

॥ नमस्ते ॥

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ANTI-ICING SYSTEM

Methods of Anti-Icing System

- 1. Thermal Anti Icing System**
 - 1. Thermal Pneumatic Anti-Icing System**
 - 2. Thermal Electric Anti-Icing System**
- 2. Chemical Anti-Icing System**

Thermal Pneumatic Anti-Icing System

- **Thermal pneumatic anti-ice using engine bleed air is most common for large surfaces such as the leading edges of the wing, empennage and engine inlet cowling.**
- **Usually use heated air ducted span-wise along the inside of the leading edge of the airfoil and distributed around its inner surface.**
- **These thermal pneumatic anti-icing systems are used for wings, leading edge slats, horizontal and vertical stabilizers, engine inlets, and more.**
- **compressor bleed air is Used as Source**

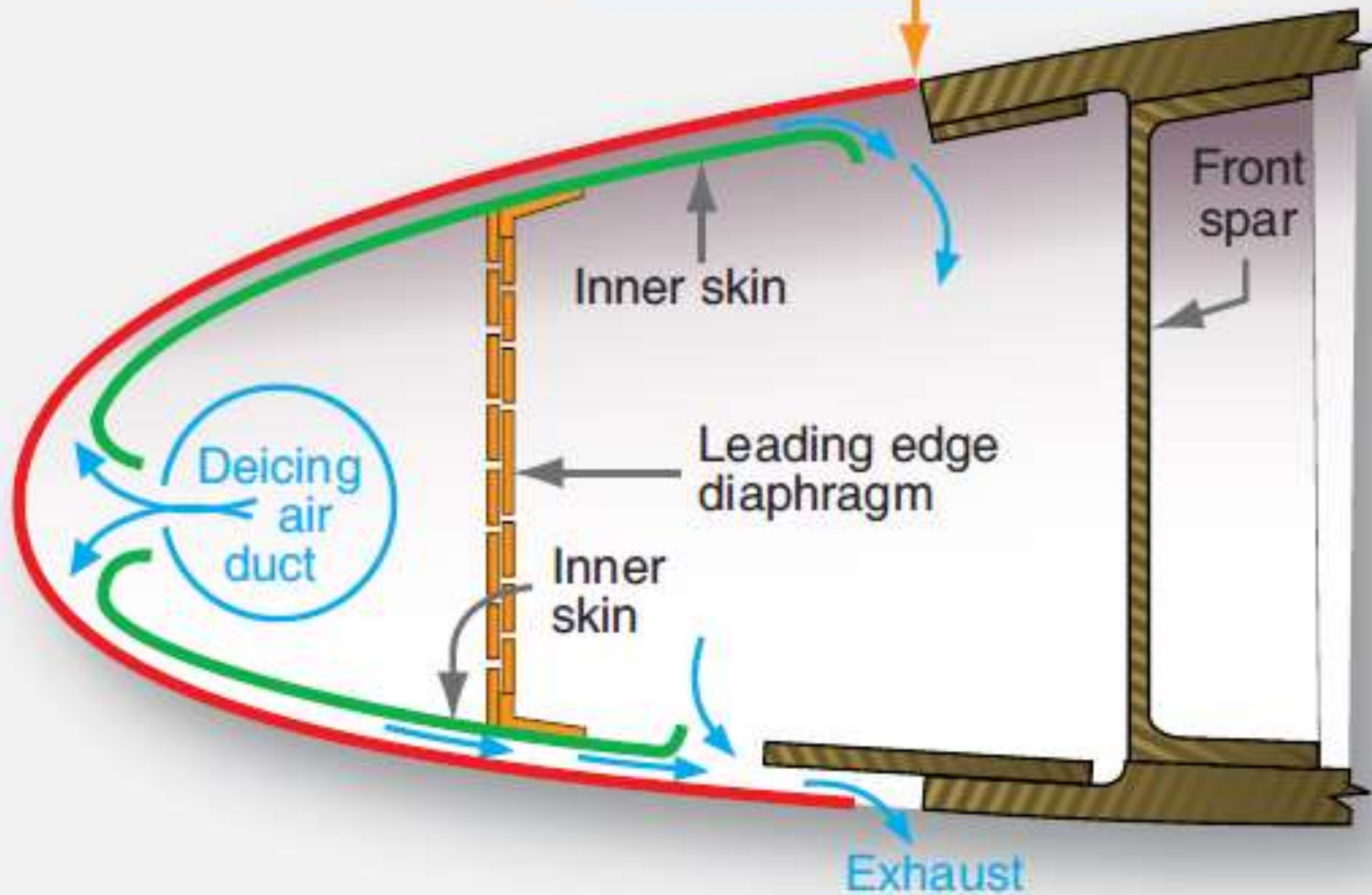
WING ANTI-ICE (WAI OR TAI) SYSTEM

- **Used in business jet and large-transport category aircraft take advantage of the relatively large amounts of very hot air.**
- **The Hot air is routed through ducting, manifolds, and valves to the leading edges of the wings.**
- **The bleed air is routed to each wing leading edge by an ejector in each wing inboard area.**
- **The ejector discharges the bleed air into piccolo tubes for distribution along the leading edge.**

- **Fresh ambient air is introduced into the wing leading edge by two flush-mounted ram air scoops in each wing leading edge, one at the wing root and one near the wingtip.**
- **The ejectors entrain ambient air, reduce the temperature of the bleed air, and increase the mass airflow in the piccolo tubes.**
- **The wing leading edge is constructed of two skin layers separated by a narrow passageway.**
- **The air directed against the leading edge can only escape through the passageway, after which it is vented overboard through a vent in the bottom of the wingtip.**

- **When the WAI switch is turned on, the pressure regulator is energized and the shutoff valve opens.**
- **When the wing leading edge temperature reaches approximately +140 °F(60 c) temperature switches turn ON the operation light above the switch.**

Contour-etched outer skin



Inner skin

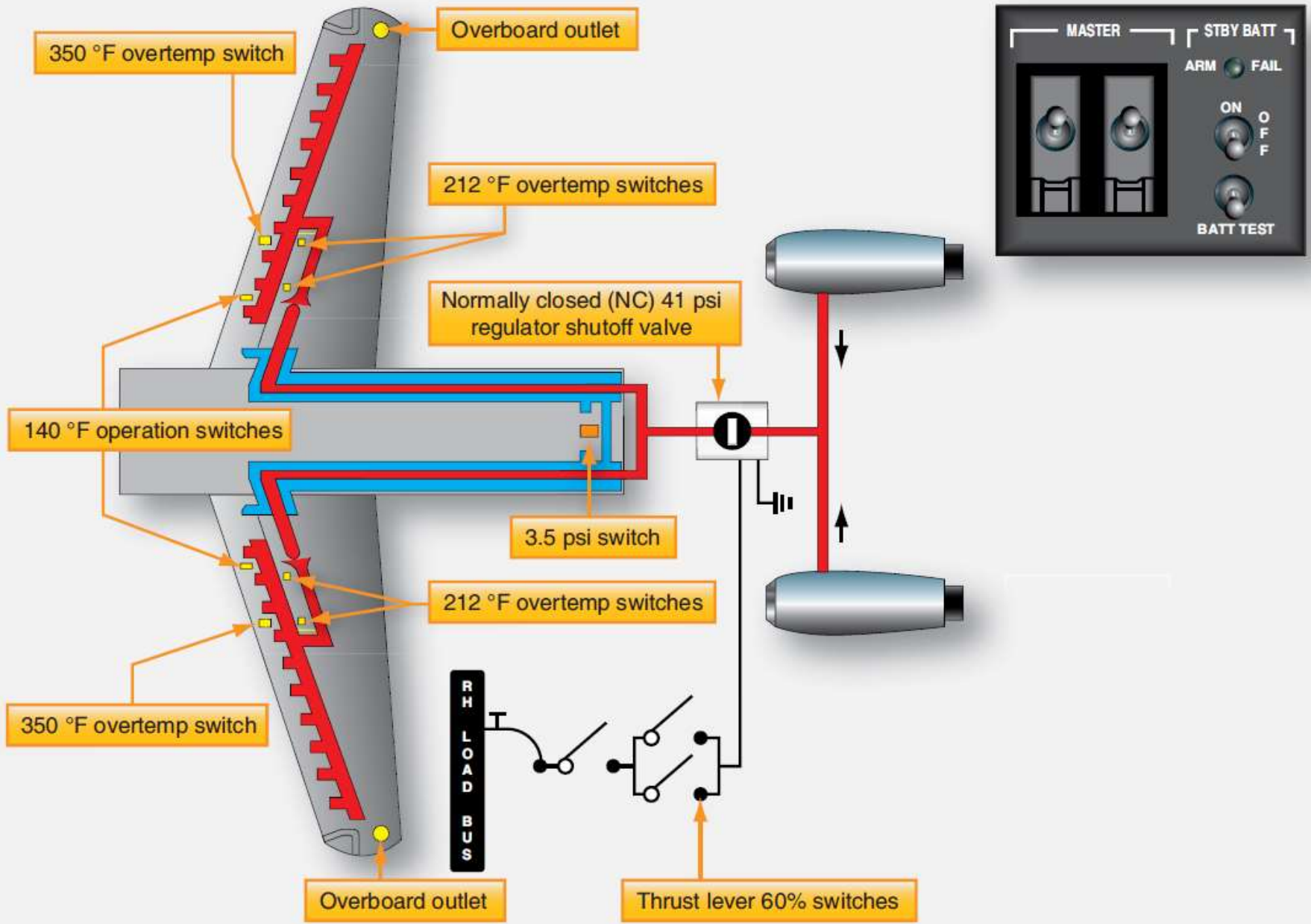
Leading edge diaphragm

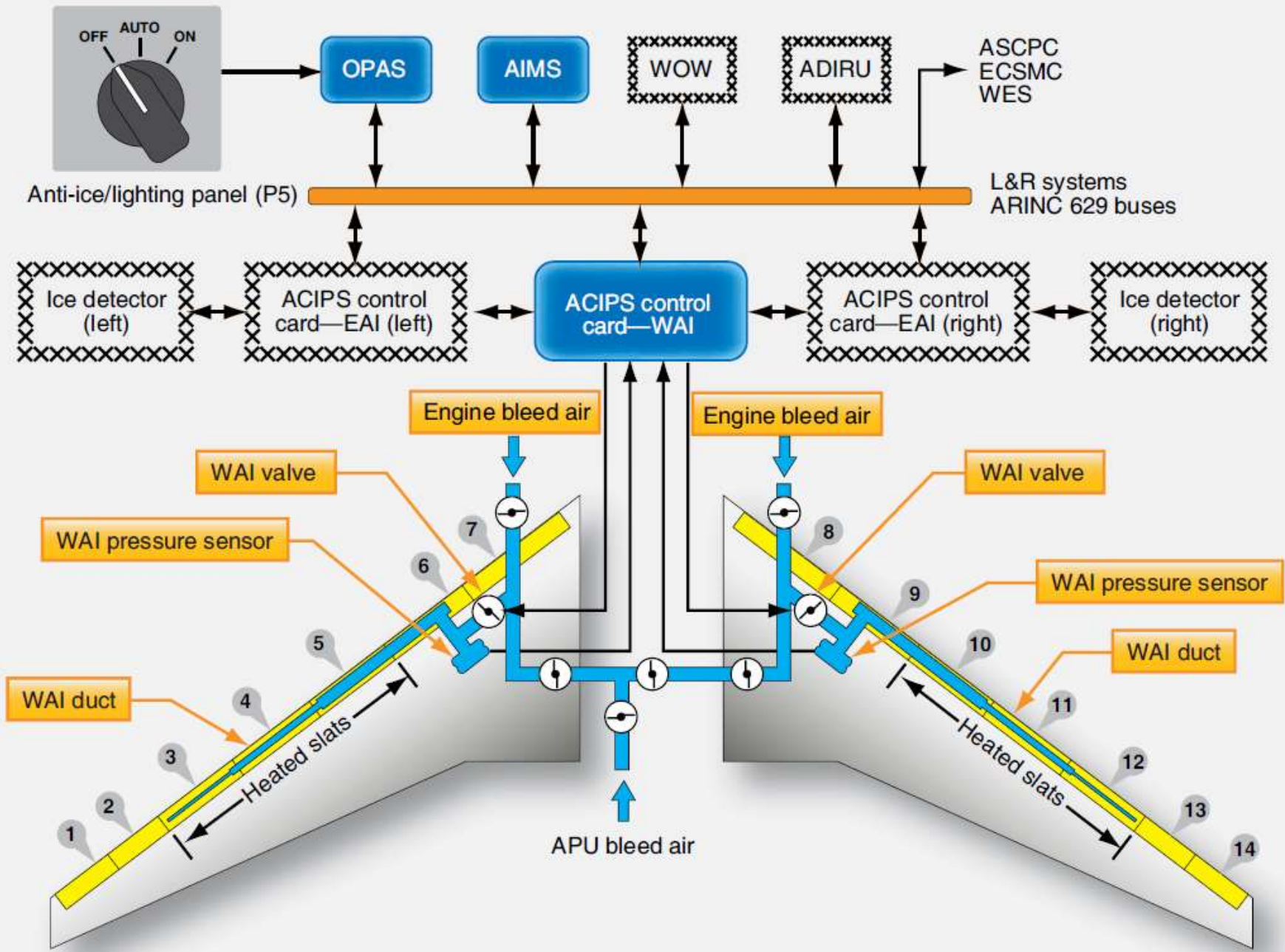
Deicing air duct

Inner skin

Front spar

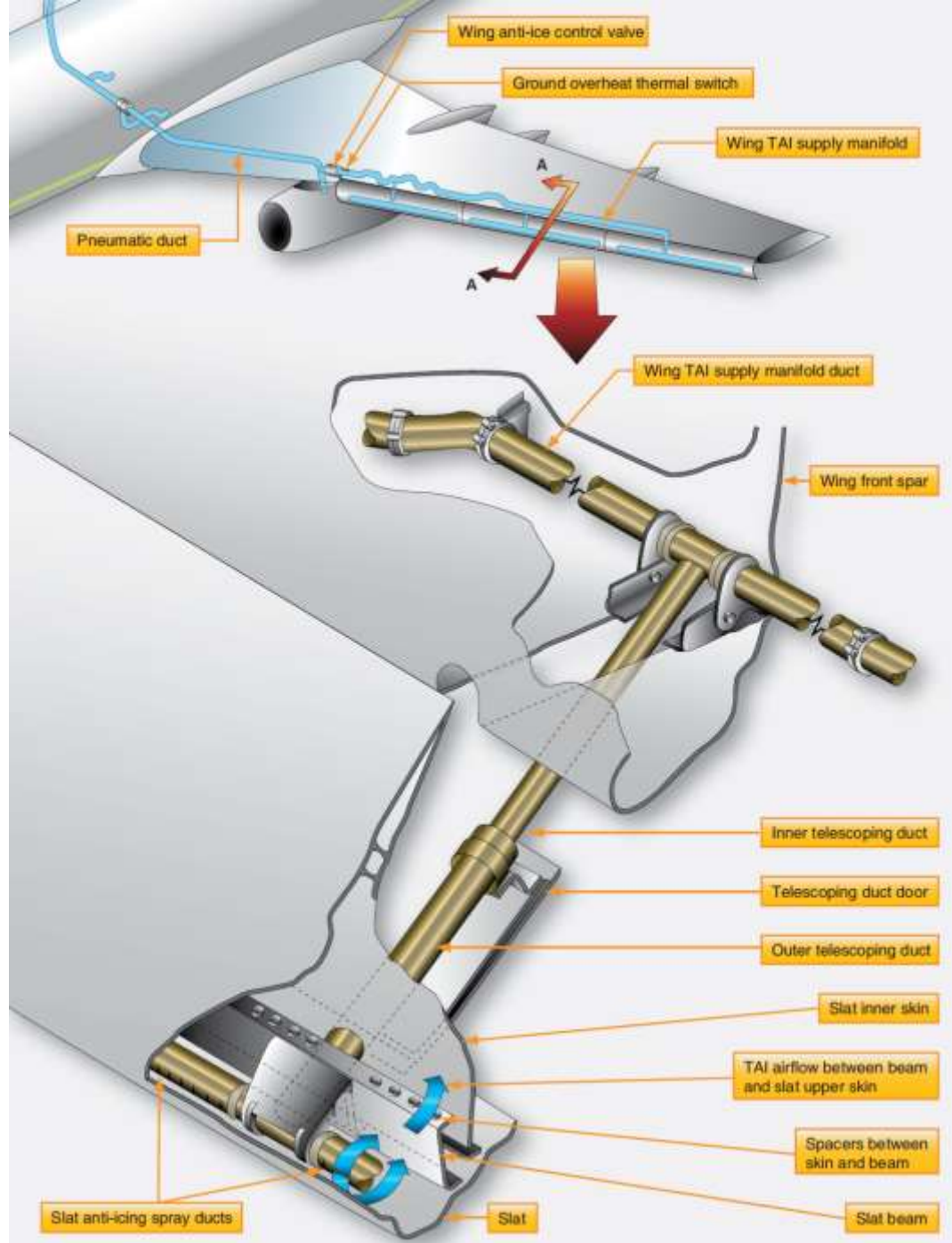
Exhaust





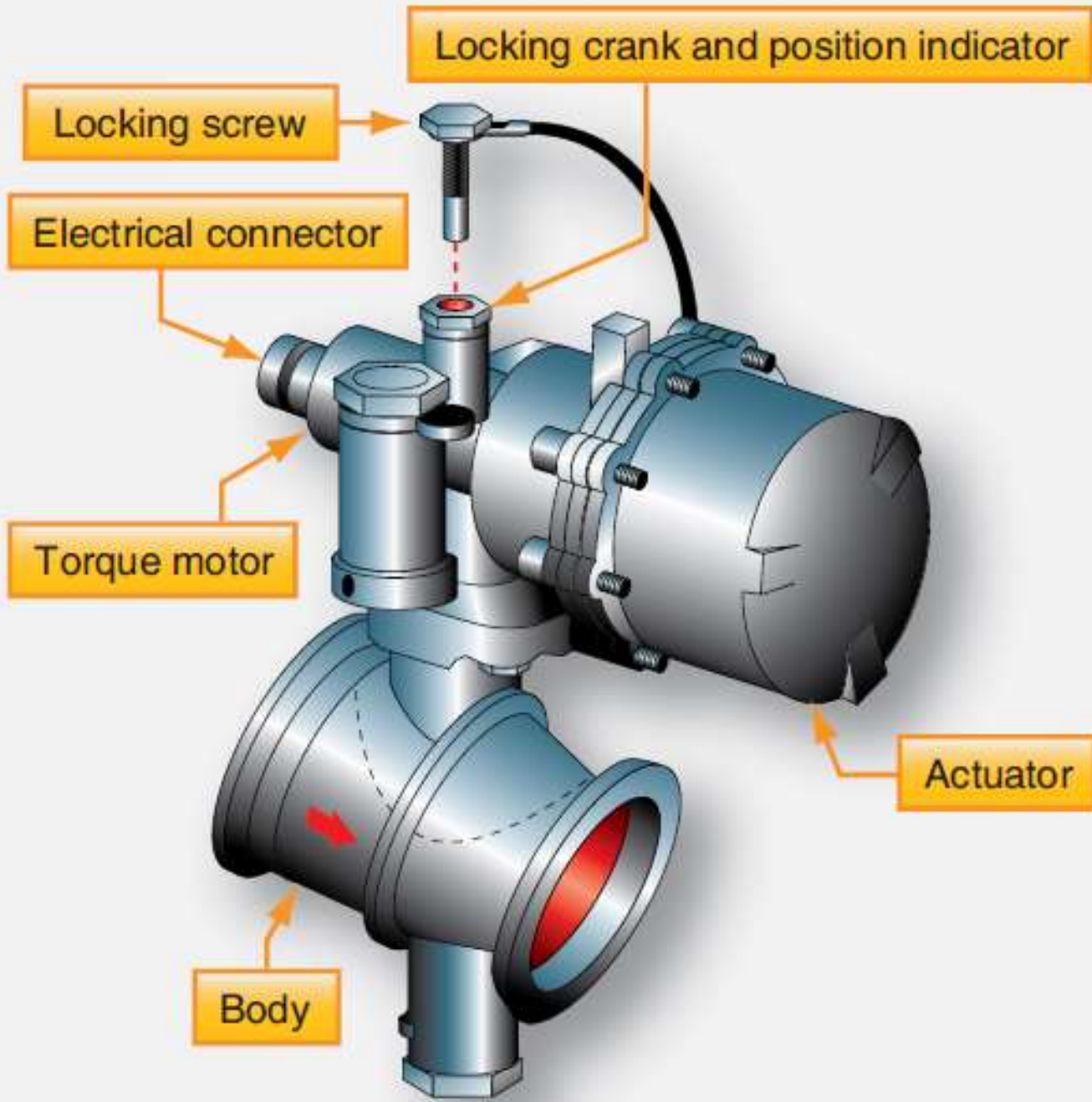
Slat Leading Edges

- **Most large turbine aircraft are fitted with leading edge slats.**
- **This means that it may be the slats that actually receive thermal pneumatic wing anti-ice, not the wing proper.**
- **The WAI ducts move air from the pneumatic system through the wing leading edge to the leading edge slats.**
- **The ducting warms the cavities through which it is routed.**
- **Combined with telescoping ducts that direct air into the slats when extended, retracted or in transit, this is sufficient to keep ice from forming on the entire wing leading edge.**
- **Holes in the bottom of each slat allow the pneumatic air to exit the slats.**



WAI Valve

- **The WAI valve controls the flow of bleed air from the pneumatic system to the WAI ducts.**
- **The valve is electrically controlled and pneumatically actuated.**
- **The torque motor controls operation of the valve.**
- **With no electrical power to the torque motor, air pressure on one side of the actuator holds the valve closed.**
- **Electrical current through the torque motor allows air pressure to open the valve.**
- **As the torque motor current increases, the valve opening increases.**



ENGINE ANTI-ICE (EAI)

- In addition to thermal pneumatic wing anti-ice, large turbine powered aircraft also have thermal pneumatic engine inlet anti-ice (EAI).
- It is extremely important that ice not be allowed to build on the engine inlet cowl. Should ice form and then break off, it is ingested by the engine and could cause engine damage.
- This is why Boeing engine anti-ice is automatically turned on before wing anti-ice when the ice detection system begins to cycle the probe heat. The EAI operates similarly to the WAI.
- Bleed air supplied from a high stage compressor bleed port is ducted to the leading edge of the engine inlet cowls. It exits the cowl through overboard vents.
- A pneumatically actuated EAI valve controls the flow of the warm bleed air to the inlet cowl. The valve is supplied control pressure from an EAI controller.
- The controller has a torque motor that moves in response to ACIPS - EAI logic card signals. It regulates activation pressure to the EAI valve

Today's Amazing Fact???????



**SNOW IS TRANSLUCENT, NOT
WHITE**



ANY QUESTIONS?????

धन्यवाद

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