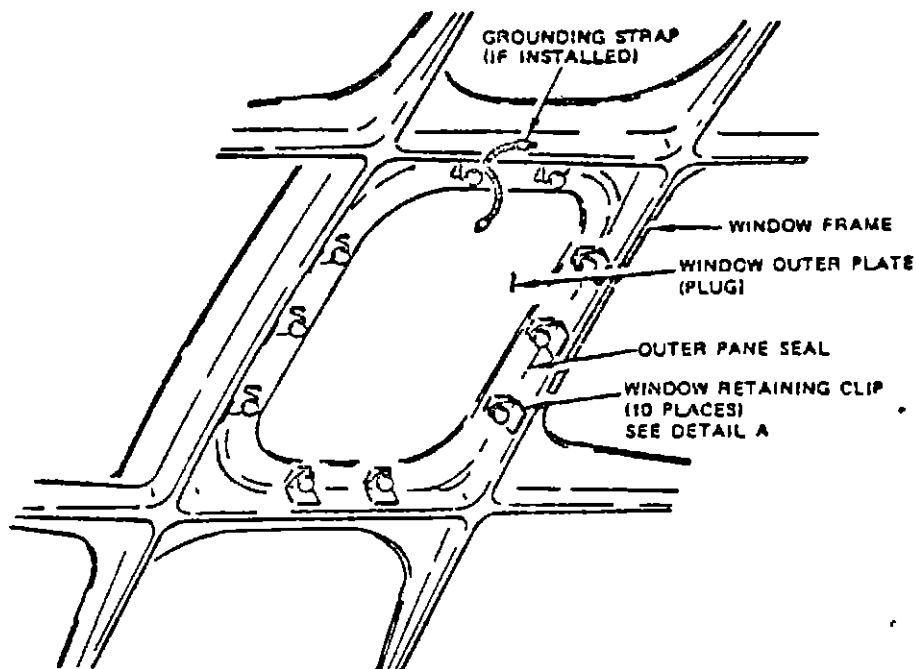
- C. Wipe the plate and window frame surfaces dry with a clean, oil and lint-free, absorbent material such as Finetex, or new cheesecloth.

4. Install Window Outer Plate

- A. Install seal on outer plate if the seal was removed.
- B. Install window outer plate in window frame.
- C. On windows fitted with spring clips, install the ten window retaining spring clips using the spring clip tool (Fig. 201, detail A).
- D. On windows fitted with adjustable clips, install the ten window retaining adjustable clips (detail A). Torque clip adjusting screws 4 to 6 inch-pounds.
- E. Install protective sidewall lining.

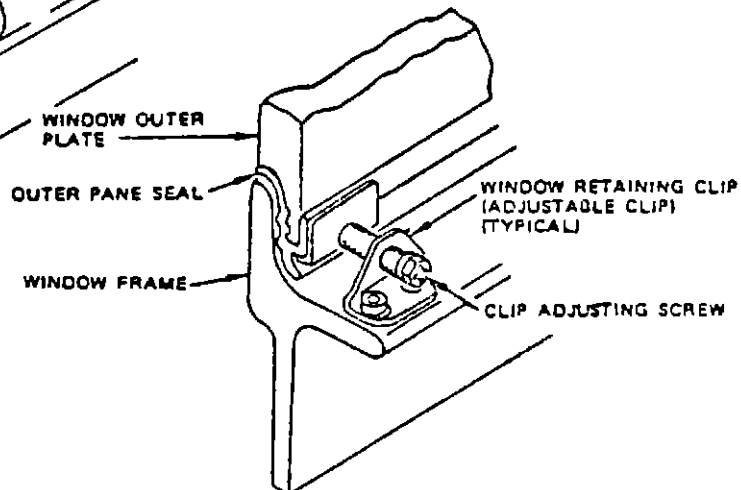


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WINDOW OUTER PLATE WITH SPRING CLIPS

DETAIL A



WINDOW OUTER PLATE WITH ADJUSTABLE CLIPS

DETAIL A

Window Outer Plate Installation

Figure 201

TR 56-27

SN REV. November 27, 1960

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ENTRY AND GALLEY SERVICE DOOR WINDOWS - MAINTENANCE PRACTICES

1. **Removal/Installation Entry and Galley Service Door Windows**

A. **Equipment and Materials**

- (1) Cellulose acetate sheeting, Permacel Tape No. 76, Minnesota Mining and Manufacturing Tape No. 221 or Transparent Cellophane No. 600, Spraylat SC-1058R, or equivalent
- (2) Masking tape.
- (3) Boiled cheesecloth.
- (4) Castile soap.

B **Remove Entry and Galley Service Door Windows**

- (1) Remove door lining and insulation as necessary to gain access to window Refer to Chapter 25, "Door Lining and Insulation."
- (2) Apply protective cover to accessible surfaces of window panes which are to be removed and later reinstalled
- (3) Remove three clips (5, figure 201) holding inner pane (6) in position

NOTE If removal of the inner pane is not required, then this step is unnecessary.

- (4) Remove three screws holding window assembly in position
- (5) Remove window assembly.

CAUTION. HANDLE ASSEMBLY WITH CARE BECAUSE WINDOW PANES ARE ONLY HELD BY STIFFNESS OF THEIR COMMON PERIPHERAL RUBBER SEAL.

- (6) Remove window panes as required and apply protective cover to uncovered surfaces of any panes which are removed, but will be reinstalled

C **Install Entry and Galley Service Door Windows**

- (1) Remove protective covering from inner surface of outer pane (3, figure 201) and from outer surface of inner pane (6)
- (2) Clean inner surface of outer pane and outer surface of inner 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.



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- (3) 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.

- (4) Install pane or panes in rubber seal (2).

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

- (5) Install window assembly and three screws which retain it in the airframe.

- (6) Install three clips (5) which secure inner pane in position in window assembly.

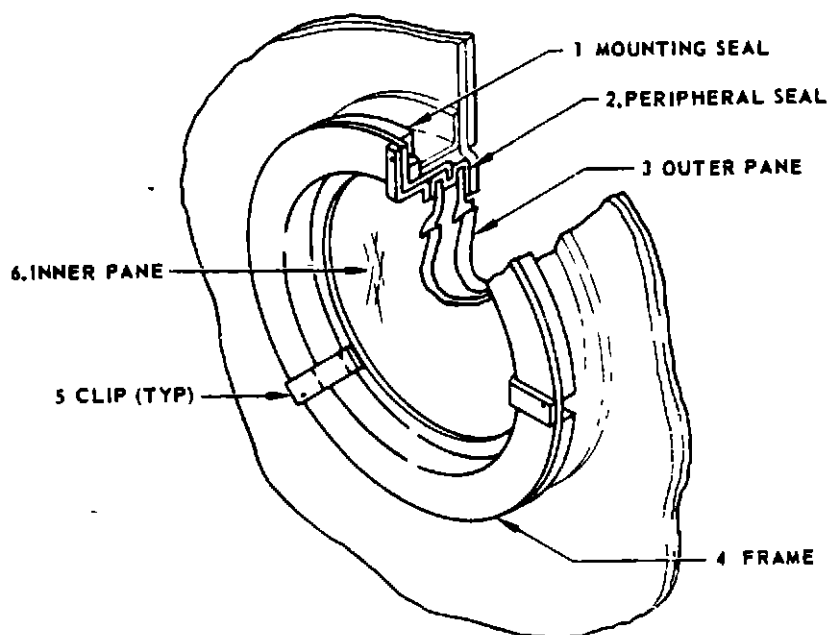
- (7) Remove protective covering from accessible surfaces of panes

- (8) Clean accessible surfaces of panes with luke warm water and castile soap. Refer to method in step (2).

- (9) Wipe dry with a clean, damp chamois.

CAUTION: REFER TO STEP (3)

- (10) Install door lining and insulation Refer to Chapter 25, "Door Lining and Insulation."

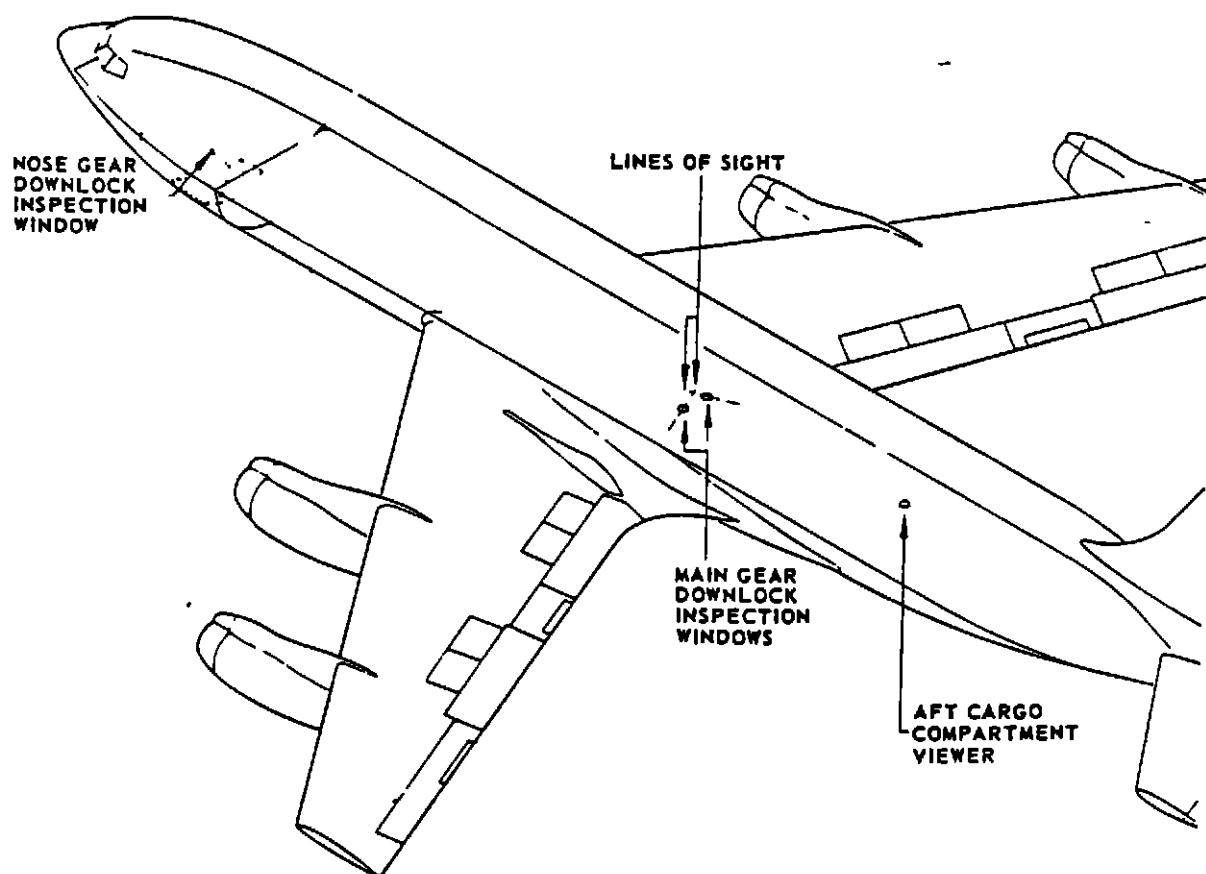


Entry and Galley Service Door Window Installation
Figure 201

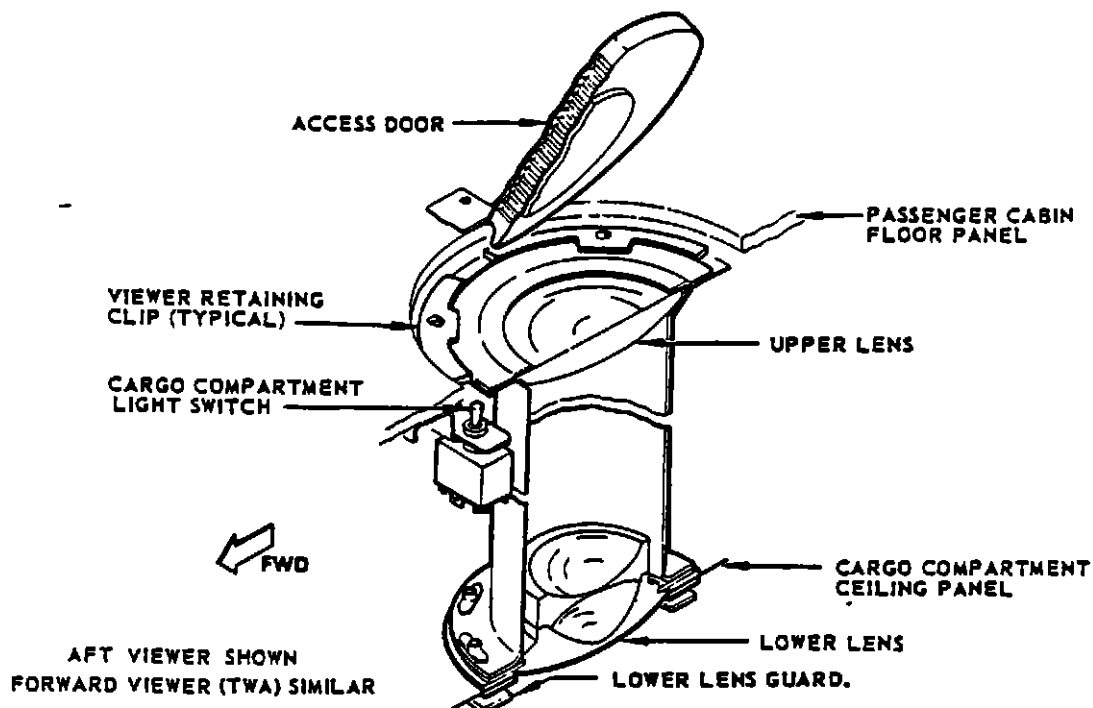
INSPECTION WINDOWS - DESCRIPTION AND OPERATION

1. General

- A. The inspection windows (figure 1) consist of left and right main gear downlock windows, a nose gear downlock window, and forward and aft cargo compartment viewers.



- B. The main gear downlock windows are located in the floor of the passenger cabin, immediately above the main wheel well and in line with the main gear side strut. The nose gear downlock window is located in the top panel of the wheel well in the lower nose compartment. The panes in these gear downlock inspection windows are laminated and consist of two layers of glass with a vinyl layer sandwiched between them. Synthetic rubber seals are used at both inner and outer surfaces of pane. A retaining ring holds the seals and the pane in position to make a pressure tight joint. Main landing gear emergency indicators are provided for use when main cargo compartment is loaded (See Landing Gear, Chapter 32)
- C. The forward cargo compartment inspection window is located in the interior door at the forward end of the forward cargo compartment. The window utilizes the same three layer laminated pane as the gear downlock windows. In this case, the pane is held in place by annular rings on either side of the door.
- D. Deleted
- E. The aft cargo compartment viewer is located in the passenger cabin floor, its position being indicated by a location stud in the right-hand front corner of the aisle rug which covers it. The viewer has a wide angle lens which permits visual examination of most of the cargo compartment at one and the same time. The viewer 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.



Cargo Compartment Viewer Installation
Figure 2



INSPECTION WINDOWS - MAINTENANCE PRACTICES

1. Inspection/Check Inspection Windows

A Examine for the following:

- (1) Scratches, cracks, delamination and chipping of window panes.
Refer to 56-1-0, "Inspection/Check, Control Cabin Windows".
- (2) Deterioration of seals.
- (3) Loose or missing fasteners at window retainers.
- (4) Scratches and chipping of cargo compartment viewer lenses.

END





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NOSE LANDING GEAR DOWNLOCK INSPECTION WINDOW - MAINTENANCE PRACTICES

1 Removal/Installation Nose Landing Gear Downlock Inspection Window

A Equipment and Materials

- (1) Cellulose Acetate Sheeting, Kodapak No E-463, Polyester Transparent Tape No 850 Minnesota Mining and Manufacturing Co , or equivalent
- (2) Masking Tape No. 202, Minnesota Mining and Manufacturing Co
- (3) Cheesecloth, Finetex, or equivalent
- (4) Castile soap
- (5) Parting Agent, Delco X769, or one part by weight of MIL-I-7444 1in/1 Tubing dissolved in four parts of cyclohexanone
- (6) Sealant, BMS 5-19, Class B, or equivalent
- (7) Aliphatic Naphtha, TT-N-95

B. Remove Nose Landing Gear Downlock Inspection Window

- (1) Remove viewing mirror and bracket.
- (2) Remove split ring, seal ring and window glass

C Prepare for Installation

- (1) Apply protective cover of cellulose acetate, or equivalent, to window glass surfaces and secure with masking tape

NOTE Do not cover area which contacts seals on both inner and outer face of window glass

- (2) Clean split ring, seal ring and window support ring with aliphatic naphtha applied with a clean, oil-free, absorbent material.

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- (3) Wipe the surfaces of each ring dry with a clean, oil and lint-free, absorbent material such as Finetex, new cheesecloth, or equivalent
 - (4) Apply parting agent, Delco X76) or equivalent, to all areas where it is possible for sealant to adhere on the window support ring and split ring
 - (5) Apply removable faying surface sealant, EMS 5-19, Class B, in a continuous bead around the support ring flange just prior to installation of the window glass. The sealant should form a gasket on the bottom side of the glass, between the glass and the parting agent on the window support ring, when the window glass is installed
- D Install Nose Landing Gear Downlock Inspection Window
- (1) Install window glass on support ring and press down on glass
 - (2) Remove all extruded sealant from entire periphery of the window glass
 - (3) Install seal ring and split ring. Secure with attaching screws.
- E Restore Airplane to Normal
- (1) Remove protective cover from window glass
 - (2) Clean window with lukewarm water and castile soap applied with a soft cloth such as boiled cheesecloth, rinse with clean water and wipe dry
 - (3) Install viewing mirror and bracket. Adjust to center image in mirror

CARGO COMPARTMENT VIEWER - MAINTENANCE PRACTICES

1 Removal/Installation Cargo Compartment Viewer

A. Equipment and Materials

- (1) Cellulose acetate sheeting, Kodapak No. E-463, Polyester Transparent Tape No. 850. Minnesota Mining and Manufacturing Co., or equivalent.
- (2) Masking Tape No. 202, Minnesota Mining and Manufacturing Co.
- (3) Castile soap
- (4) Cheesecloth

B. Remove Cargo Compartment Viewer (See figure 201)

- (1) Apply protective cover of cellulose acetate or equivalent, to accessible surface of lower lens. Secure cover with masking tape.
- (2) Remove screws holding cargo compartment ceiling panel to lower flange of viewer.
- (3) Fold back or remove passenger cabin floor rug over floor panel in which viewer is located.

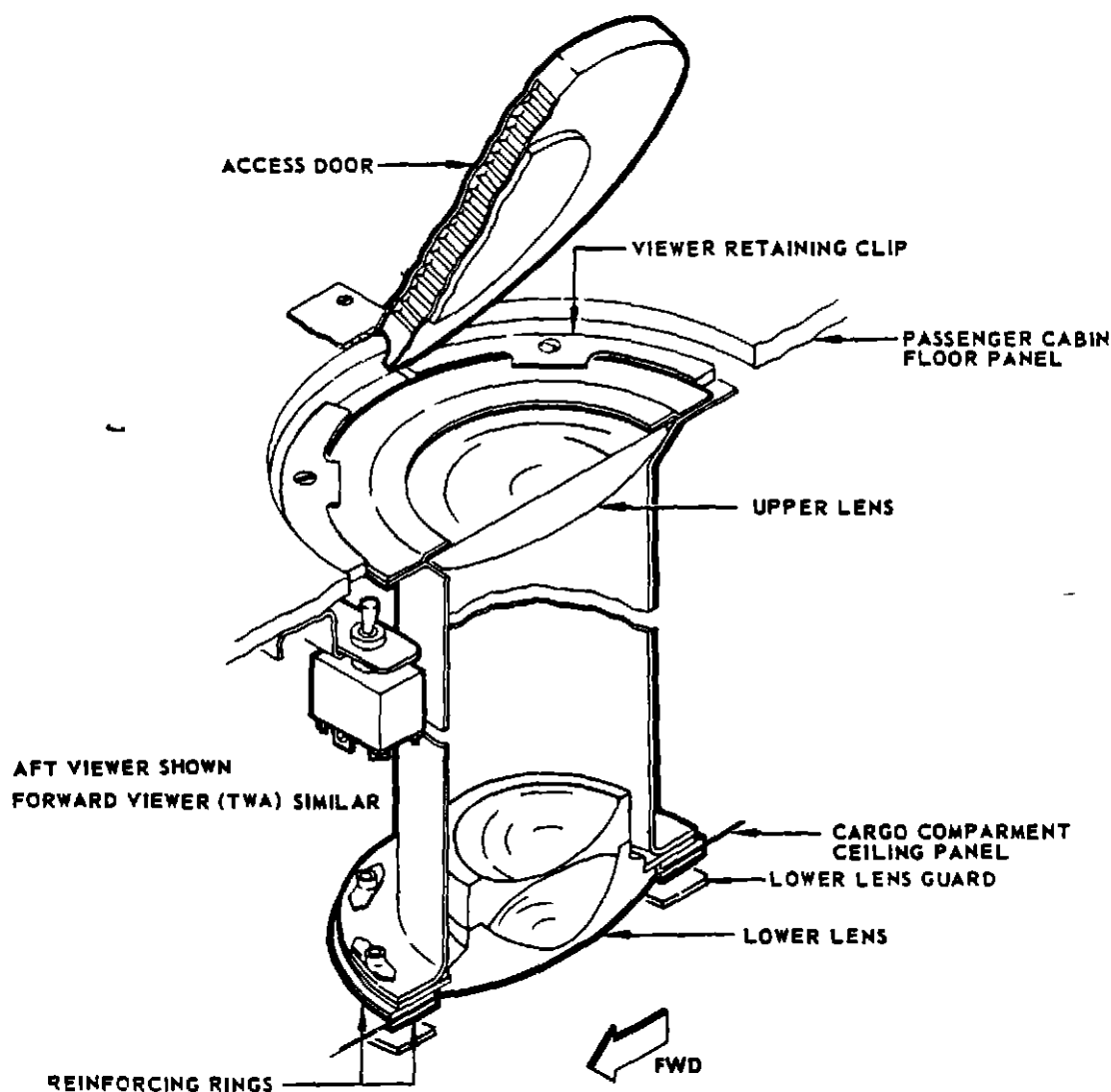
NOTE. Aft viewer is located under aisle rug identified by stud in forward right hand corner. Forward viewer (TWA) is located under rug between left hand seat tracks in area of blanked off passenger windows.

- (4) Open viewer access door and retain in open position.
- (5) Apply protective cover of cellulose acetate, or equivalent, to accessible surface of upper lens. Secure cover with masking tape.
- (6) Remove viewer retaining clips and screws.
- (7) Lift viewer out through hole in floor panel.

C. Install Cargo Compartment Viewer (See figure 201)

- (1) Apply protective cover of cellulose acetate, or equivalent, to accessible surfaces of viewer lenses. Secure covers with masking tape.
- (2) Install viewer by inserting through hole in floor panel.
- (3) Install viewer retaining clips and screws.
- (4) Remove protective cover from upper lens.

- (5) Clean upper lens with lukewarm water and soap applied with a soft cloth such as cheesecloth, rinse with clean water and wipe dry
- (6) Close viewer access door
- (7) Unfold or replace passenger cabin floor rug over viewer floor panel and tape down.
- (8) Install screws holding cargo compartment ceiling panel to lower flange of viewer
- (9) Remove protective cover from lower lens of viewer
- (10) Clean lower lens with lukewarm water and soap applied with a soft cloth, such as cheesecloth, rinse with clean water and wipe dry



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MAIN LANDING GEAR DOWNLOCK INSPECTION WINDOW -
MAINTENANCE PRACTICES

1. Removal/Installation Main Landing Gear Downlock Inspection Window

A Equipment and Materials

- (1) Cellulose Acetate Sheeting, Kodapak No. E-463, Polyester Transparent Tape No. 850. Minnesota Mining and Manufacturing Co., equivalent
- (2) Masking Tape No 202, Minnesota Mining and Manufacturing
- (3) Cheesecloth, Finetex, or equivalent
- (4) Castile soap
- (5) Parting Agent, Delco X769, or one part by weight of MIL-I-7444 Vinyl Tubing dissolved in four parts of cyclohexanone
- (6) Sealant, BMS 5-19, Class B, or equivalent
- (7) Aliphatic Naphtha, TT-N-95

B. Remove Main Landing Gear Downlock Inspection Window

- (1) Fold passenger cabin aisle rugs, above main gear inspection window access doors, forward and aft from rug joint. This exposes the panel in which the access doors are located.
- (2) Remove panel in which the access doors are located.
- (3) Remove window retaining ring, inner seal ring, and window glass.

C Prepare for Installation

- (1) Apply protective cover of cellulose acetate, or equivalent, to window glass surfaces and secure with masking tape

NOTE Do not cover area which contacts seals on both inner and outer face of window glass.
- (2) Clean retaining ring, seal ring, spacers, and window support pan with aliphatic naphtha applied with a clean, oil-free, absorbent material

WARNING. ALIPHATIC NAPHTHA IS FLAMMABLE



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- (3) Wipe the surfaces of each ring, spacers, and pan dry with a clean, oil and lint-free, absorbent material such as Finetex, new cheesecloth, or equivalent
- (4) Apply parting agent, Delco X769 or equivalent, to all areas where it is possible for sealant to adhere on the window support pan, spacers, and retaining ring.

NOTE Steps (4) and (5) are not required if synthetic rubber seal rings are installed on both the inner and outer sides of the glass.

- (5) Apply removable faying surface sealant, HMS 5-19, Class B, in a continuous bead around the support pan flange just prior to installation of the window glass. The sealant should form a gasket on the bottom side of the glass, between the glass and the parting agent on the window support pan, when the window glass is installed.

D. Install Main Landing Gear Downlock Inspection Window

- (1) Install outer seal ring and window glass on support pan and press down on glass.

CAUTION IF THE SYNTHETIC RUBBER OUTER SEAL RING IS USED INSTEAD OF THE REMOVABLE SEALANT, MAKE SURE THE SEAL RING IS IN PLACE BEFORE INSTALLING THE WINDOW GLASS

- (2) If sealant was applied on the support pan, remove all extruded sealant from entire periphery of the window glass.
- (3) Install inner seal ring and retaining ring. Secure with attaching screws.

CAUTION: PRESS DOWN ON THE RETAINING RING WHILE TIGHTENING BOLTS TO ENSURE A PRESSURE TIGHT JOINT. THE RETAINING RING HAS SLOTTED BOLT HOLES

E. Restore Airplane to Normal

- (1) Remove protective cover from window glass.
- (2) Clean window with lukewarm water and castile soap applied with a soft cloth such as boiled cheesecloth, rinse with clean water and wipe dry
- (3) Install cabin floor panel in which the main gear inspection window access doors are located. Assure that access doors are taped down and are not secured with screws.
- (4) Unfold passenger cabin aisle rugs over floor panel and tape down.