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DESCRIPTION

The ice and rain protection system allows unrestricted operation of the aircraft in icing conditions and heavy rain.

ANTI ICE

Either hot air or electrical heating protects critical areas of the aircraft as follows.

HOT AIR

- R – four outboard leading-edge slats of each wing.
- engine air intakes.

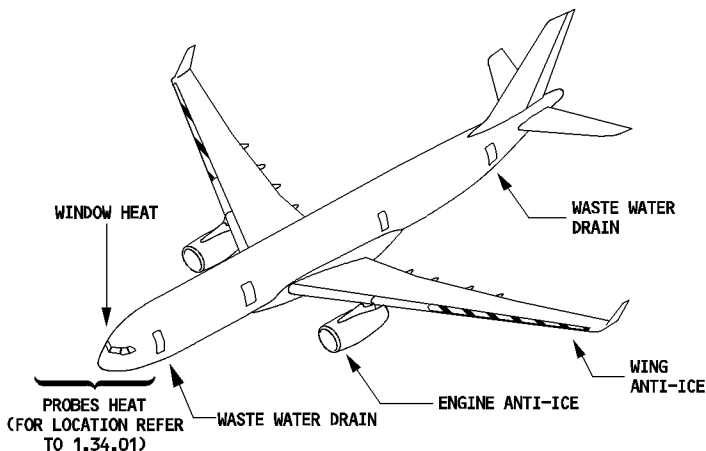
ELECTRICAL HEATING

- flight compartment windows.
- R – sensors, pitot probes, static ports, TAT probes and angle-of-attack probes.
- waste-water drain mast.

RAIN REMOVAL

Fluid rain repellent \triangleleft and wipers remove rain from the front windshield panels.

6FC5-01-3010-001-A001AA



DESCRIPTION

In flight, hot air from the pneumatic system heats the four outboard slats (4-5-6-7) of each wing.

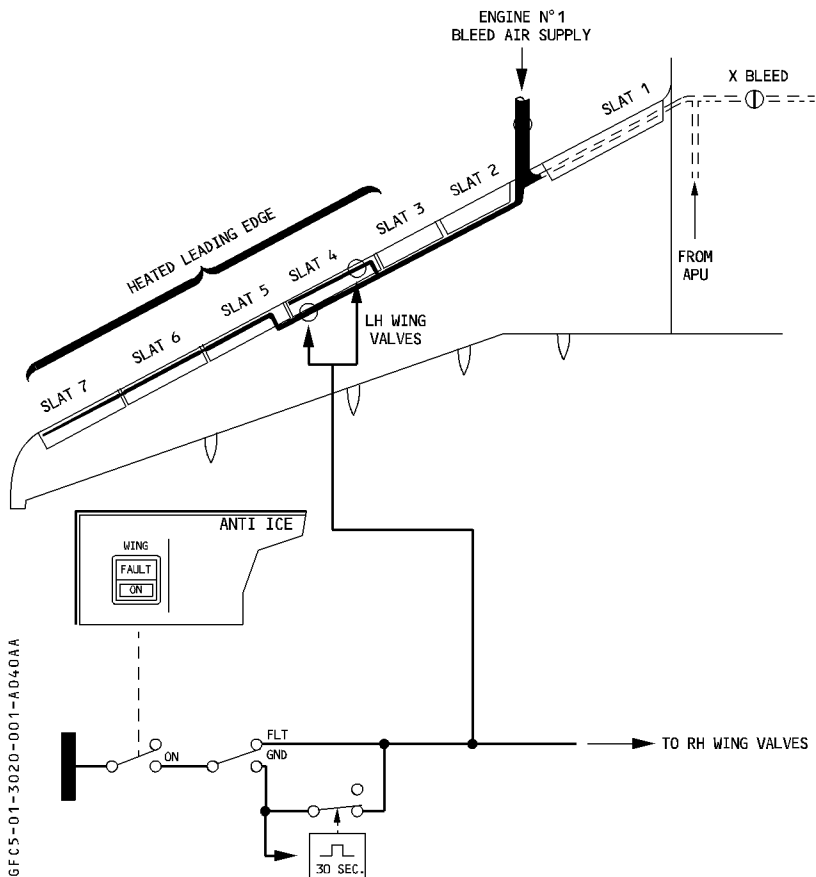
The WING pushbutton on the ANTI ICE panel controls the valves.

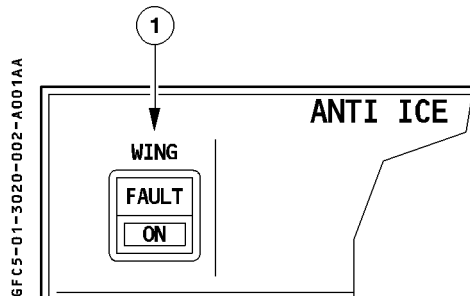
When the aircraft is on ground, the flight crew can initiate a 30-second test sequence by turning the system ON.

If the system detects a leak during normal operation, the affected side's wing anti-ice valve automatically closes (see 1.36.10).

When wing anti-ice is selected, the EPR limit is automatically reduced, and the idle EPR is automatically increased.

In the event of an electrical power supply failure, the valves close.



CONTROLS AND INDICATORS**OVERHEAD PANEL****① WING ANTI ICE pushbutton**

This pushbutton simultaneously controls the wing anti-ice system on the left and right sides.

ON : It comes on blue.

The WING A.ICE indication appears on the ECAM MEMO page.

Wing anti-ice control valves open, if pneumatic supply is available.

On the ground, the wing anti-ice control valves open for only 30 seconds (test sequence).

Off : The ON light goes off.

The wing anti-ice control valves close.

FAULT It : The amber light comes on, and a caution appears on the ECAM, if :

- The position of the anti-ice control valve is not the required position, or
- Low pressure is detected.

Note : The amber **FAULT** light comes on briefly during pressure built up, or when the valves open.

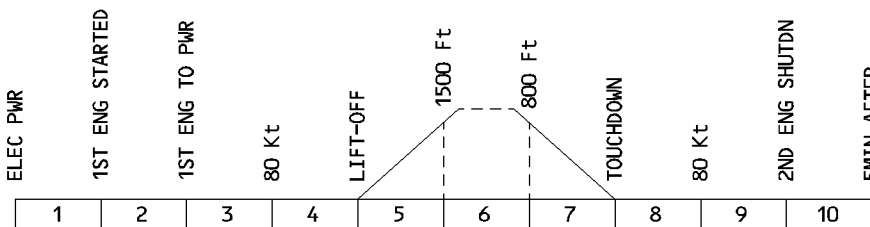
ECAM BLEED PAGE

R (Refer to 1.36.20).



WARNINGS AND CAUTIONS

6FCS-01-3020-003-A100AA



E / WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
L(R) INR (OUTR) WING HI PR High pressure is detected.	NIL	NIL	BLEED	NIL	3, 4, 5, 7, 8
L(R) INR (OUTR) WING LO PR Low pressure is detected.	SINGLE CHIME	MASTER CAUT		NIL	4, 8
L(R) INR (OUTR) WING OPEN One wing valve remains open, when wing anti-ice is selected off.			BLEED	WING ANTI ICE FAULT It	
WAI SYS FAULT Wing anti-ice relay failure					
WING VLVE NOT OPEN One wing valve remains closed, when wing anti-ice is selected on.					3, 4, 5, 7, 8
WING OPEN ON GND Time delay relay failure.					

MEMO DISPLAY

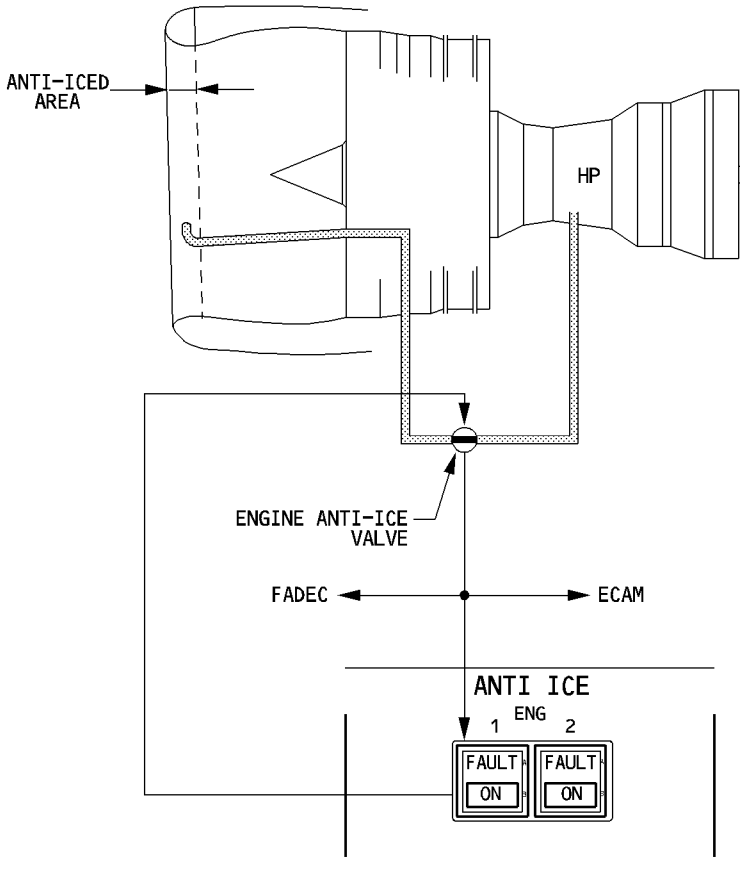
- R The WING A.ICE message is displayed in green, when the WING ANTI ICE pushbutton is ON.

DESCRIPTION

An independent air bleed from the high pressure compressor protects each engine nacelle from ice. The air is supplied through a two-position (open and closed) valve that the flight crew controls with pushbuttons : One for each engine.

The valve closes automatically, if air is not available (engine not running).

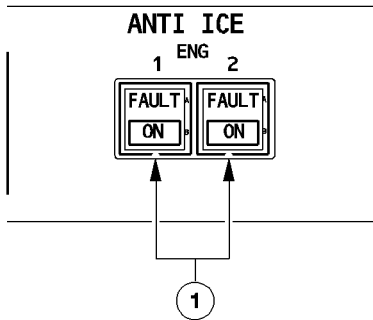
- R When an engine anti-ice valve is open, the EPR limit for that engine is automatically reduced, and the modulated idle EPR is automatically increased.
- R If electric power fails, the valves open.



6FCS-01-3030-001-A050AA

CONTROLS AND INDICATORS**OVERHEAD PANEL**

6F C5-01-3030-002-A050AA

**①** ENG 1 (2) pb sw

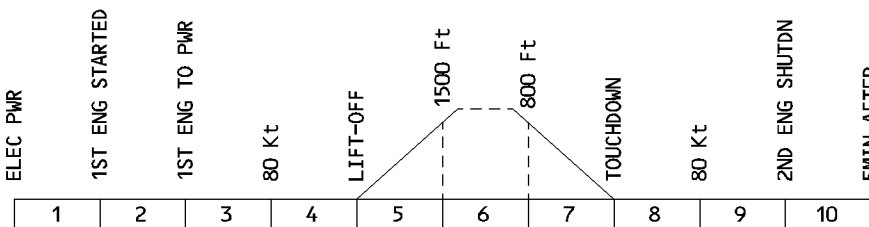
- ON** : Comes on blue.
 ECAM MEMO displays "ENG A-ICE".
 Engine anti ice valve opens.
 Continuous ignition is automatically activated if EIU is inoperative.
- Off** : ON light goes out.
 Engine anti ice valve closes.
- FAULT It** : Comes on amber and caution message appears on ECAM, if the position of the anti ice valve disagrees with the ENG pushbutton selection.

R Note : The amber **FAULT** light comes on briefly as the valve transits.



WARNINGS AND CAUTIONS

6FC5-01-3030-003-A110AA



E/W/D: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) VALVE CLOSED Valve disagree.	SINGLE CHIME	MASTER CAUT	NIL	ENG affected ANTI ICE FAULT It	4, 5, 7, 8
ENG 1(2) VALVE OPEN Valve disagree.					

MEMO DISPLAY

R This display shows ENG A.ICE in green, if either one ENG ANTI ICE pushbutton is ON, or the nacelle anti-ice valve's electrical power is lost.

DESCRIPTION

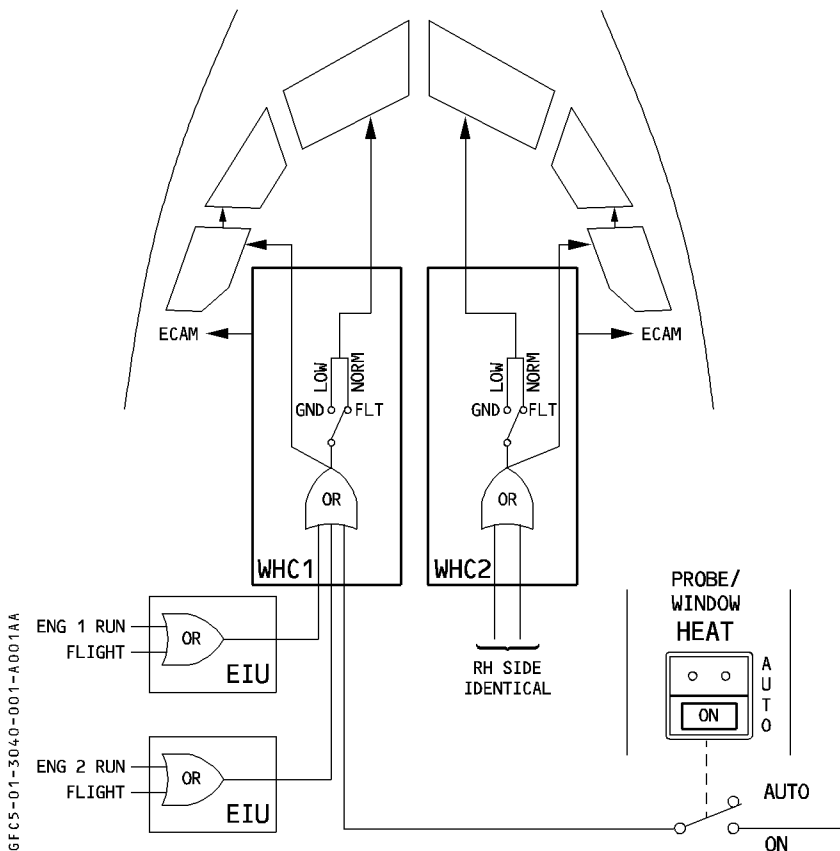
The aircraft uses electrical heating for anti icing each windshield and demisting the cockpit side windows.

Two independent Window Heat Computers (WHC), one on each side, automatically regulate the system and protect it against overheating and indicate faults.

Window heating comes on :

- automatically when at least one engine is running, or in flight
- manually when the flight crew switches ON the PROBE WINDOW HEAT pushbutton switch.

R The windshield heating operates at low power on the ground and at normal power in flight.
 R Only one heating level exists for the windows.
 R



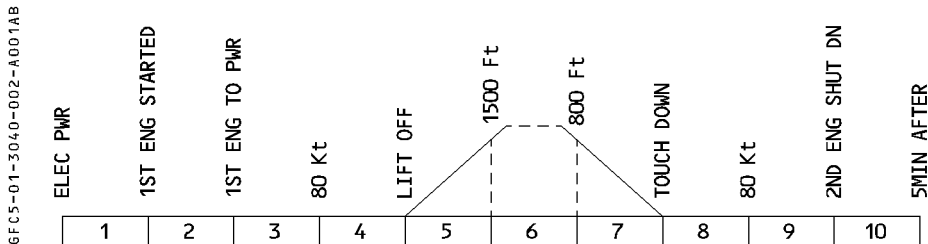


CONTROLS AND INDICATORS

OVERHEAD PANEL

R (Refer to 1.30.50)

WARNINGS AND CAUTIONS



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
L(R) WSHLD HEAT failure of L or R windshield heating	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
L+R WSHLD HEAT failure of both windshield heatings					
L(R)(L+R) WINDOW HEAT failure of L, R or L+R window heatings	NIL	NIL			



DESCRIPTION

Electrical heating is provided for the protection of:

- Pitots.
- Static ports.
- Angle Of Attack (AOA) probes.
- Total Air Temperature (TAT) probes.

Three independent Probe Heat Computers (PHC) automatically control and monitor:

- Captain probes
- F/O probes
- STBY probes

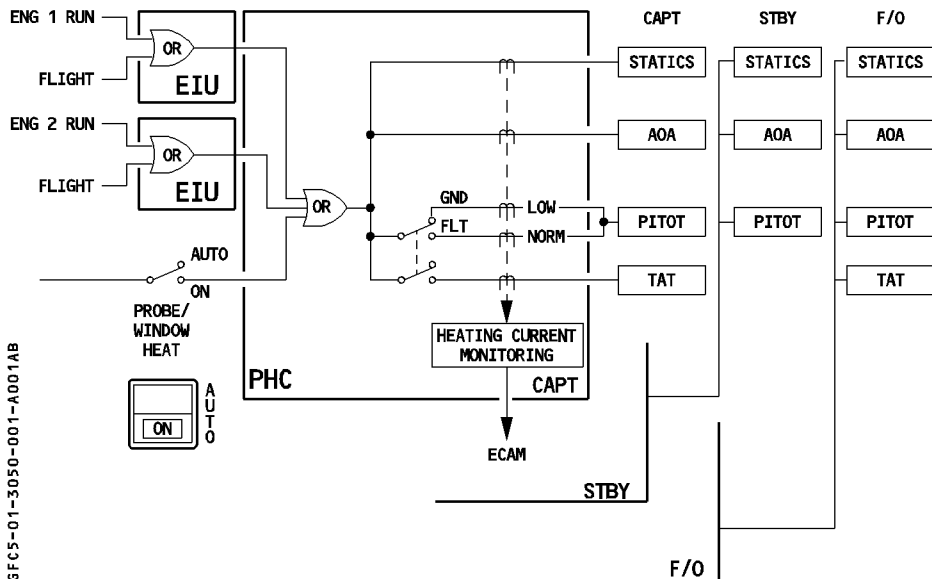
They provide overheat protection and fault indication.

The probes are heated:

- automatically when at least one engine is running, or in flight
- manually by switching ON the PROBE/WINDOW HEAT pushbutton.

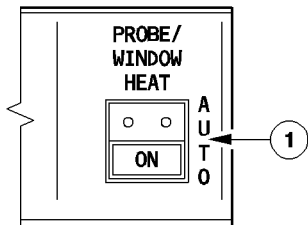
On the ground, TAT probes are not heated and pitot heating operates at low level (normal power in flight by automatic changeover).

FOR INFO



CONTROLS AND INDICATORS**OVERHEAD PANEL**

6FC5-01-3050-002-A001AA

**① PROBE / WINDOW HEAT pushbutton**

AUTO : Probes / windows are automatically heated :

- In flight, or
- On ground (except TAT probes), provided one engine is running

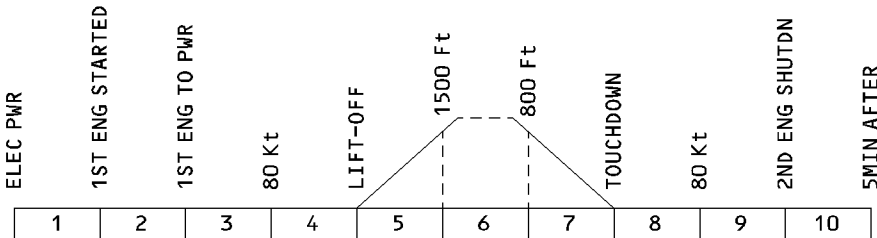
ON It : Comes on in blue.

Probes / windows are heated (except TAT probes on ground).



WARNINGS AND CAUTIONS

6FCS-01-3050-003-A001AA



E / WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CAPT (F/O)(STBY) PROBES HEAT Failure of one Probe Heat Computer Channel (PHC)	SINGLE CHIME	MASTER LIGHT	NIL	NIL	4, 5, 7, 8
CAPT (F/O)(STBY) PITOT HEAT CAPT (F/O)(STBY) AOA HEAT CAPT (F/O)(STBY) L(R) STAT HEAT CAPT (F/O) TAT HEAT Failure of corresponding probe heating		MASTER CAUT			3, 4, 5, 7, 8



DESCRIPTION

An ice protection system is installed to prevent ice formation in the waste disposal system and the potable water system. Electrical heating elements in form of flexible tapes are attached to the waste/potable water lines which are installed in areas of possible icing conditions (in the vicinity of fuselage skin). Temperature sensors are installed to detect icing conditions. The fill/drain nipples on the water service/waste panel and the two drain masts are heated. The two Water Ice-Protection Control Units (WIPCU) installed operate independently : one controls the forward section of the ice protection system, the second one the aft section.

SYSTEM OPERATION

The temperature sensors measure permanently the water line temperature. In the WIPCU, the measured value is compared with a reference temperature for the related location. This threshold can be set individually for each area by maintenance action. If the temperature drops below the reference value the heater elements for the related area are turned on. A different (higher) threshold is used to turn the heater elements off.



DESCRIPTION

WIPERS

Each front windshield is provided with a two speed electric wiper.
Each is controlled by a rotary selector.

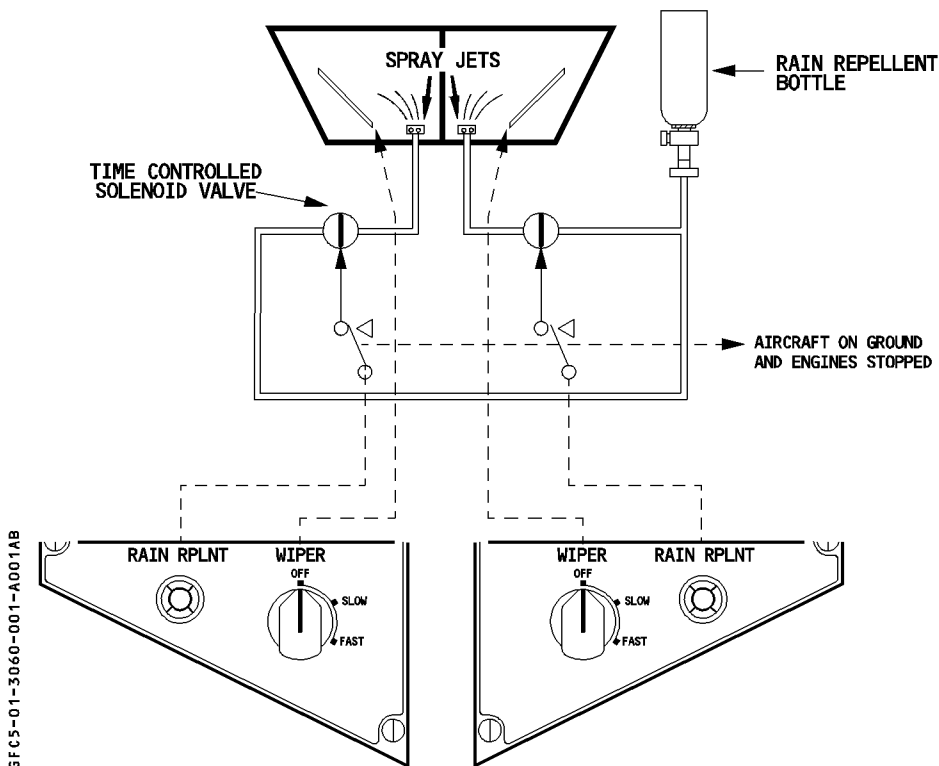
RAIN REPELLENT

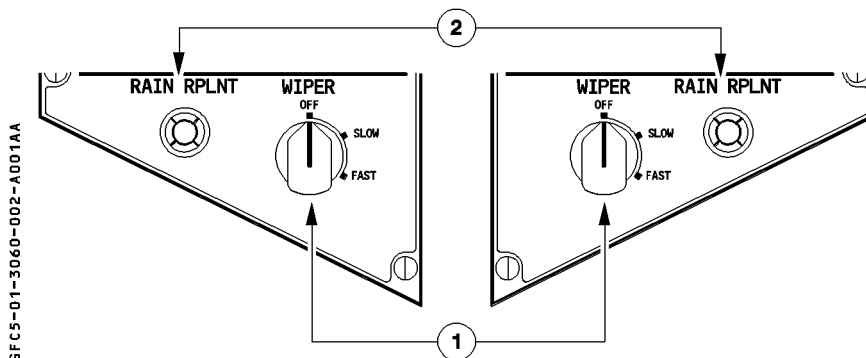
In moderate to heavy rain a rain repellent liquid may be sprayed on the windshield to improve visibility.

The window is covered by spray after about 30 seconds.

Application of rain repellent is controlled by a pushbutton.

R



CONTROLS AND INDICATORS**OVERHEAD PANEL****① WIPER sel**

Each rotary selector controls its wiper at either low or high speed. When turned off the wiper stops out of view.

② RAIN RPLNT pb

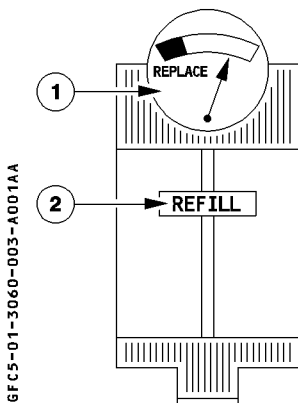
R Each of these buttons controls the application of rain repellent fluid to one side of the front windshield.

R When the flight crew pushes the button, the timer applies a measured quantity of rain repellent to the windshield. To repeat the cycle the flight crew must push the button again.

R This function is inhibited when the aircraft is on the ground, engines stopped.



RIGHT AFT CORNER OF THE COCKPIT



① RAIN RPLNT pressure indicator

Shows the nitrogen pressure in the rain repellent bottle.

When the needle is in the yellow sector the bottle should be replaced.

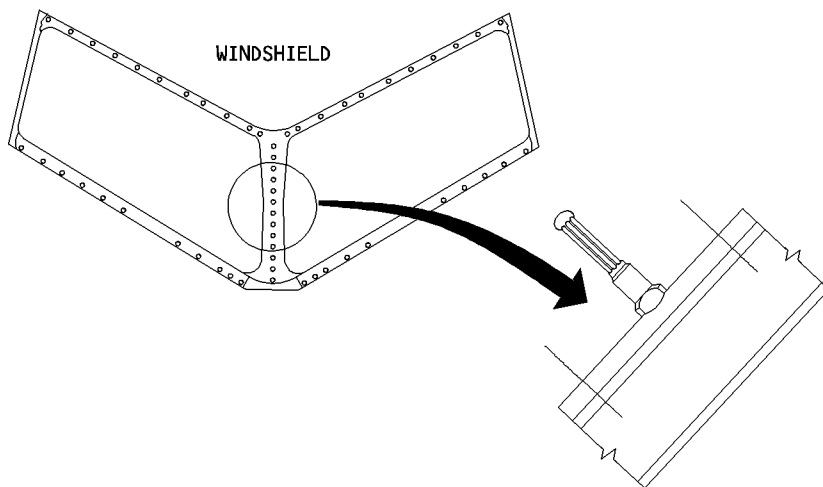
② RAIN RPLNT quantity indicator

When REFILL float is in view the bottle should be replaced.

**DESCRIPTION****VISUAL ICE INDICATOR**

An external visual ice indicator, which is visible to the crew, is installed between the two windshields. The indicator also has a light. (◀)

R



GFC5-01-3070-001-A001AA

BUS EQUIPMENT LIST

R

		NORM			EMER ELEC		
		AC	DC	DC BAT	AC ESS	DC ESS	HOT
WING ANTI ICE	INNER VALVES					SHED	
	OUTER VALVES					SHED	
ENG ANTI ICE CLOSURE	ENG 1		DC1				
	ENG 2		DC2				
WINDOW HEAT	WHC	1				SHED (LAND REC)	
		2		DC2			
	HEATING POWER	L	AC1			SHED (LAND REC) (2)	
		R	AC2				
PROBE HEAT	PHC	CAPT OR STBY			X		
		F/O		DC2			
	STATICS	CAPT OR STBY		DC1			
		F/O		DC2			
	PITOT	CAPT				X (1)	
		F/O	AC2				
		STBY	AC1 (1)				
	AOA	CAPT				SHED	
		F/O	AC2				
		STBY				SHED	
TAT	CAPT	AC1					
	F/O	AC2					
RAIN REMOVAL	WIPER	CAPT		DC1			
		F/O		DC2			
	RAIN REPELLENT	CAPT					X
		F/O		DC2			
WATER/WASTE ANTI ICE	WIPCU 1 and 2			DC2			
	HEATING ELEMENTS AND DRAIN MAST	AC1					

- (1) When AC1 is lost and AIR DATA is switched to "CAPT ON 3", the standby pitot is switched to AC ESS BUS and Captain pitot heating is lost.
- (2) Only LH windshield heating is supplied by AC ESS BUS.