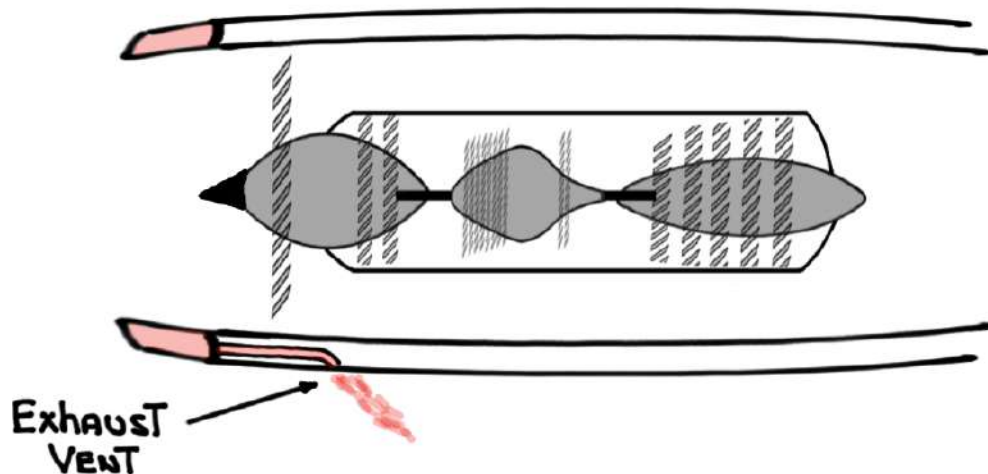


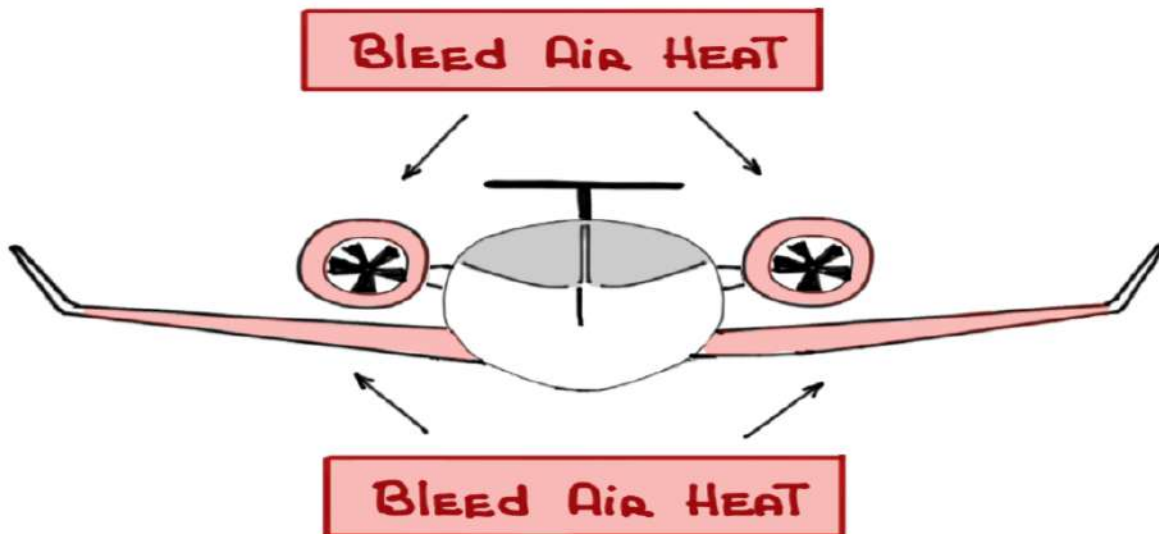
# G500 ICE & RAIN PROTECTION SYSTEM



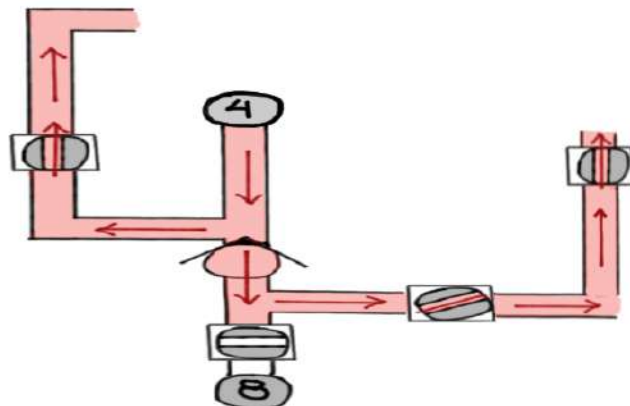
For study purposes only

THE ICE AND RAIN PROTECTION SYSTEM IS ABOUT THE PREVENTION OR REMOVAL OF ICE FORMATION ON:

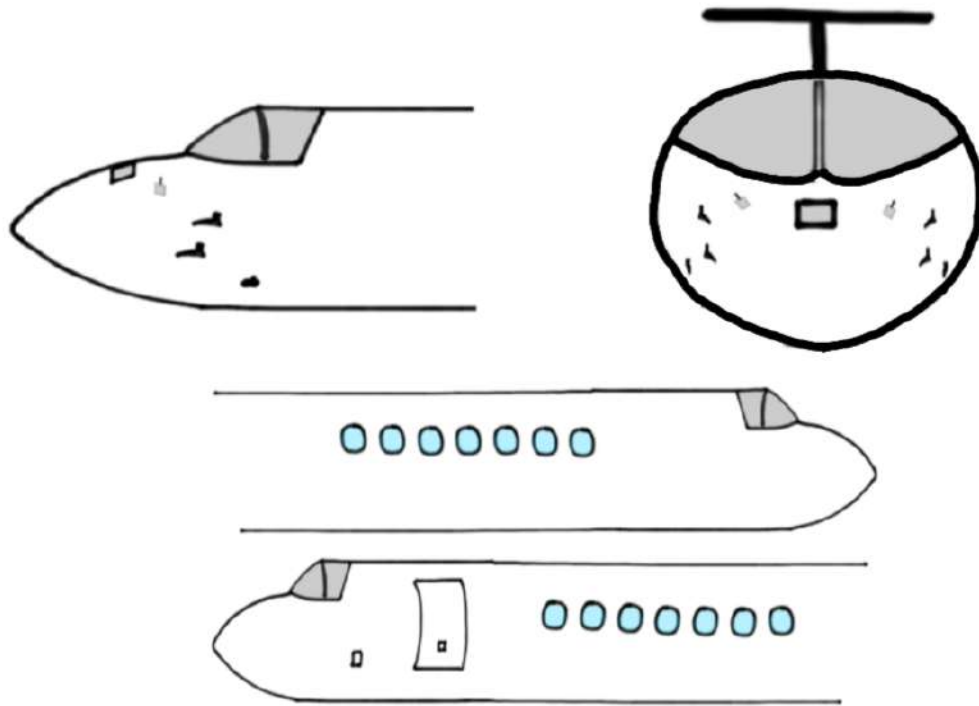
- ① ENGINE COWL INLETS
- ② WING LEADING EDGES



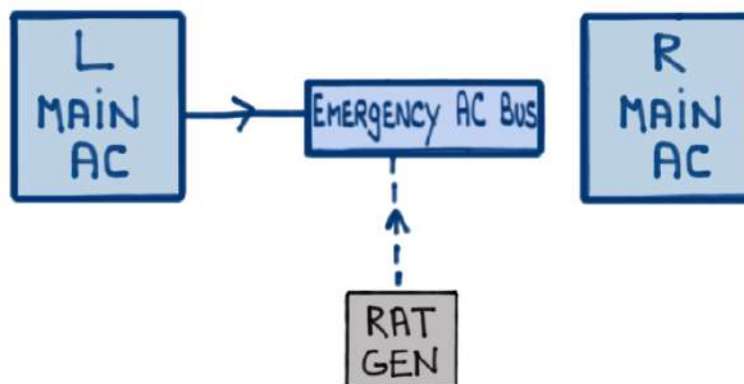
THROUGH THE USE OF BLEED AIR HEAT FROM THE PNEUMATIC SYSTEM



- ③ Multifunction Probes
- ④ Total Air Temperature (TAT) probes
- ⑤ Windshield/cabin windows
- ⑥ EVS window



Through The use of AC power from The Electrical Power System



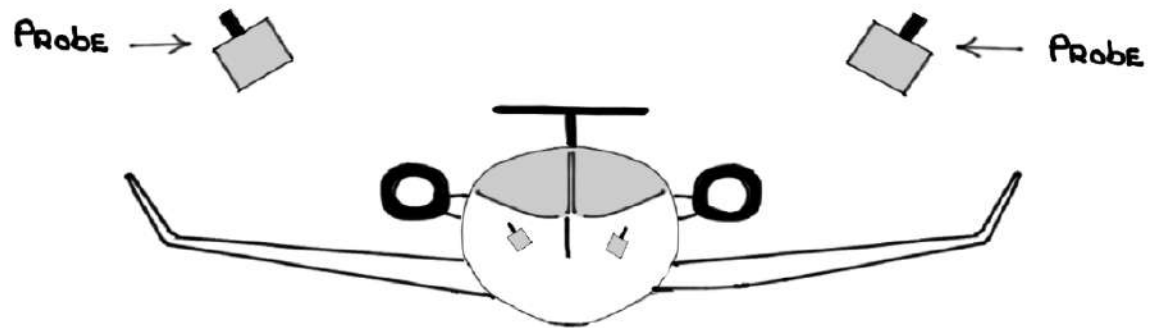
# Icing Conditions

- Icing conditions on the ground may exist:
  - ① when the static air temperature (SAT) is between +10 and -40°C and visible moisture, or
  - ② when operating on ramps, taxiways or runways where surface snow, ice, standing water or slush can be ingested by the engines or freeze on the engines or nacelles; or
  - ③ after landing with fuel cold-soaked from prolonged flights at high altitudes, even if ambient temperatures are significantly above freezing. Loading additional fuel can bring the cold mixture in contact with the upper wing
- Icing conditions in flight may exist when total air temperature (TAT) is below 10°C and SAT is above -40°C with visible moist present

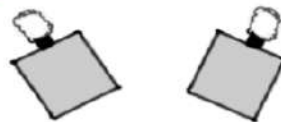


# ICE DETECTION SYSTEM

- The ICE DETECTION SYSTEM CONSISTS OF TWO (2) EXTERIOR PROBES LOCATED ON BOTH SIDES OF THE FUSELAGE BELOW THE PILOT'S AND COPILOT'S WINDOWS



- ICE DETECTOR PROBES VIBRATE AT A FREQUENCY OF 40,000 Hz. ICE THICKNESS AFFECTS THE RESONATE PROPERTIES OF THE PROBES. ACTIVATION OF THE SYSTEM OCCURS WHEN PROBES ACCUMULATE 0.020 INCHES OF ICE FORMATION. THIS DECREASES THE PROBE'S FREQUENCY BY APPROXIMATELY 130 Hz

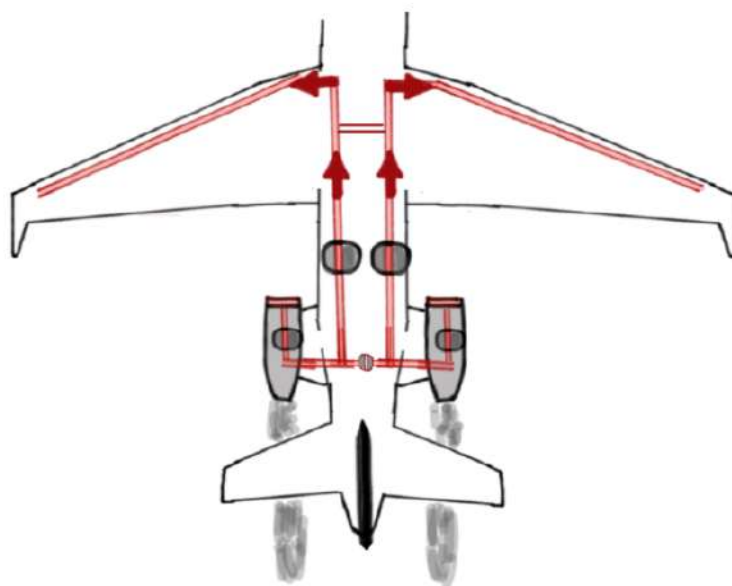
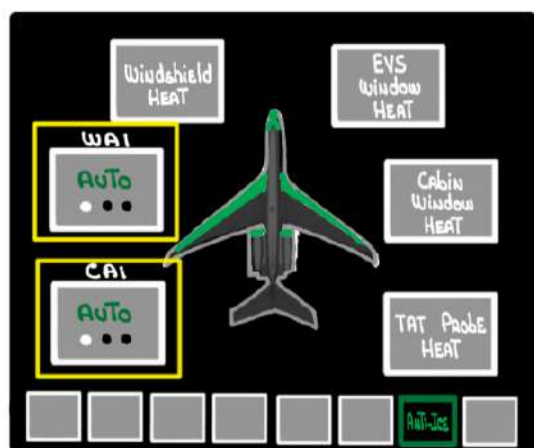


- WHEN THIS HAPPENS THE CREW IS NOTIFIED OF THE PRESENCE OF ICE VIA A CAS MESSAGE

ICE DETECTED

- If THE WAI SYSTEM is in AUTO The wing ANTI-ICE VALVES OPEN AUTOMATICALLY AND ALLOW **HOT** ENGINE BLEED AIR TO HEAT UP THE wing LEADING EDGES

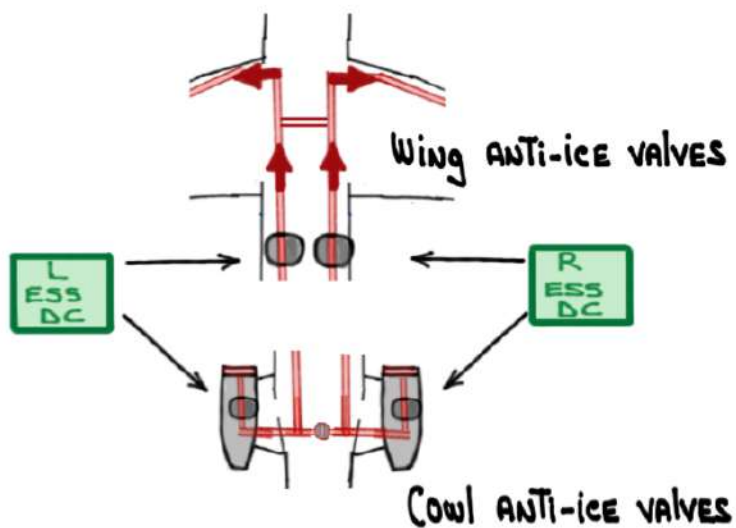
- If THE CAI SYSTEM is in AUTO The cowl ANTI-ICE VALVES OPEN AUTOMATICALLY AND ALLOW **HOT** ENGINE BLEED AIR TO HEAT UP THE ENGINES' cowl INLETS



400' AGL → FL350



FL350 → Touchdown

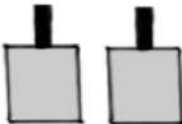


- The CREW is THEN NOTIFIED:

L-R CAI ON

WAI ON

- The PROBES ARE THEN HEATED TO MELT THE ICE AND ALLOW ITS VIBRATION FREQUENCY TO RETURN TO NORMAL SPEED - READY TO CONTINUE DETECTING MORE ICING. THE PROCESS CONTINUES UNTIL THERE IS NO MORE ICING



- When icing is no longer detected by the  **ICE DETECTED** EXTINGUISHES if ICE ACCUMULATION is  $< 0.02$ " FOR THREE (3) MINUTES



• Cowl ANTI-ICE VALVES CLOSE AND **L-R CAI ON** EXTINGUISHES

• Wing ANTI-ICE VALVES CLOSE AND **WAI ON** EXTINGUISHES

- With switches in AUTO cowl and wing heat ceases approximately two (2) minutes after

**ICE DETECTED** MESSAGE EXTINGUISHES

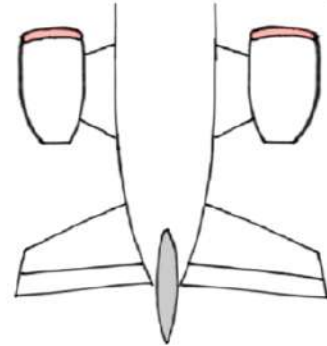
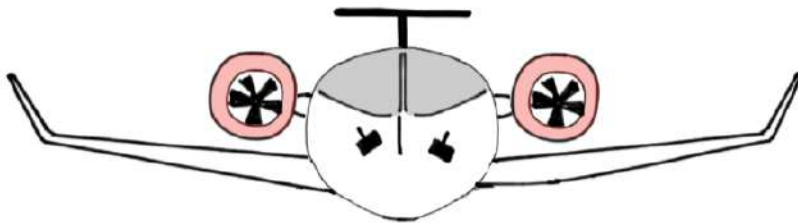
- Left  = 

Right  = 

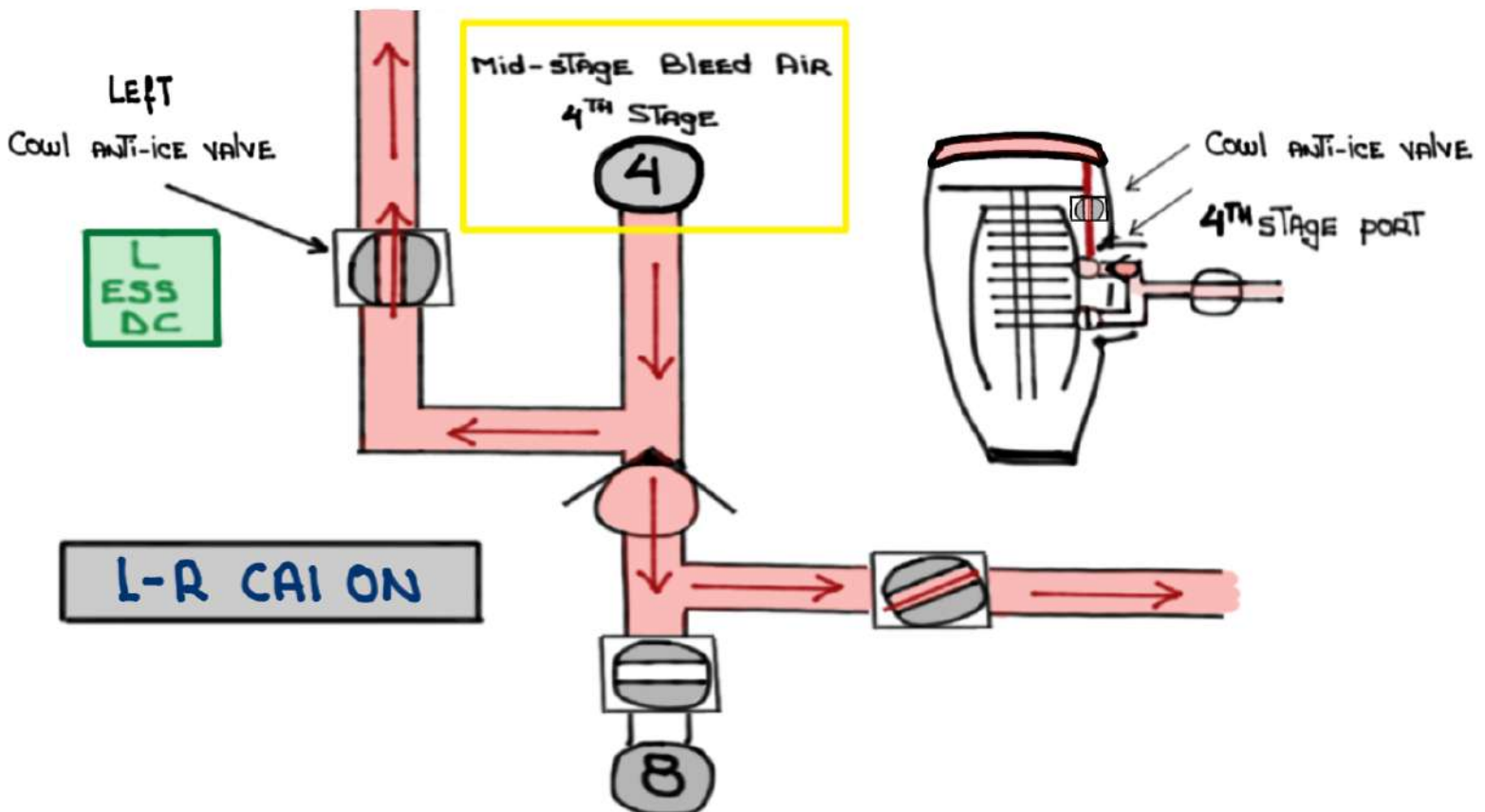


# Cowl ANTI-ice (CAI) SYSTEM

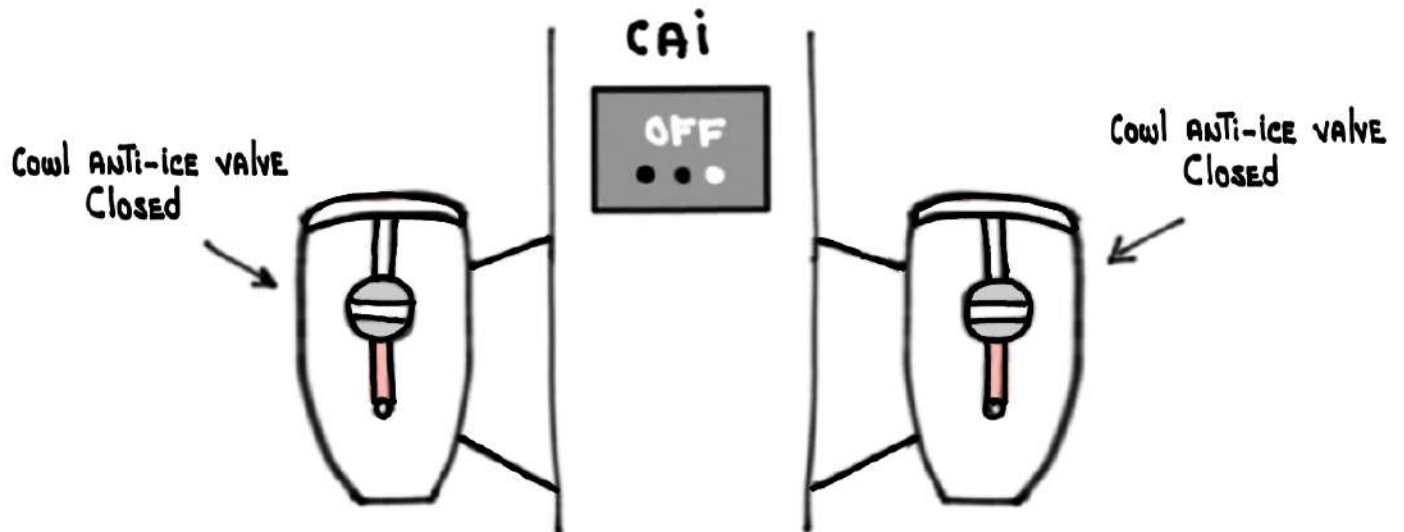
- THE CAI SYSTEM PROTECTS THE ENGINE COWL INLETS FROM ICE ACCUMULATION
- THE CAI SYSTEM CONSISTS OF TWO (2) SEPARATE AND INDEPENDENT SYSTEMS - ONE (1) FOR EACH ENGINE



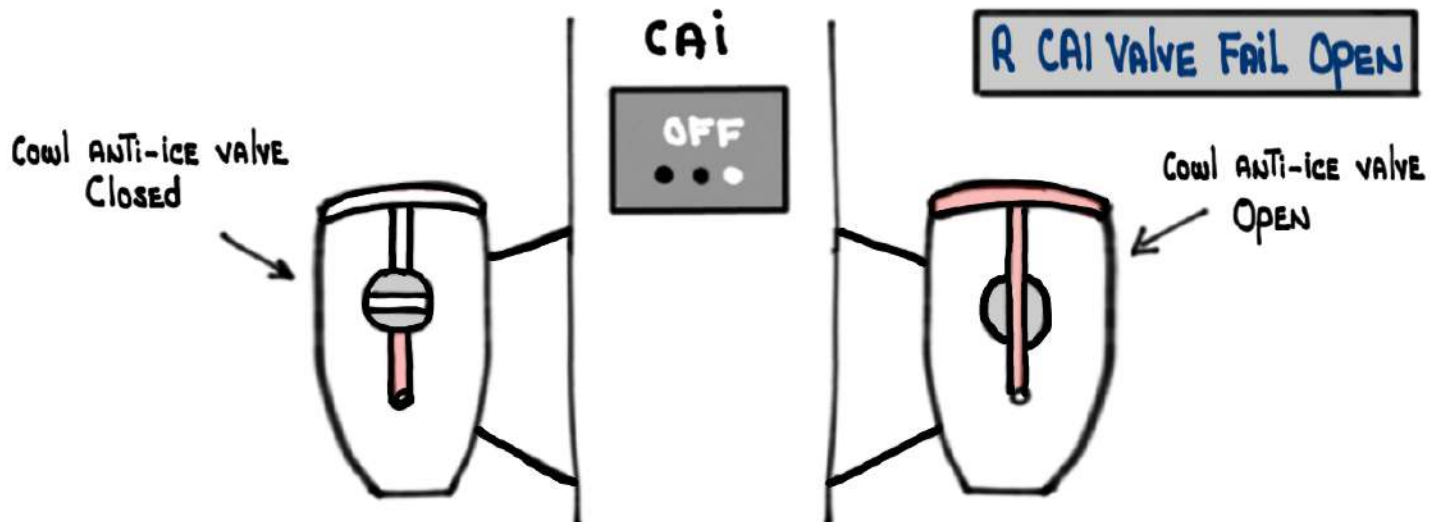
- IT USES **HOT** ENGINE BLEED AIR (MID STAGE ONLY)



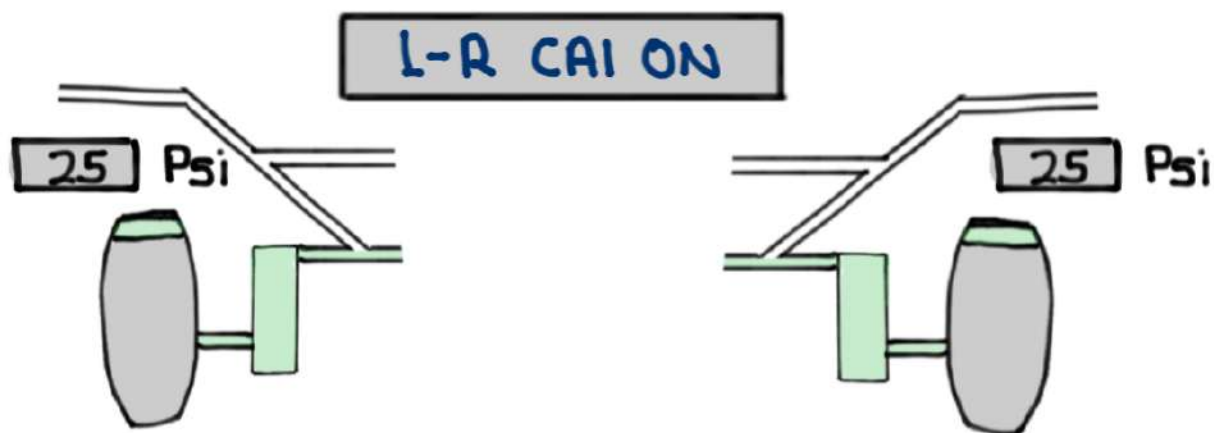
- CAI VALVES ARE ELECTROPNEUMATIC. THEY REQUIRE 28 VDC POWER AND PNEUMATIC PRESSURE TO CLOSE



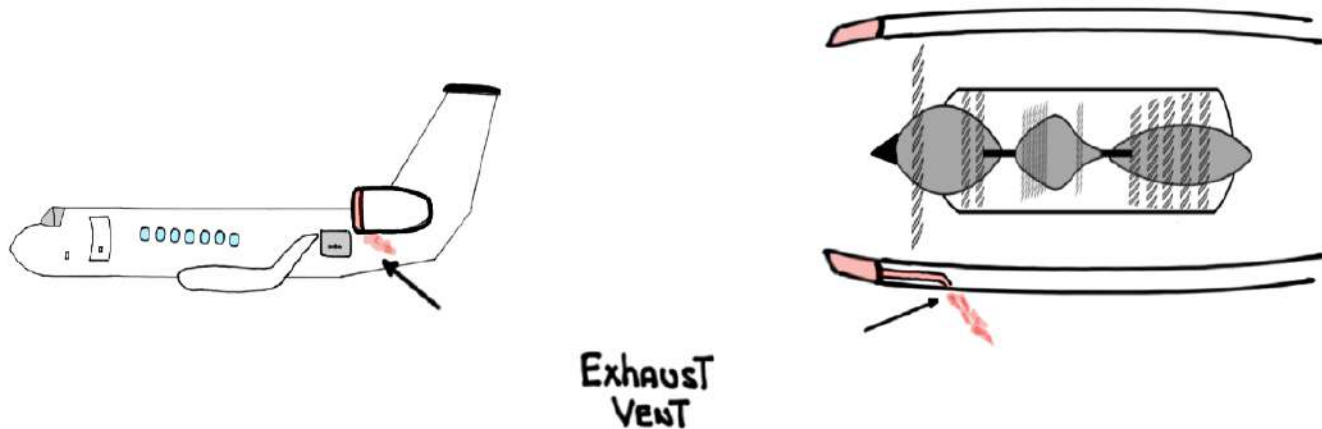
- CAI VALVES FAIL IN THE OPEN POSITION



- CAI STATUS is indicated in PRESSURE (PSI) INSTEAD OF TEMPERATURE BECAUSE ENGINE BLEED AIR IS NOT MODULATED BY THE CAI SYSTEM. PRESSURE VARIES BASED ON ENGINE POWER

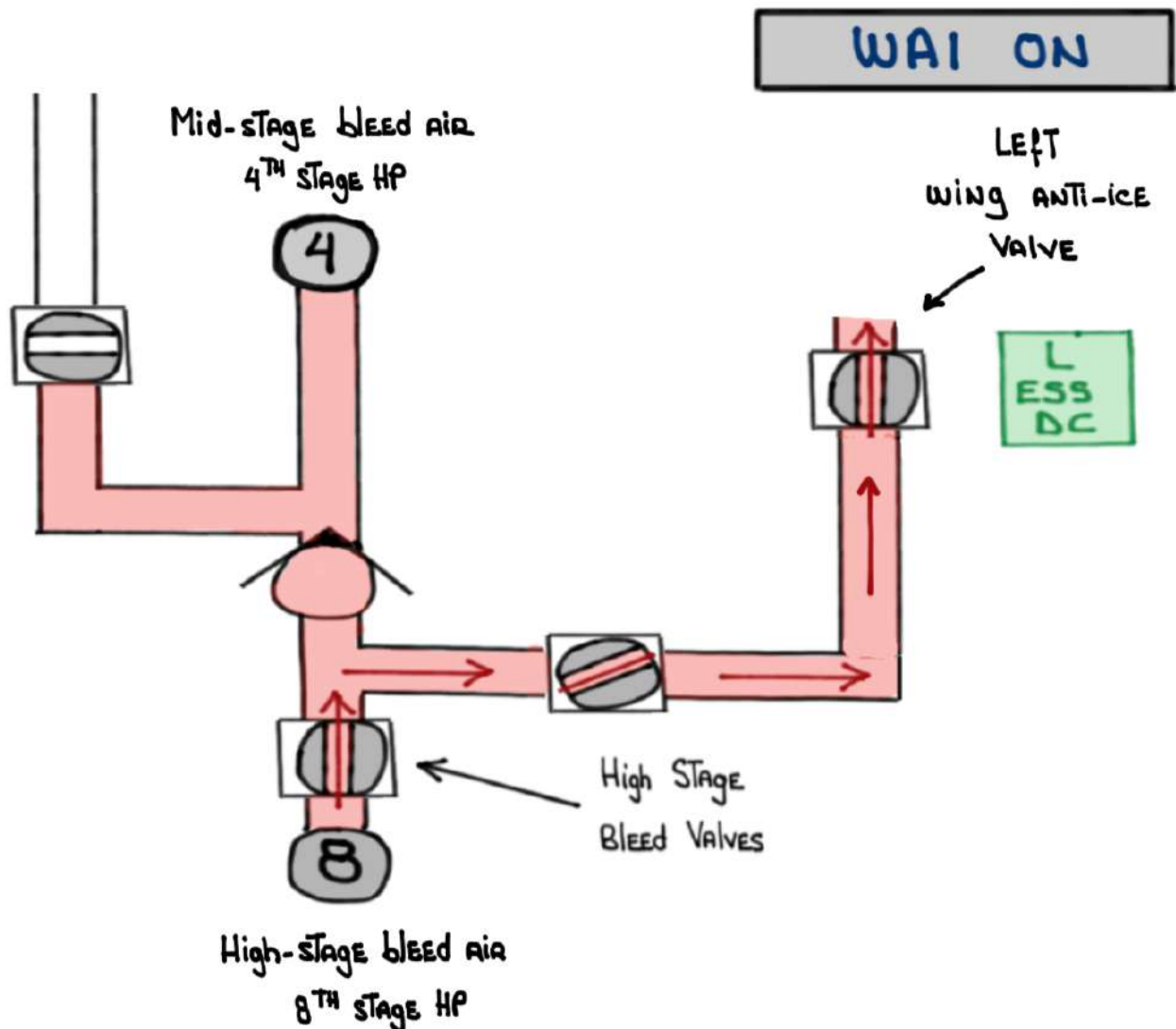


- AFTER PASSING THROUGH THE CAI SUPPLY DUCT, AND HEATING THE COWL LEADING EDGES, THE BLEED AIR IS EXHAUSTED OVERBOARD VIA VENTS LOCATED AT THE BOTTOM OF THE ENGINE COWLS



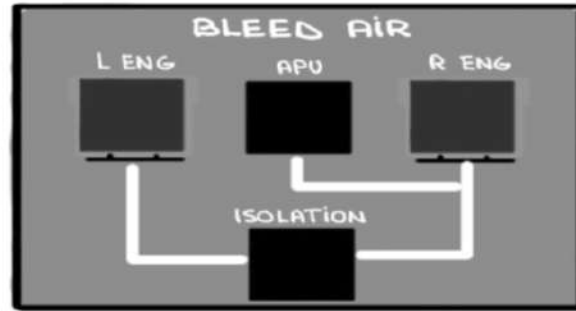
# Wing Anti-ice (WAI) System

- The WAI System protects the wing leading edges against ice accumulation
- The WAI System consists of two (2) separate and independent systems - one (1) for each wing but joined by a crossover duct
- IT USES **HOT** engine bleed air (mid or high stage)





- AT LEAST ONE (1) ENGINE BLEED AIR SWITCH MUST BE ON FOR WAI OPERATION



WAI with only one (1) BLEED AIR SOURCE:

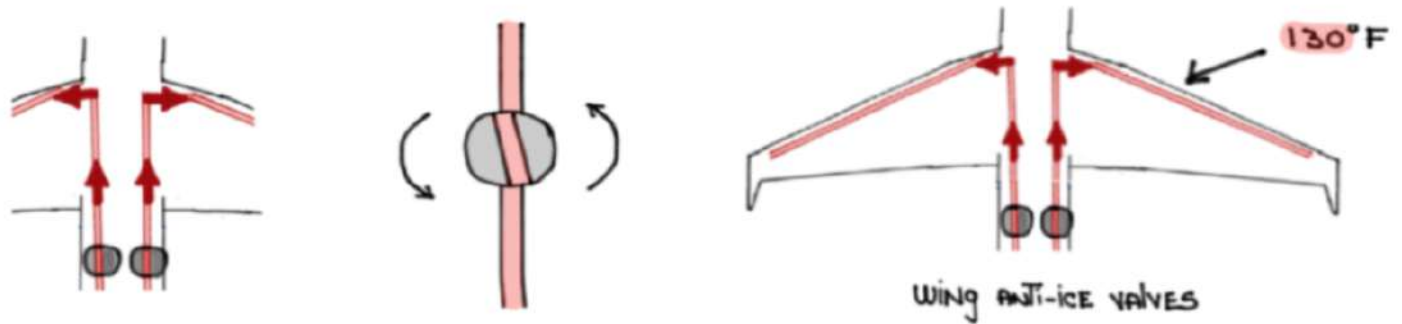
- RESTRICTED TO SINGLE PACK OPERATIONS
- MAXIMUM ALTITUDE/AIR SPEED: 32,000' / M0.85
- WAI ACTIVATION / WING TEMP > 100° F PRIOR TO ENTRY

- **HOT** ENGINE BLEED AIR FLOWS THROUGH THE WAI VALVES

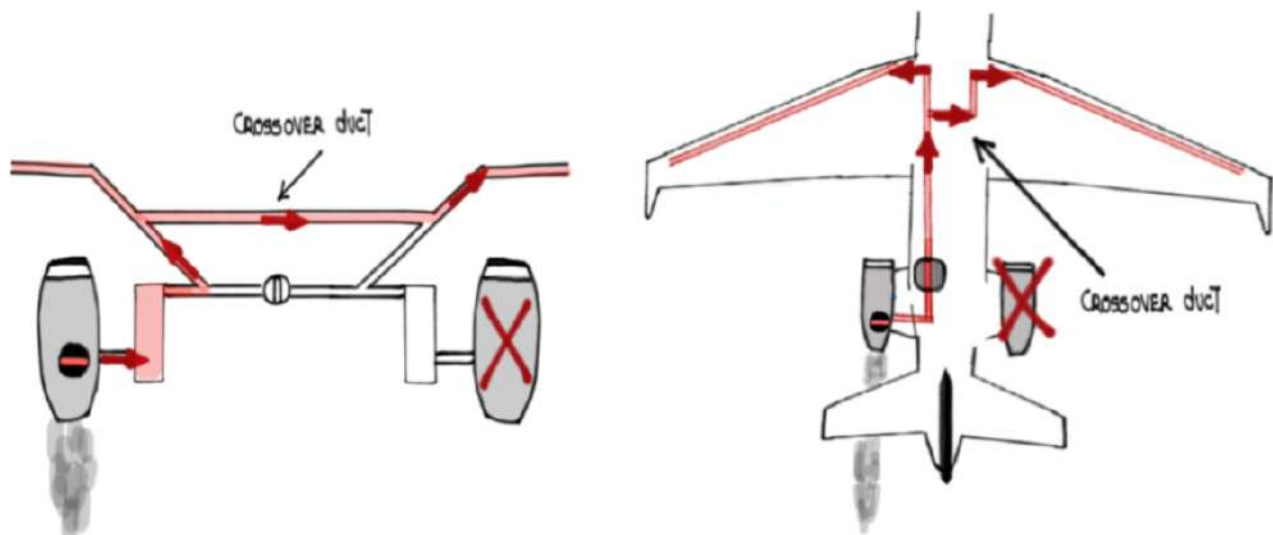
- Two (2) WAI VALVES
- LOCATED IN THE TAIL COMPARTMENT
- BUTTERFLY-TYPE VALVES
- SPRING-LOADED CLOSED (FAIL CLOSED)
- PNEUMATICALLY ACTUATED
- VARIABLE PRESSURE REGULATOR & SHUTOFF VALVES
- PROVIDES REGULATED HOT AIR TO ITS RESPECTIVE WING LEADING EDGE



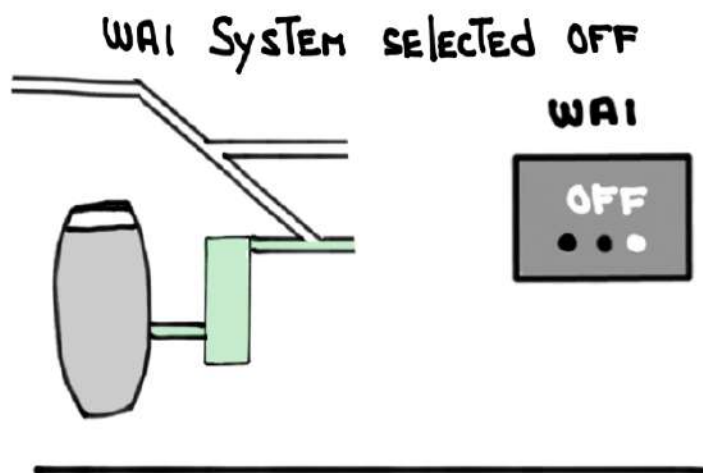
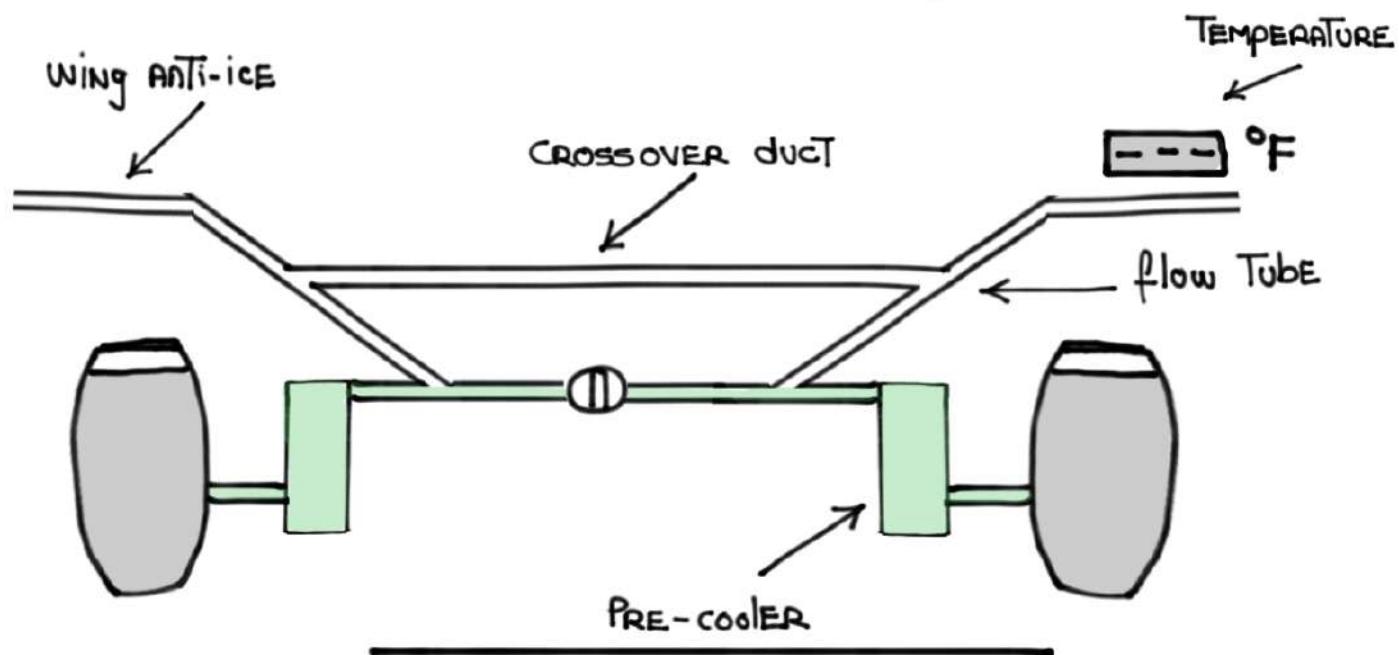
- The wing ANTI-ICE VALVES MODULATE IN ORDER TO MAINTAIN A **130°F** TARGET TEMPERATURE



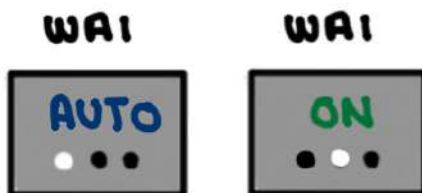
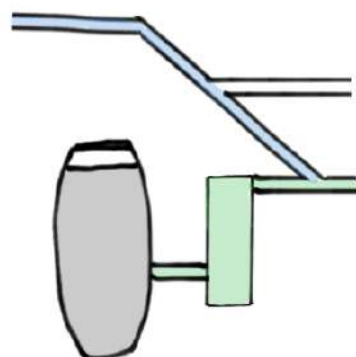
- The **HOT** ENGINE bleed air THEN PASSES THROUGH THE MAIN WHEEL WELL BEFORE EXITING OVERBOARD VIA TWO (2) SCREENS LOCATED BEHIND THE MAIN WHEEL WELL
- IN CASE OF ENGINE FAILURE A CROSSOVER DUCT ALLOWS BLEED AIR FROM THE OPERATING ENGINE TO HEAT UP THE INOPERATIVE SIDE'S LEADING EDGES



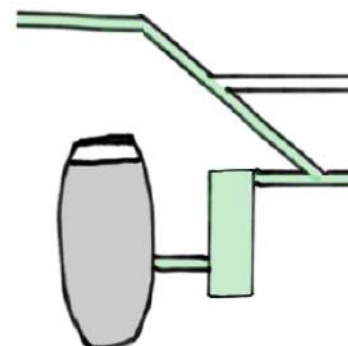
# ECS/PRESSURIZATION synoptic page



WAI SYSTEM SELECTED ON  
TEMPERATURE INCREASING

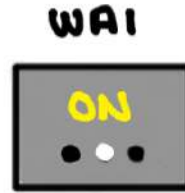
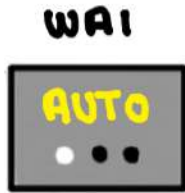
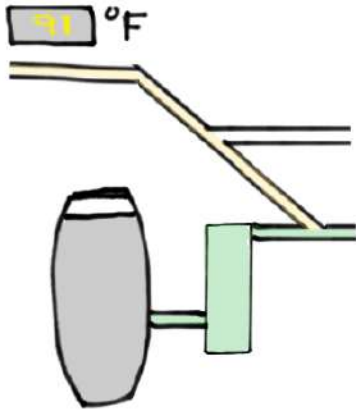


WAI SYSTEM SELECTED ON  
TEMPERATURE  $\geq 100^{\circ}\text{F}$   $< 180^{\circ}\text{F}$



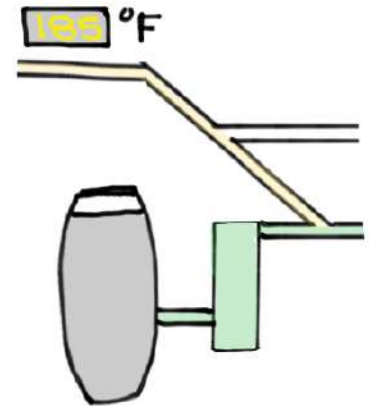
WAI SYSTEM SELECTED ON

> 2 MINUTES: TEMPERATURE < 100°F



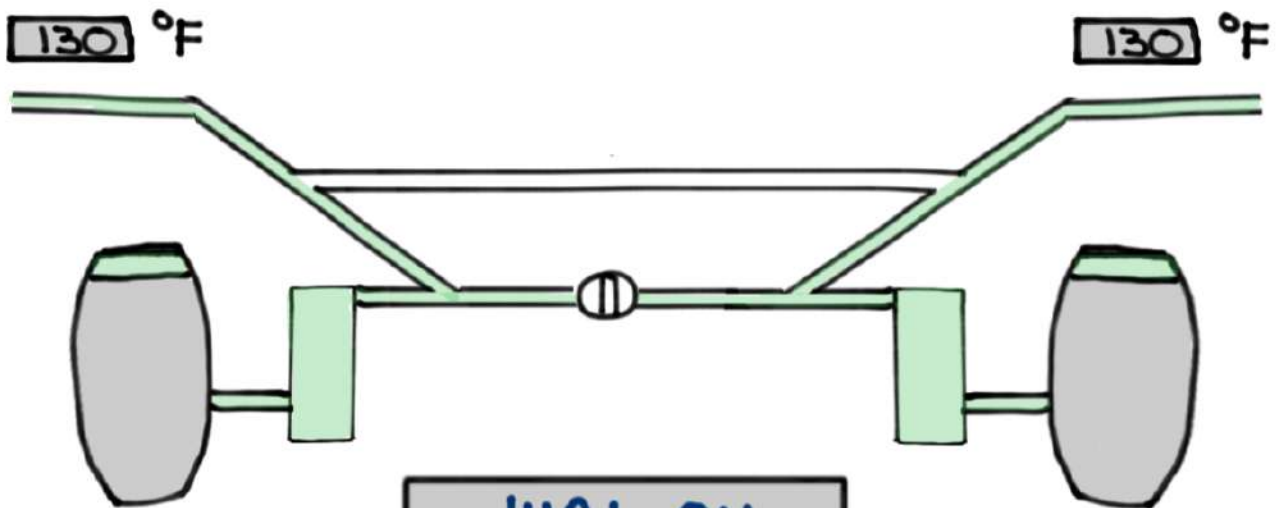
WAI SYSTEM SELECTED ON

TEMPERATURE ≥ 180°F

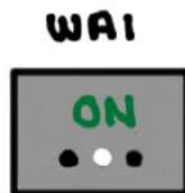


L Wing Temperature Low

L Wing Overheat

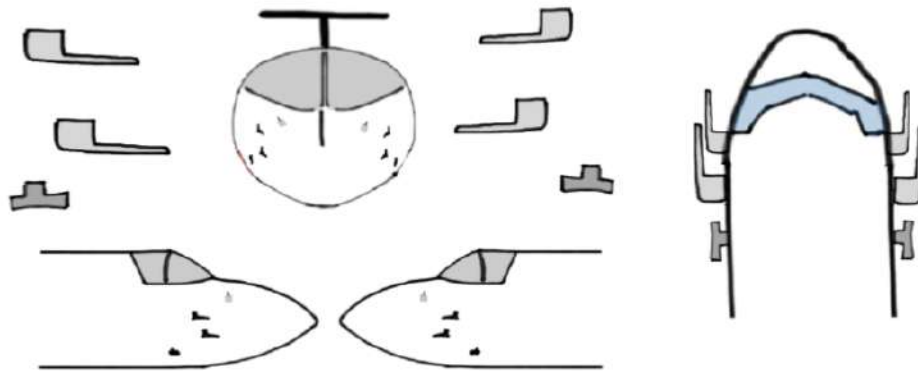


WAI ON



# MULTIFUNCTION PROBES AND TOTAL AIR TEMPERATURE (TAT) PROBES

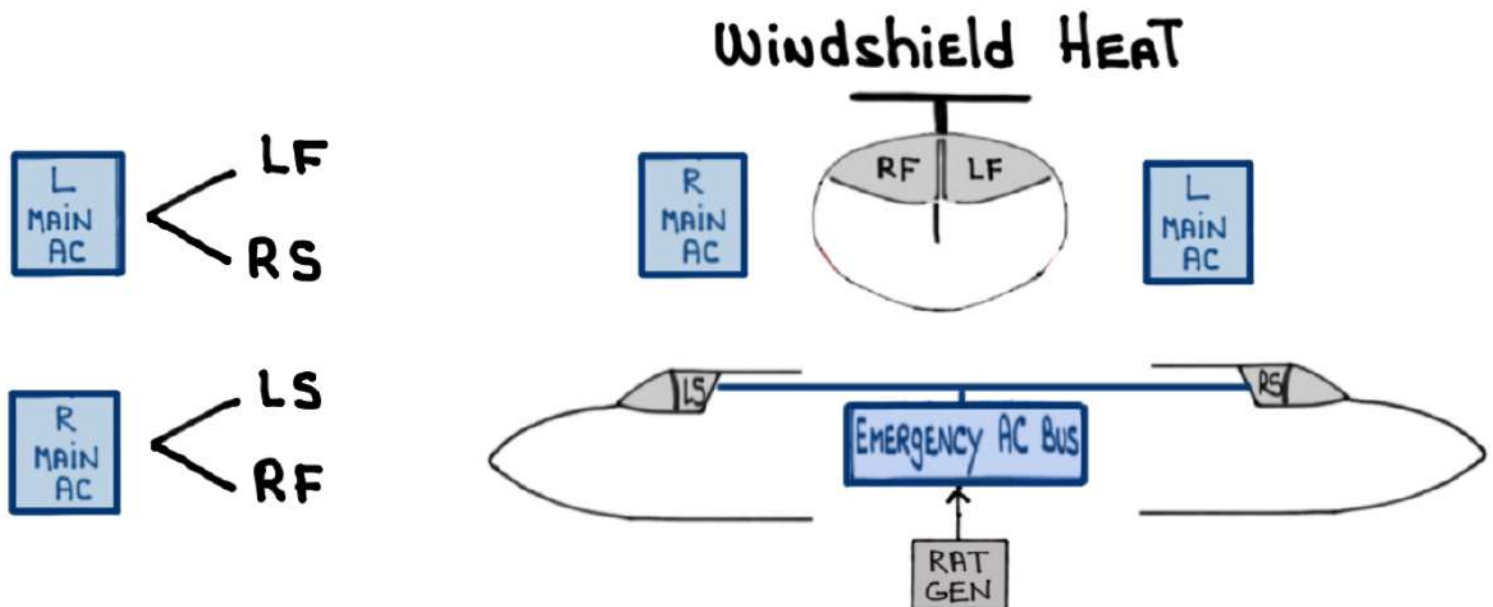
- PROBES ARE ELECTRICALLY HEATED TO PREVENT ICE FORMATION



- AIR DATA PROBE HEATERS ARE TURNED ON AUTOMATICALLY AFTER ENGINE START
  - $150^{\circ}\text{C}$  <  $60\text{ KTS}$  > FULL HEAT
- TAT PROBES ARE ONLY HEATED ABOVE  $100\text{ KTS}$

# Windshield HEAT

- PROTECTS pilot AND copilot front/side windshields FROM ICE ACCUMULATION AND fogging
- ELECTRICALLY POWERED HEATING ELEMENTS WITHIN EACH windshield
- HEATS windshields slowly TO AVOID RAPID TEMP CHANGES
- **GROUND:**
  - DEFAULTS TO OFF
  - CAN BE MANUALLY SELECTED ON
- **In flight:**
  - DEFAULTS TO ON





- IN THE EVENT OF A DUAL IDG AND APU GEN FAILURE THE RAT GEN CAN POWER THE HEATING ELEMENTS FOR THE SIDE WINDOWS

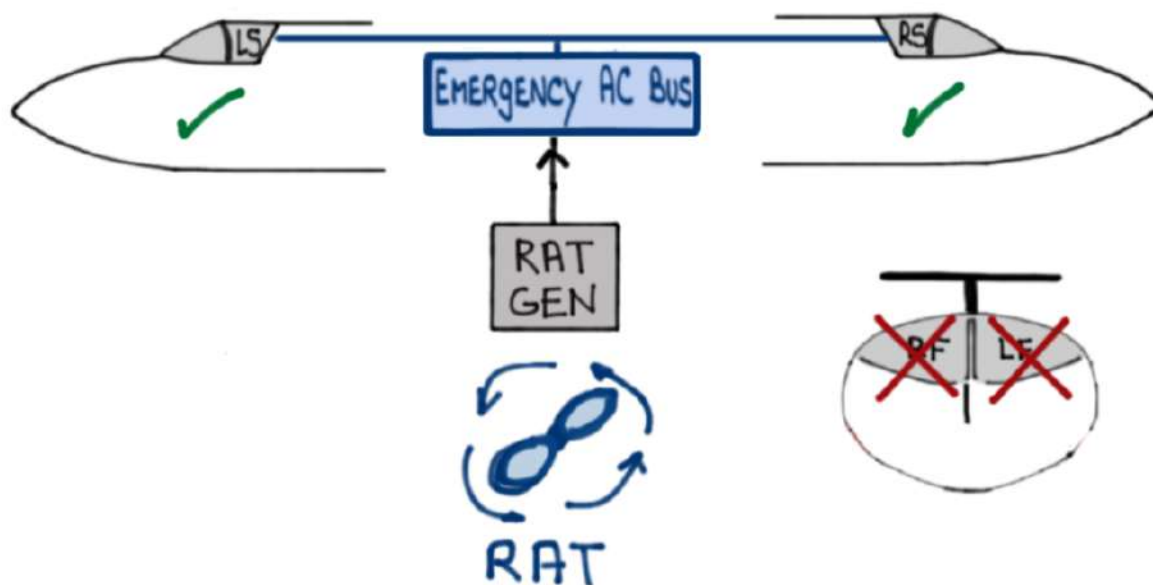
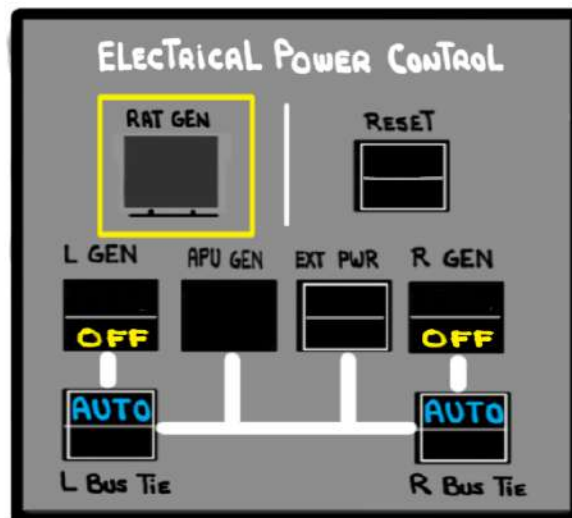


L-R AC POWER FAIL

L-R AC POWER FAULT

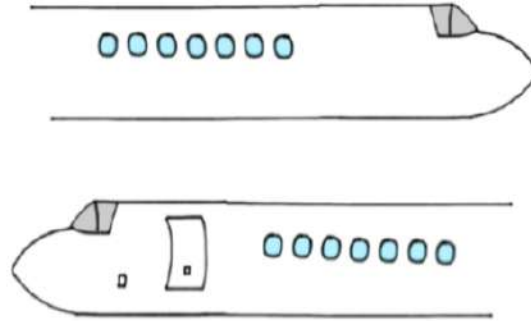
APU POWER FAIL

RAT GENERATOR ON



# Cabin Window HEAT

- Provides ELECTRIC HEAT TO FOURTEEN (14) CABIN windows



- Defaults OFF AT POWER UP
- TURNS ON AUTOMATICALLY > 60 KTS
- MANUAL OVERRIDE CAPABILITY GROUND ONLY - TEN (10) MINUTE limit OR IRREPARABLE DAMAGE CAN OCCUR DUE TO LACK OF AIRFLOW



# EVS Window HEAT

- Provides protection against ice accumulation on the EVS windshield

- Electrically heated

- Modes:

① MANUAL: FIVE (5) MINUTES ON

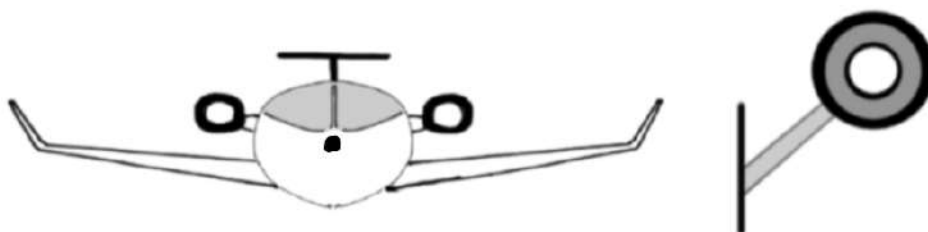
② AUTOMATIC:

- WOW Air AND

ICE DETECTED

- Cyclic HEAT applied to EVS windshield

• GEAR UP: ONE (1) MINUTE ON / SEVEN (7) MINUTES OFF



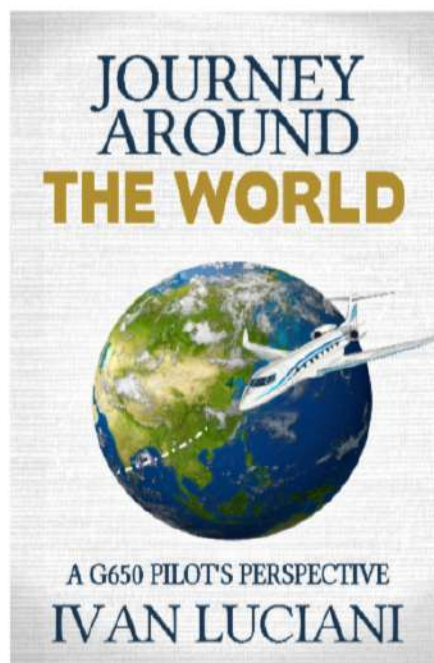
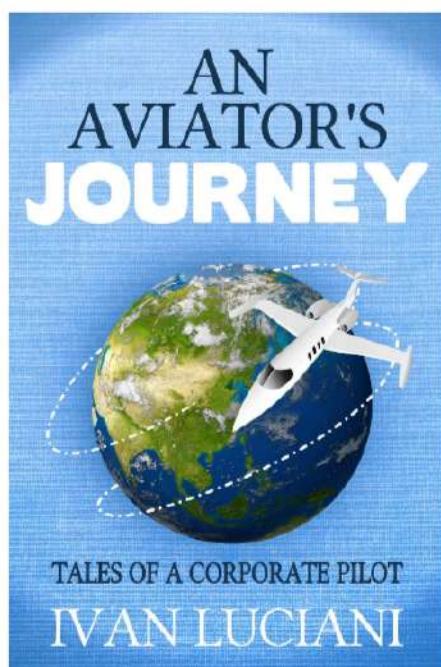
• GEAR DOWN: ONE (1) MINUTE ON / ONE (1) MINUTE OFF



**REMINDER:** these system notes are intended for study purposes only. Always refer to official Gulfstream manuals and other approved references when operating your aircraft.

**NOTE:** these system notes are updated from time to time and what is posted on Code450.com will always be the most recent version.

Questions, comments or errors...please do send me an email:  
[ivan.luciani@gmail.com](mailto:ivan.luciani@gmail.com)



Thank you!