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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

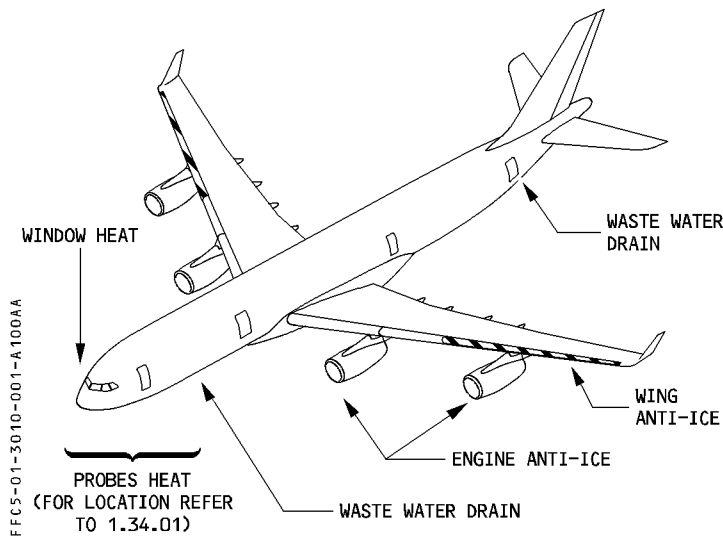
- Four outboard leading-edge slats of each wing.
- Engine air intakes.

ELECTRICAL HEATING

- Flight compartment windows.
- Sensors, pitot probes, static ports, TAT probes and angle-of-attack probes.
- Waste water drain mast.

RAIN REMOVAL

R Wipers and fluid rain repellent, remove rain from the front windshield panels.



DESCRIPTION

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

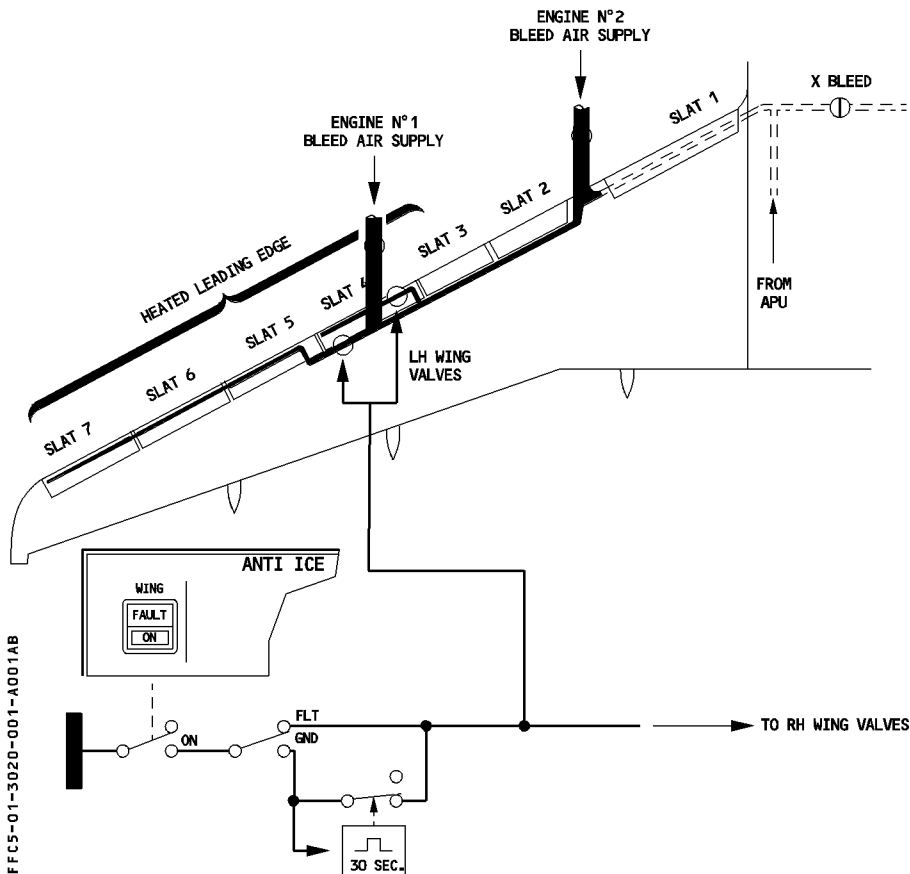
The WING pushbutton on the ANTI ICE panel controls the four valves.

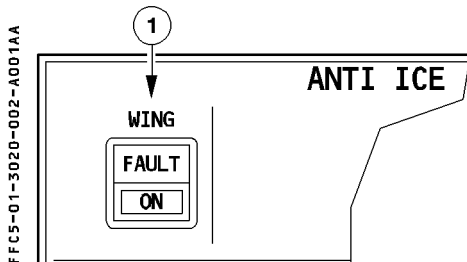
When the aircraft on ground, the flight crew can initiate a 30-second test sequence by turning the system ON.

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

R When wing anti-ice is selected, the N1 limit is automatically reduced, and the idle N1 is automatically increased.

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



CONTROLS AND INDICATORS**OVERHEAD PANEL****① WING ANTI ICE pb sw**

- R This switch controls the wing anti ice system on the left and right sides simultaneously.
 R ON : It lights up blue
 R WING A. ICE appears on the ECAM MEMO page
 R Wing anti ice control valves open if a pneumatic supply is available.
 R On the ground the wing anti ice valves open for 30 seconds only (test sequence).
 R Off : ON light goes out.
 R Wing anti ice control valves close.
 R FAULT It : Amber light comes on, and caution appears on ECAM, if :
 R – the position of the anti ice control valve is not the required position, or
 R – low pressure is detected.

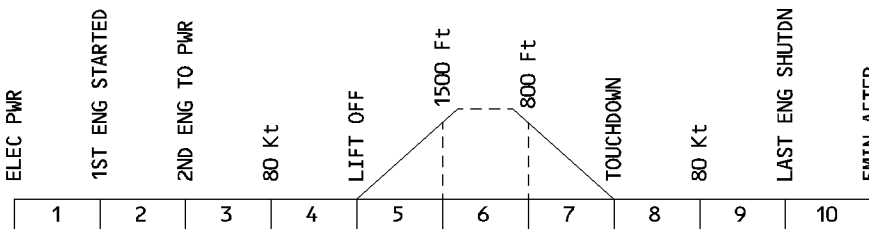
- R *Note* : The amber FAULT light comes on briefly during pressure built up, or
 R when valves open.

ECAM BLEED PAGE

- R (Refer to 1.36.20).

WARNINGS AND CAUTIONS

FFCS-01-3020-003-A001AA



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		NIL	4, 5, 7, 8
L(R) INR (OUTR) WING LO PR Low pressure is detected	SINGLE CHIME	MASTER CAUT	BLEED	WING ANTI ICE FAULT It	3, 4, 5, 7, 8
L(R) INR (OUTR) WING OPEN One wing valve remains open when wing anti-ice is selected off.					4, 8
WAI SYS FAULT Wing anti-ice relay failure			NIL		
WING VLVE NOT OPEN One wing valve remains closed when wing anti-ice is selected on.			BLEED		3, 4, 5, 7, 8
WING OPEN ON GND Time delay relay failure					

MEMO DISPLAY

R WING A.ICE message appears in green, if the WING ANTI ICE pushbutton is ON.

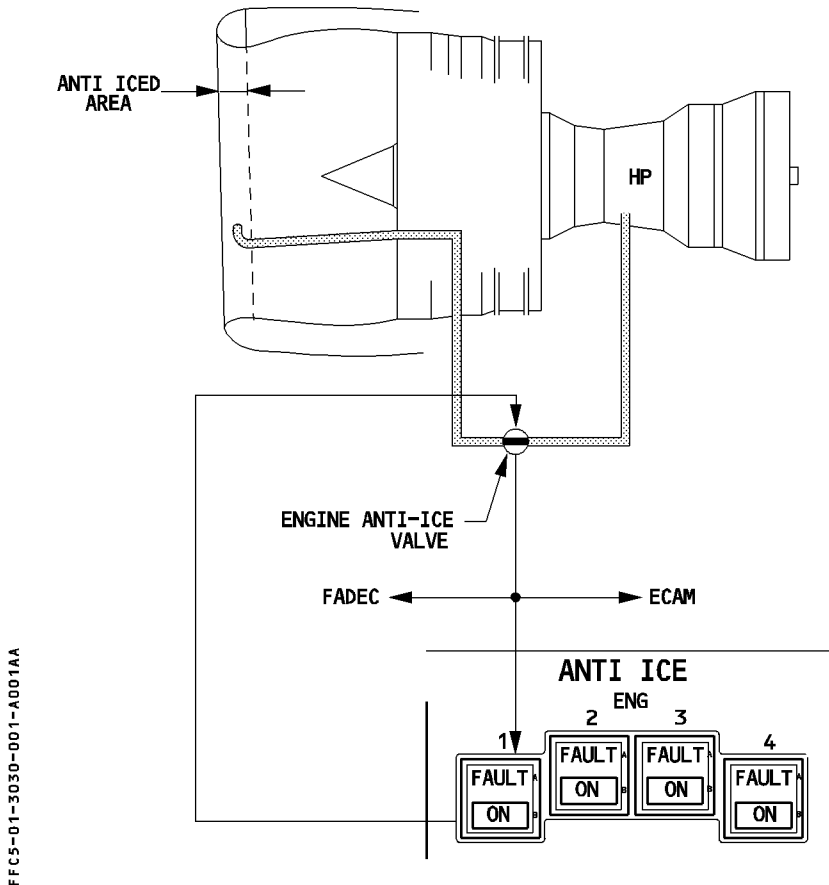
DESCRIPTION

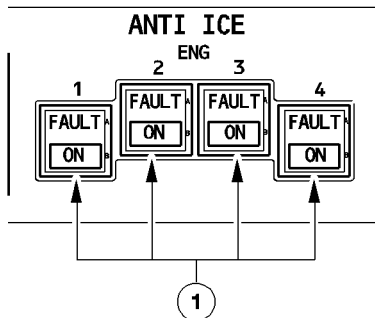
Each engine nacelle is anti iced by an independent air bleed from the high pressure compressor. The air is supplied through an open/closed valve.

The valve is controlled from the cockpit by an ENG pushbutton (one for each engine).

- R When an engine anti ice valve is open, the N1 limit is automatically reduced, and the idle N1 is automatically increased.

In the event of an electrical power supply failure the valve open.



CONTROLS AND INDICATORS**OVERHEAD PANEL**① ENG 1 (2, 3 or 4) pushbutton

ON : The ON light comes on blue.
 The ECAM MEMO displays "ENG A. ICE".
 The engine anti-ice valve opens.
 Continuous ignition is automatically activated. The IGNITION memo appears on the ECAM.

Off : The ON light goes out.
 The engine anti-ice valve closes.

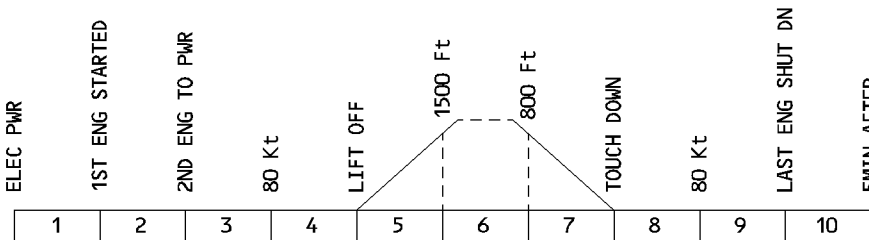
FAULT It : Comes on amber, with an ECAM caution, if the position of the anti-ice valve disagrees with the ENG pushbutton selection.

Note : The amber FAULT light comes on briefly, while the valve transits.



WARNINGS AND CAUTIONS

FFCS-01-3030-003-A100AA



E/W/D: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2)(3)(4) VALVE CLOSED valve disagree	SINGLE CHIME	MASTER CAUT	NIL	ENG affected ANTI ICE FAULT It	3, 4, 5, 7, 8
ENG 1(2)(3)(4) VALVE OPEN valve disagree					

MEMO DISPLAY

- R This display shows ENG A.ICE message in green either if one ENG ANTI ICE pushbutton is
- R at ON or if the nacelle anti ice valves are open.
- R If the ice detection system is installed, ICE NOT DET message appears in green, when ice
- R is no longer detected after 130 seconds.

DESCRIPTION

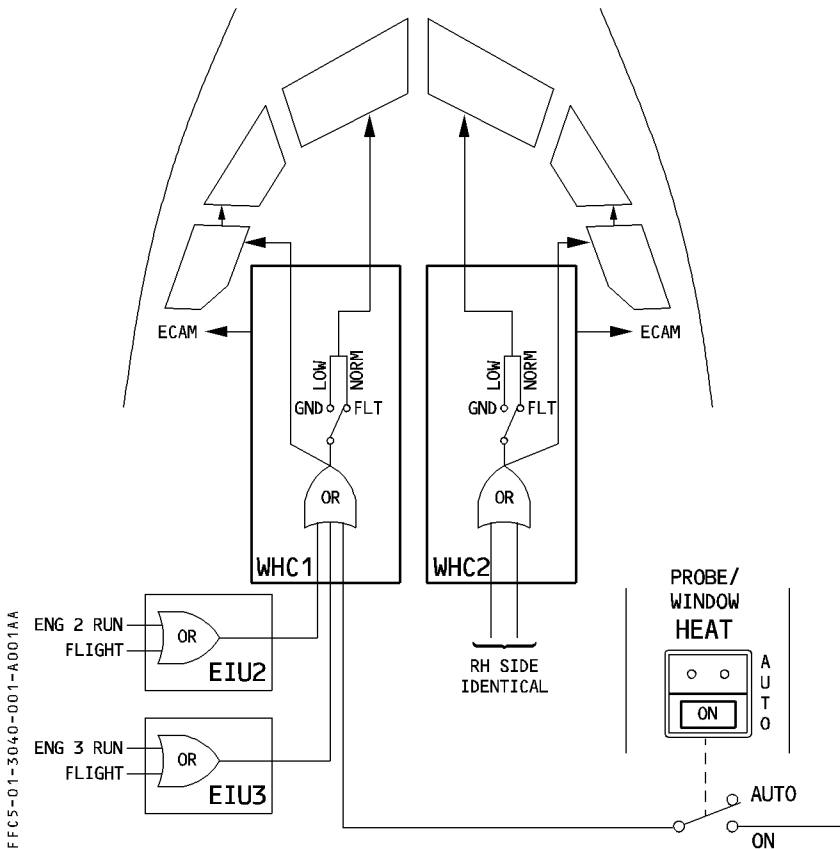
The aircraft uses electrical heating for anti icing each windshield and demisting the cockpit side windows.

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 :

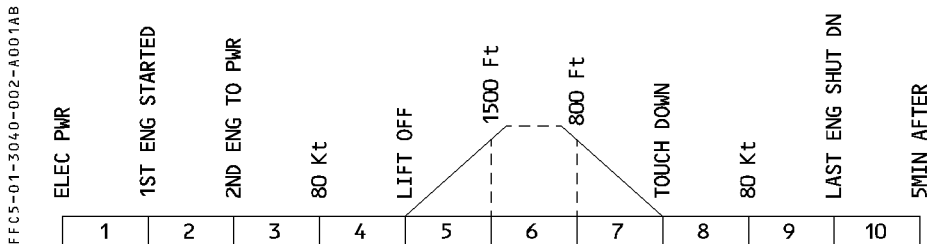
- automatically when engine 2 or 3 is running, or in flight
- manually when the flight crew switches ON the PROBE/WINDOW HEAT pushbutton switch.

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**

(Refer to 1.30.50)

WARNINGS AND CAUTIONS

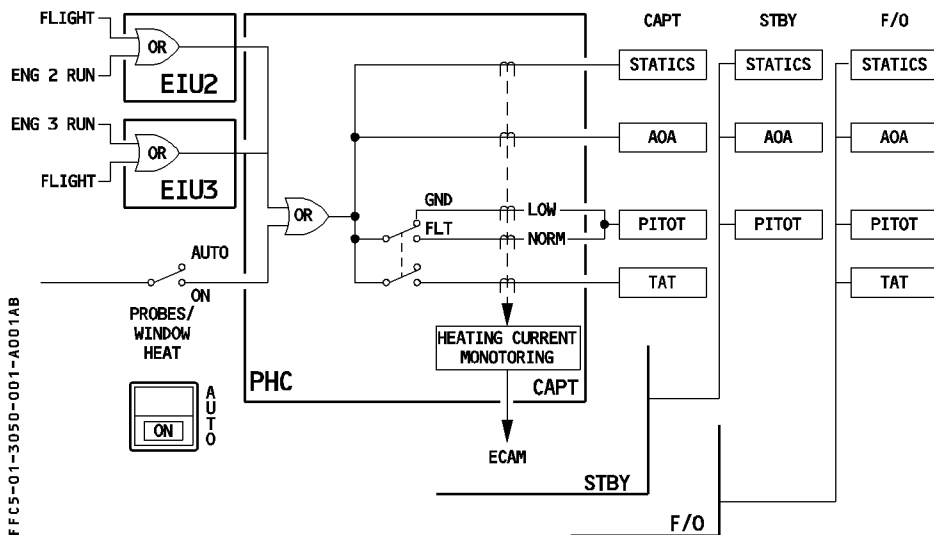
E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
L(R) WSHLD HEAT failure of L or R windshield heating	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
L+R WSHLD HEAT failure of both windshield heatings					
L(R)(L+R) WINDOW HEAT failure of L, R or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



DESCRIPTION

- R Electrical heating protects :
- R – pitot heads.
 - R – static ports.
 - R – Angle-Of-Attack (AOA) probes.
 - R – Total Air Temperature (TAT) probes.
- R Three independent Probe Heat Computers (PHC) automatically control and monitor :
- R – Captain probes
 - R – F/O probes
 - R – STBY probes
- R They protect against overheating and indicate fault.
- R The probes are heated :
- R – automatically when engine 2 or 3 is running, or in flight
 - R – manually, when the flight crew switches ON the PROBE/WINDOW HEAT pushbutton switch.
- R On the ground, the TAT probes are not heated and pitot heating operates at low level (the changeover to normal power in flight is automatic).

FOR INFO

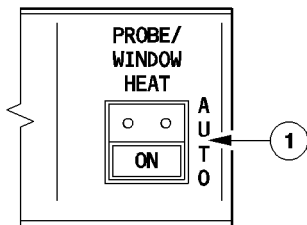




CONTROLS AND INDICATORS

OVERHEAD PANEL

FFCS-01-3050-002-A001AA



① PROBES/WINDOW HEAT pushbutton

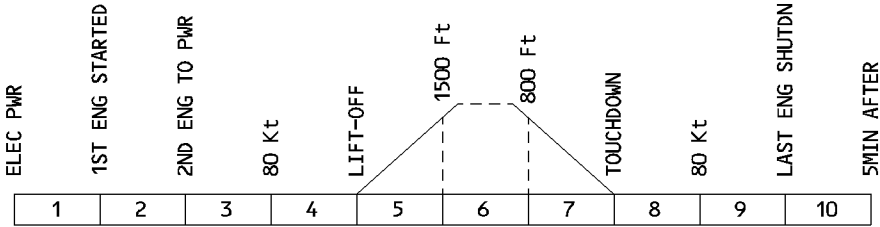
AUTO : Probes/windows are automatically heated :

- In flight, or
- On ground (except TAT probes), provided Engine 2 or 3 is running.

ON It : The blue light indicates that the probes and windows are heated (except TAT probes on ground).

WARNINGS AND CAUTIONS

FFCS-01-3050-003-A001AA



E/W/D : 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 Heating Computer.	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 heating elements for the related area are turned on. A different (higher) threshold is used to turn the heating elements off.

DESCRIPTION**WIPERS**

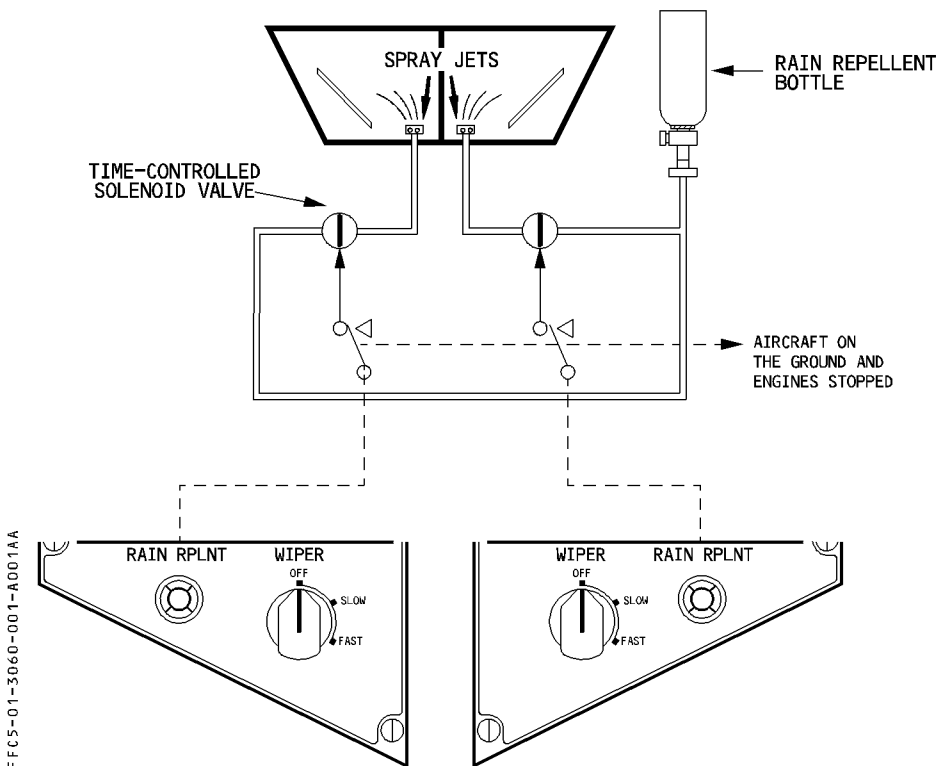
- Each front windshield has a two-speed electric wiper.
- R Each crewmember can control the wiper's speed via a rotary selector.

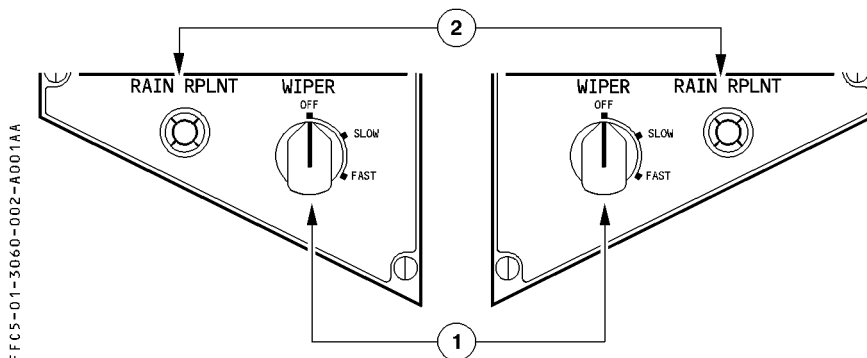
RAIN REPELLENT

In moderate to heavy rain, the flight crew can spray a rain repellent liquid on the windshield to improve visibility.

The window is covered by spray after about 30 seconds.

Separate pushbuttons control the rain repellent application to each side of the windshield.



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

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

R ② RAIN RPLNT pbs

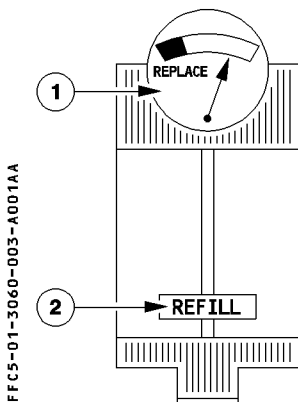
R Each of these button controls the application of rain repellent fluid to one side of the front windshield.

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

This 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

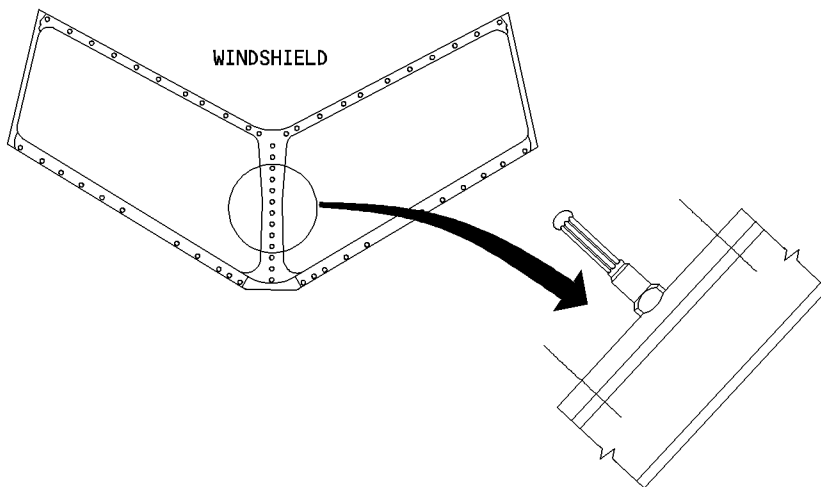
R When REFILL float is in view, the bottle should be replaced.

**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

FFCS-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		DC1				
	OUTER VALVES		DC1				
ENG ANTI ICE CLOSURE	ENG 1 and ENG 3		DC2				
	ENG 2 and ENG 4		DC1				
WINDOW HEAT	WHC	1	DC1				
		2	DC2				
	HEATING POWER	L	AC1-1				
		R	AC2-4				
PROBE HEAT	PHC	CAPT OR STBY		X			
		F/O	DC2				
	STATICS	CAPT OR STBY	DC1				
		F/O	DC2				
	PITOT	CAPT			X (1)		
		F/O	AC2-3				
		STBY	AC1-2 (1)				
	AOA	CAPT	AC1-1				
		F/O	AC2-3				
		STBY	AC1-2				
TAT	CAPT	AC1-1					
	F/O	AC2-3					
RAIN REMOVAL	WIPER	CAPT	DC1				
		F/O	DC2				
	RAIN REPELLENT ◀	CAPT				X	
		F/O	DC2				
ICE DETECT SYSTEM ◀	ICE DETECTION	PROBE 1	AC1				
	ICE DETECTION	PROBE 2	AC2-3				
WATER/WASTE ANT-ICE	WIPCU 1 and 2		DC2				
	HEATING ELEMENTS AND DRAIN MAST	AC1-1					

(1) When AC1-2 is lost and AIR DATA is switched to "CAPT ON 3", the standby PITOT is switched to AC ESS BUS, and the Captain's pitot heading is lost.