NOFOD® TECHNICAL OVERVIEW

- **FAA PMA PQ2029NM**
- **FAA STC SA6042NM**
- **FAA AD 2001-06-16**

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NOFOD® TECHNICAL OVERVIEW

- The Causes of ICE-FOD
- The Conditions of Clear Ice
- The Solution
- The NOFOD® Heater System Components
- The NOFOD® Heater System Operation
- TDG Customer Support

THE CAUSES OF ICE-FOD

HISTORY

Some years ago, a major DC-9 operator in Northern Europe experienced serious engine foreign object damage (FOD). This type of FOD was associated with ice. The carrier launched an investigation that identified a source of ICE-FOD that, up to that time, few people knew existed.

The result of the investigation determined that if a wing containing a full or nearly full fuel tank is exposed to the cold of high-altitude cruise for a long period, it becomes cold-soaked. If the aircraft subsequently lands at an airport with an ambient temperature above freezing and a readily available source of moisture such as rain, drizzle, heavy fog, etc., that moisture will freeze when it comes in contact with the top surface of the cold-soaked wing[1].

The characteristics of the FOD:

- The ice formed is usually clear.
- The wing appears to have a wet surface.
- To detect this ice, the wing surface has to be (felt by hand) closely inspected.

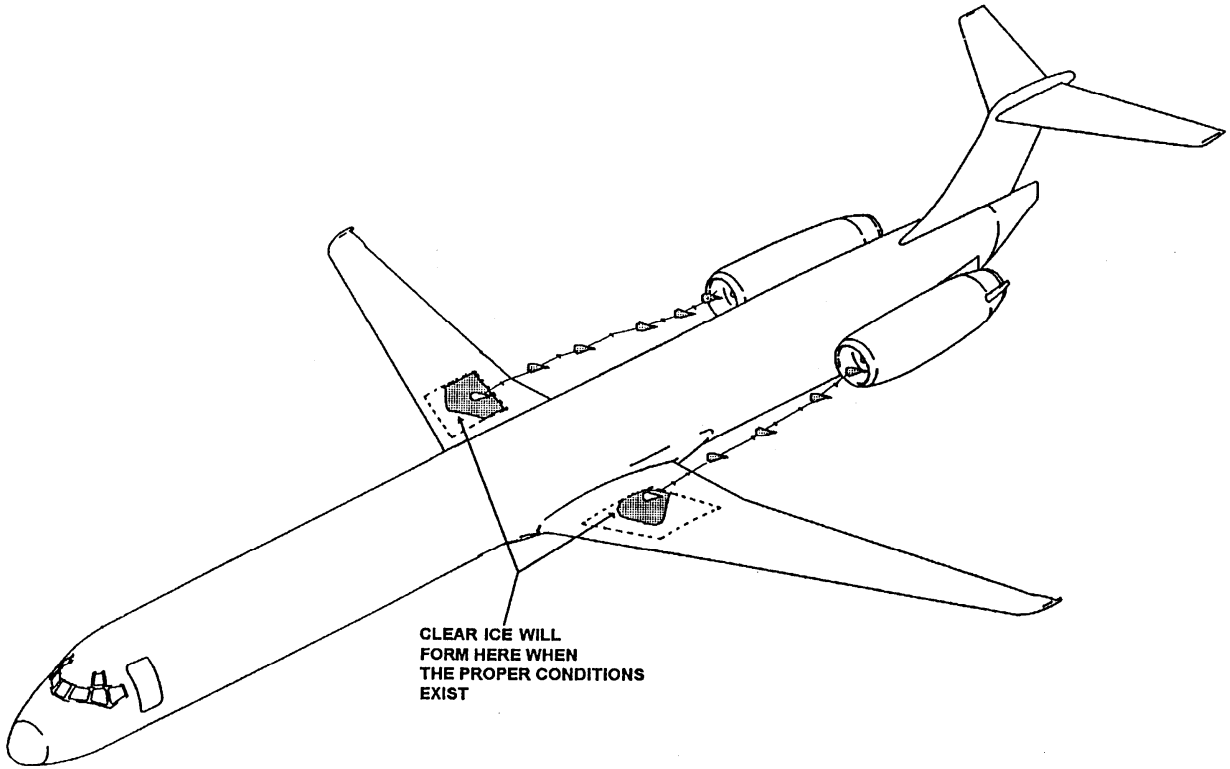
If ice is present but not detected, the natural flexing of the wing during the taxi for takeoff will loosen the ice, and at rotation the airflow over the wing will cause it to break loose. The clear ice that has formed in the area ahead of the engines then flies into the engine, striking the intake lip / bullet / guide vanes, etc., shattering into smaller pieces as it passes into the fan section, creating the soft FOD damage long associated with ice.

Ambient ground temperatures higher than 60°F (15°C) may still permit cold-soak ice to form. There are so many variables involved that the upper ambient ground temperature limit is not known.

These variables include flight duration, en route and ground ambient temperatures, fuel tank levels upon arrival, the timing and extent of refueling, and the presence of humidity, fog, drizzle, or rain. The cooling effect of a series of high altitude flights may be cumulative.

[1] INFORMATION SOURCE: MD Flight Approach --ICEFOD--Inspection for Ice.

THE CAUSES OF ICE-FOD



THE CONDITIONS OF CLEAR ICE

PRESENT CONDITIONS

Clear ice/frost may form on the upper and lower wing surfaces of MD-80 series aircraft. This contamination forms on the wing surfaces directly above and below the wing fuel tanks due to the effect of *supercooled[1] fuel* impinging on the internal wing surfaces. Factors contributing to the formation of this contamination are:

- Duration of flight at cruise altitudes
- The relationship between the outside air temperature and dew point[2] at the airport
- The dew point temperature relationship is often visible in the form of heavy dew[3] fog, drizzle or rain

NOTE: When ice or frost is present on MD-80 upper wing surfaces both the top and bottom surfaces must be deiced. When the top surface is void of contamination, a 1/8-inch thickness of condensation frost is permissible on the bottom surfaces. However, no ice accumulation is allowed.

Whenever the station ambient temperature is 50º F. (10ºC.), the upper surfaces (wing tank area) of both wings shall be checked. This check is to be performed after the wing tanks have been fueled and as close to departure as is practical.

PRESENT INSPECTION

Using an approved ladder placed on, or adjacent to (dependent on the ladder type used) the wing leading edge, and located approximately six (6) feet outboard of the fuselage, check the wing upper surface for contamination. This check is accomplished by feeling for ice/snow along an area of the wing upper surface, aft of the front spar, outboard as far as can safely be reached from the ladder. In addition, from the ladder, check the aft (cold corner) section of the wing for contamination visually and by using the ice detection pole (CPN 5445164).

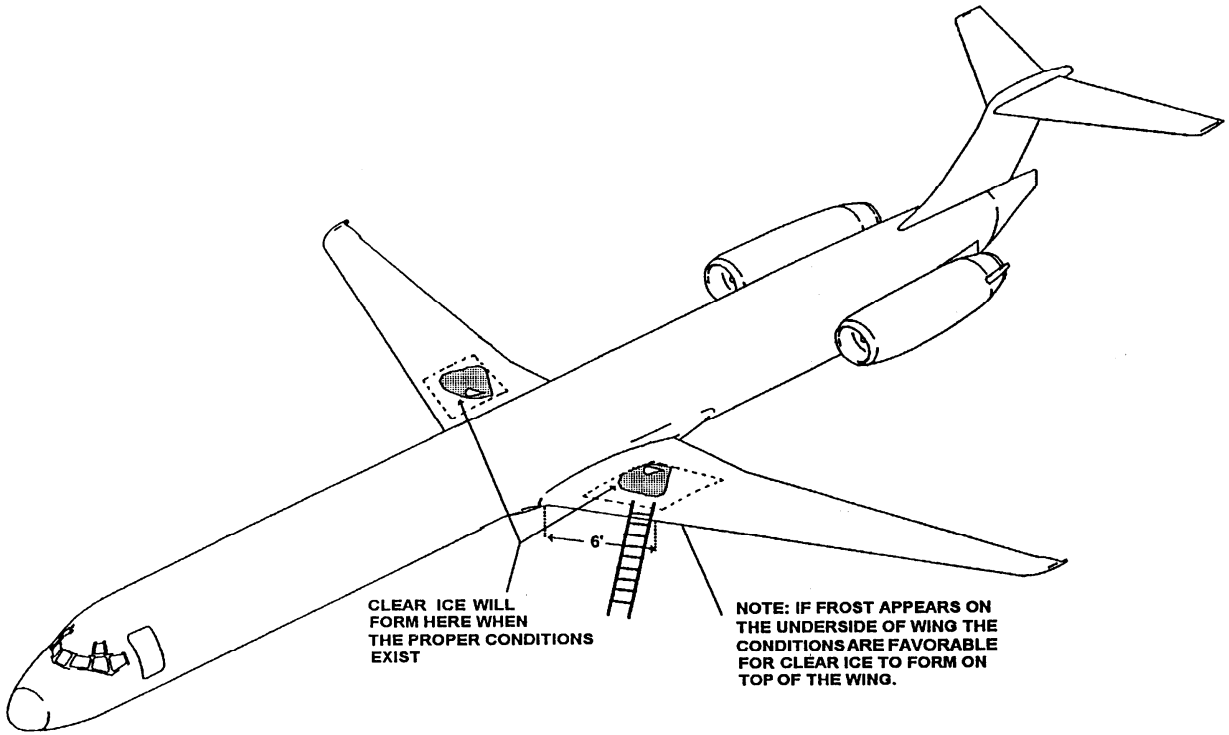
Check the black striped triangle areas of each wing by alternately pushing and drawing the tip of the ice detection pole fore and aft alternately along the painted and unpainted surfaces. The black painted stripes should have the feel of a rough friction surface, while the unpainted surfaces should feel smooth.

[1]SUPERCOOL - To cool below the freezing point without solidification (American Heritage Dictionary)

[2]DEW POINT - The Temperature at which air becomes saturated and produces dew. (American Heritage Dictionary)

[3]DEW - Water droplets condensed from the air, usually at night, onto cool surfaces. (American Heritage Dictionary)

THE CONDITIONS OF CLIMATE



PRESENT INSPECTION

THE SOLUTION

ICE DETECTORS	TDG NOFOD® ANTI-ICE SYSTEM
Boeing means of compliance to AD2001-06-16 installs in the upper wing surface notifies flight crew that there is ice on the wing. Flight crew calls for wing to be deiced.	TDG means of compliance to AD2001-06-16 installs aluminum composite heater blankets on the upper wing surface, automatically activated and prevents ice from forming.

The NOFOD® System is designed to provide certain de-icing, anti-icing, and warning functions.

De-icing functions: The NOFOD® System is designed to remove ice which may have accumulated SOLELY as a result of cold fuel in the main fuel tanks in ambient temperature conditions above freezing. The design is such that the warm indication will not be given with ice remaining on the heater panels.

NOTE: The NOFOD® System was not designed to de-ice the entire engine FOD zone, defined as being those areas of the aircraft for which if ice were to be shed, the shed particles could enter the engine inlets. In environmental icing conditions, the surface area of the entire FOD zone is immense and includes sections of both the wing upper surfaces and the fuselage.

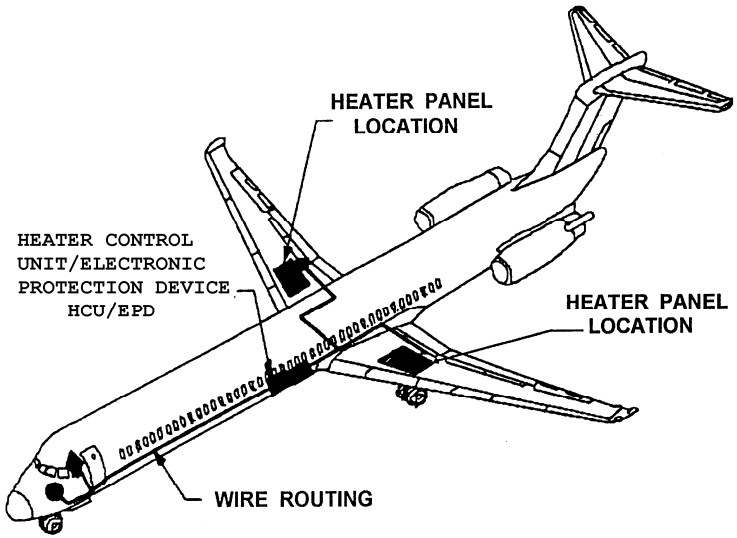
Anti-ice functions: The NOFOD® System is designed to prevent ice from forming SOLELY as a result of cold fuel (> -15ºF) in the main wing fuel tanks in ambient temperature conditions above freezing. ***A warm indication will not be given unless the heater panels are free of ice.***

NOTE: The NOFOD® System was not designed to anti-ice the entire engine FOD zone.

During non-environmental icing conditions, the NOFOD® System is designed to alert the crew whenever ice may have formed or be forming on the heater panels.

NOTE: The NOFOD® System was not designed to indicate to the crew when environmental icing conditions exist. As such the warning indications issued by the system must be interpreted in conjunction with the flight crew's assessment as to whether or not environmental icing conditions exist.

THE SOLUTION



MEANS OF COMPLIANCE

United States Of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number SA6042NM

This Certificate issued to TDG Aerospace, Inc.
545 Corporate Drive
Escondido, California 92029

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 25 of the Federal Aviation Regulations.

Original Product Type Certificate Number: A6WE

Make: McDonnell Douglas

Model: DC-9-81, -82, -83, -87, and MD-88

Description of Type Design Change: Installation of NOFOD Overwing Anti-Ice System in accordance with FAA approved TDG Master Drawing List E93-104, Revision E, dated August 16, 1993, or later FAA approved revision. FAA approved Airplane Flight Manual Supplement TDG Document E93-096 dated September 9, 1993, or later FAA approved revision, is required as part of this installation.

Limitations and Conditions: The installation should not be incorporated in any aircraft unless it is determined that the interrelationship between this installation and any previously approved configuration will not introduce any adverse effect upon the airworthiness of the aircraft. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: July 30, 1992

Date of issuance: September 24, 1993

Date reissued: Dec. 9, 1994; Dec. 9, 1998; Oct. 26, 2000; Oct. 31, 2001; Nov. 13, 2003; Sep. 15, 2004

Date amended: November 15, 1996

By direction of the Administrator

(Signature)

Manager, Technical & Administration Support
Staff, Los Angeles Aircraft Certification Office
(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 8110-2(10-68) Page 1 of 3

This certificate may be transferred in accordance with FAR 21.47.

NOFOD® HEATER COMPONENTS

DESCRIPTION

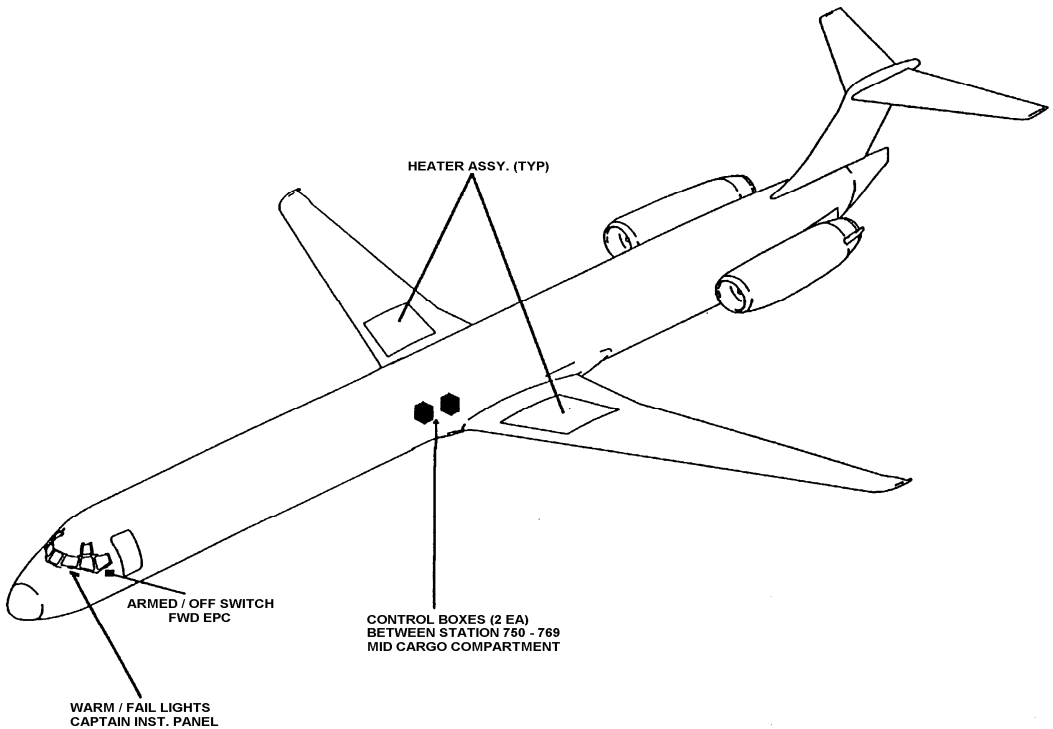
Each overwing heater covers approximately 47 square feet of the upper wing surface just outboard of the overwing walkway. The heater is fastened and bonded to the upper wing surface. The painted black-striped triangle, used for the physical check of the wing upper surface, is painted on top of the heater.

The system operates on the ground, through a guarded switch (O/W Heater Switch) installed on the left EPC. The heaters are designed to ensure that their surface temperature does not exceed that which would normally occur from the airplane being parked in a sunny location on a hot day - - 40ºF (4ºC) and 85ºF (29ºC). The system is inhibited by placing the O/W Heater Switch in the OFF position.

System status is displayed by the two annunciator lights on the Captain's instrument panel.

A WARM Light illuminates when both heaters are at 40ºF (4ºC) or above. The Heater Control Units (HCU) continuously monitor the system for electrical faults and will remove AC electrical power to both heaters and deactivate the WARM Light when a fault is detected. When any fault is detected, a FAIL Light and MASTER CAUTION Lights will illuminate.

NOFOD® HEATER COMPONENTS



DESCRIPTION

NOFOD® HEATER COMPONENTS

INDICATION

L. FAIL and **R. FAIL** LIGHT (Amber)

Illuminates when any fault is detected with power applied to the system.

WARM Light (Green)

Illuminates when both heaters are 40ºF (4ºC) or above. Warm Light inhibit is reset by pressing the light assembly.

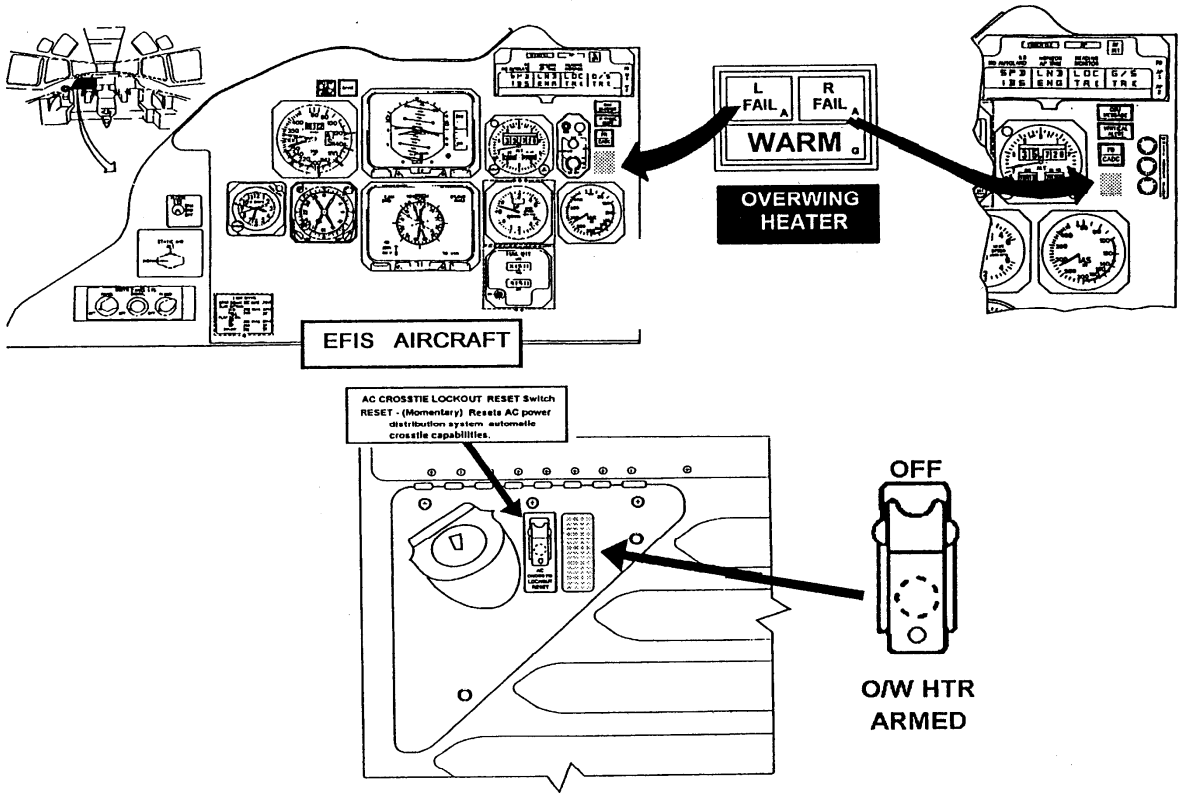
ARMED / OFF SWITCH

O/W Htr Switch

ARMED: Provides electrical power to the HCU/EPDs when the aircraft is on the ground.

OFF: Removes electrical power from the HCU/EPDs

NOFOD® HEATER COMPONENTS



INDICATION and ARMED / OFF SWITCH

NOFOD® HEATER COMPONENTS

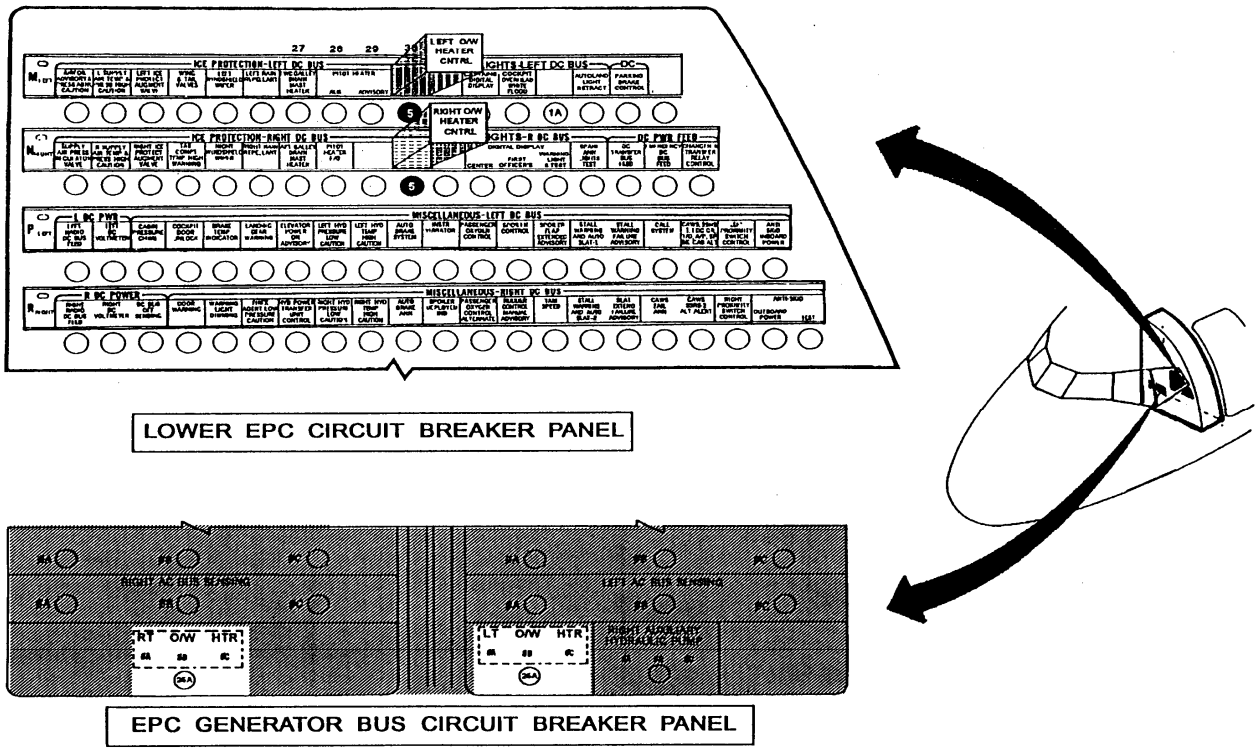
CIRCUIT BREAKERS

Two circuit breakers installed on the Lower EP Circuit Breaker Panel behind the Captain's seat labeled:

- **LEFT O/W HEATER CONTRL (M-30)**
- **RIGHT O/W HEATER CONTRL (N-3)**

Two circuit breakers installed on the Generator Bus Circuit Breaker Panel behind the Captain's seat labeled;**LT O/W HTR, and RT O/W HTR**

NOFOD® HEATER COMPONENTS



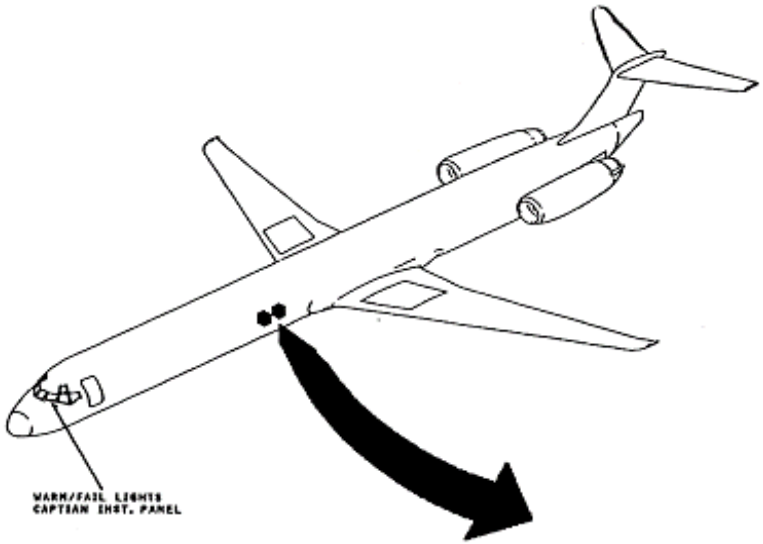
NOFOD® HEATER COMPONENTS

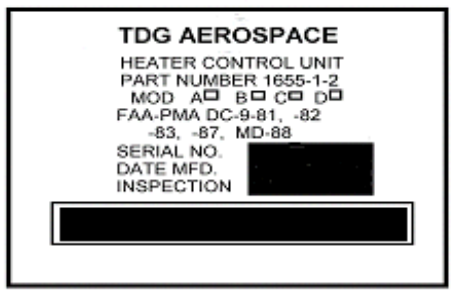
HEATER CONTROL UNIT-ELECTRONIC PROTECTION DEVICE (HCU/EPD)

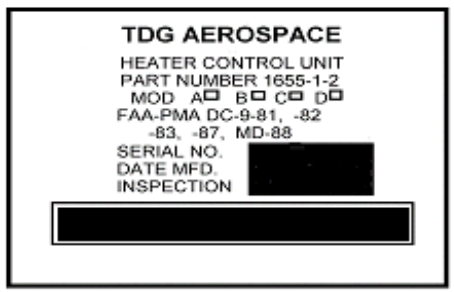
The HCU/EPD's are located in the Mid cargo area behind the sidewall panel marked OVERWING HEATER CONTROL UNIT between stations 750 thru 769.

Each HCU/EPD senses the associated heater panel temperature, controls the power to heat the panels and provides the pilot an indication of the system status. This status is continuously monitored by the HCU/EPD's for electrical faults. If a fault is detected the HCU/EPD will remove AC electrical power from both heater panels and deactivate the warm light. When any fault is detected, a FAIL Light will illuminate.

NOFOD® HEATER COMPONENTS







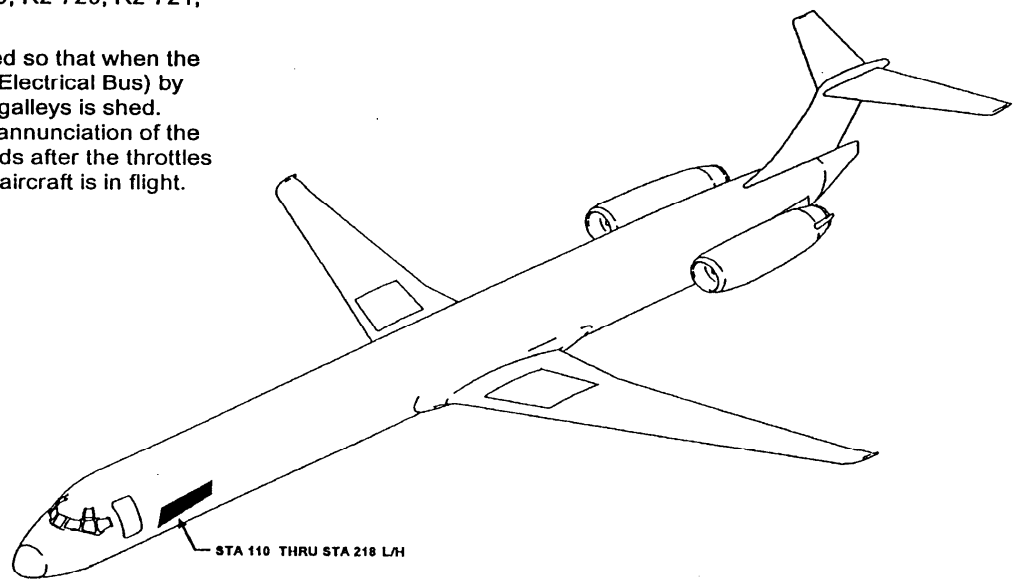
NOFOD® HEATER COMPONENTS

RELAYS

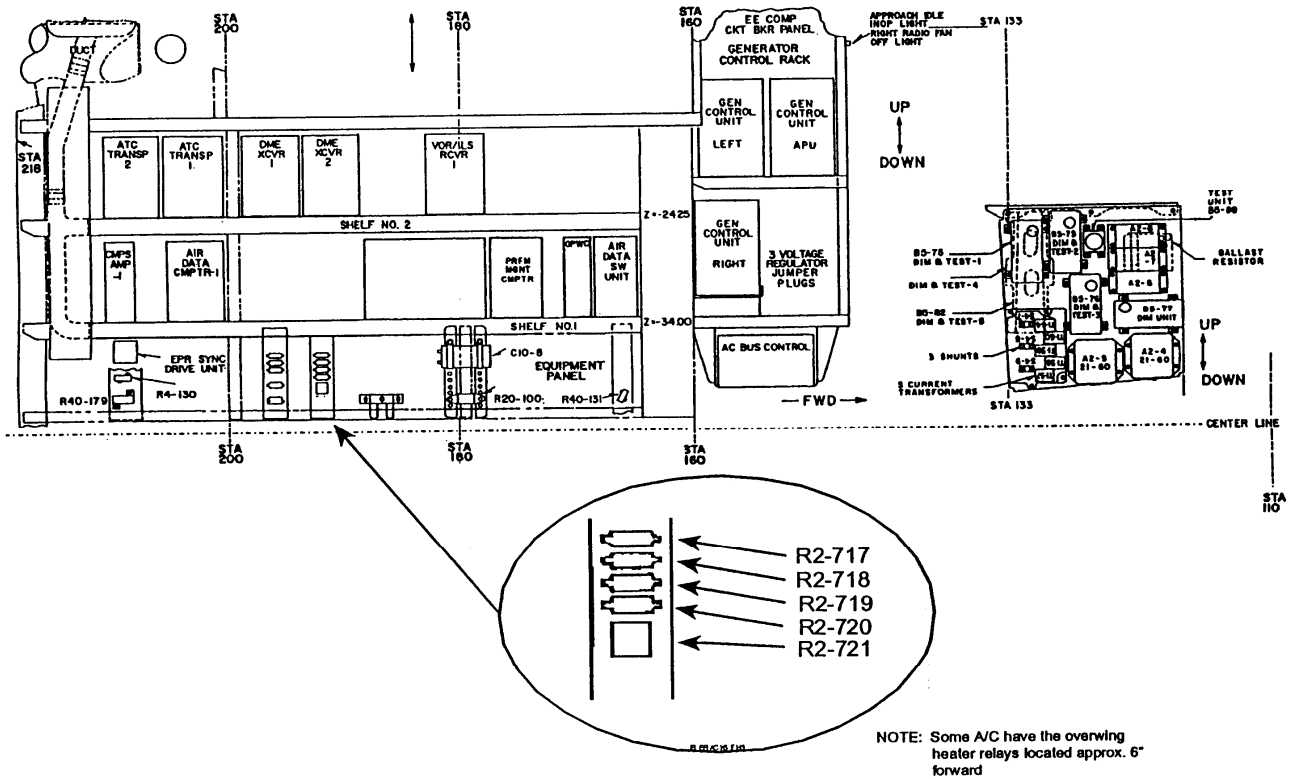
Location: Relays are located at station 193.28, Aft Left Radio Rack.

Relays: R2-717, R2-718, R2-719, R2-720, R2-721,

The relay logic in the aircraft is designed so that when the aircraft is powered solely (Left & Right Electrical Bus) by the APU or External power one of the galleys is shed. Also there is control logic to inhibit the annunciation of the WARM, L FAIL & R FAIL lights 5 seconds after the throttles are advanced for takeoff and while the aircraft is in flight.



NOFOD® HEATER COMPONENTS



NOTE: Some A/C have the overwing heater relays located approx. 6" forward

RELAYS

NOFOD® HEATER COMPONENTS

WING HEATER PANELS

The heater panels are .125” thick, aluminum-encased composite assemblies that cover over 47 square feet of inboard upper section of the wing and are fastened to the wing along the leading and trailing edges. Along with the Heaters, there are four (4) pairs of temperature sensors, four (4) active sensors and four (4) spare sensors. If a temperature sensor is tested inoperative, by moving a few cannon plug pins you will be able to activate the spare sensor, and deactivate the defective sensor.

The painted black striped triangle, used for the physical check of the wing upper surface, is painted on top of the heater. The heater panels use resistive elements powered by the AC electrical system to warm the panel. The electrical leads are routed through the center trailing edge of the panel. Resistive Temperature Devices (RTD) type sensors built into the panel are monitored by the electrical control box to regulate temperature.

Secondary covers are installed over the fuel tank access and boost pump access covers. The covers allow maintenance to be performed to the fuel tank, and boost pump without removing the heater panel.

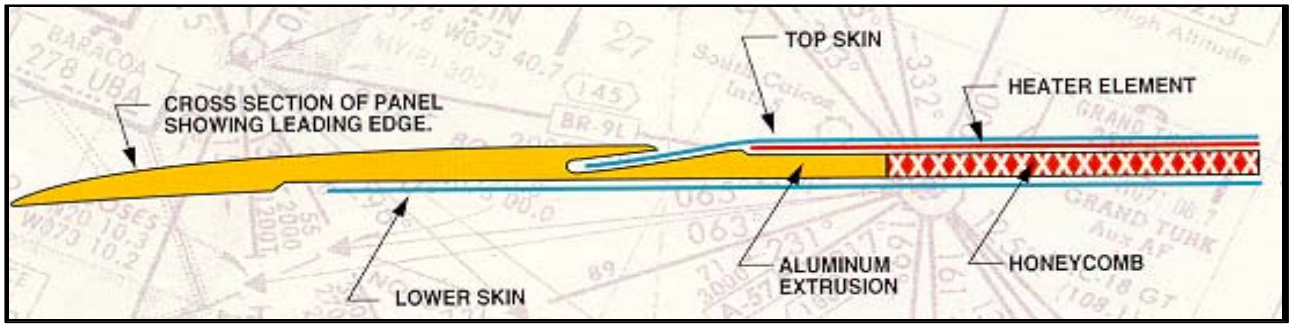
HEATER ELEMENTS

The heater panel is made up of etched metal foil elements arranged into two separate circuits per panel. Each circuit is designed to provide the exact power density map to match the local thermal requirements. The elements are encapsulated in a tough dielectric.

The heater elements cover greater than 95% of the area covered by the heater panel. The heater elements are arranged in two zones (channels) on each panel.

The large zone, (channel 1) resistance, is 17.3 ohms and produces 2312 Watts of power at 200 VAC, the small zone, (channel 2) resistance, is 34.7 ohms and produces 1152 Watts at 200 VAC. Most of the heater area is of uniform power density, but certain areas on the panel require an increased power density (tailored heat application) to fulfill the local thermal requirements.

NOFOD® HEATER COMPONENTS



The NOFOD® Heater Panel becomes a structural part of the wing.

The NOFOD® profile is designed to minimize aerodynamic disruption on the surface of the wing.

Honeycomb insulation prevents the heat generated from transferring to the fuel, significantly reducing the power requirements to prevent clear ice formation.

Honeycomb insulation prevents potential damage from the direct heating of the wing structure and surfaces under the blanket.

System uses 3-phase AC electrical power for heater units and 28 volt DC for the control circuits.

NOFOD® HEATER COMPONENTS

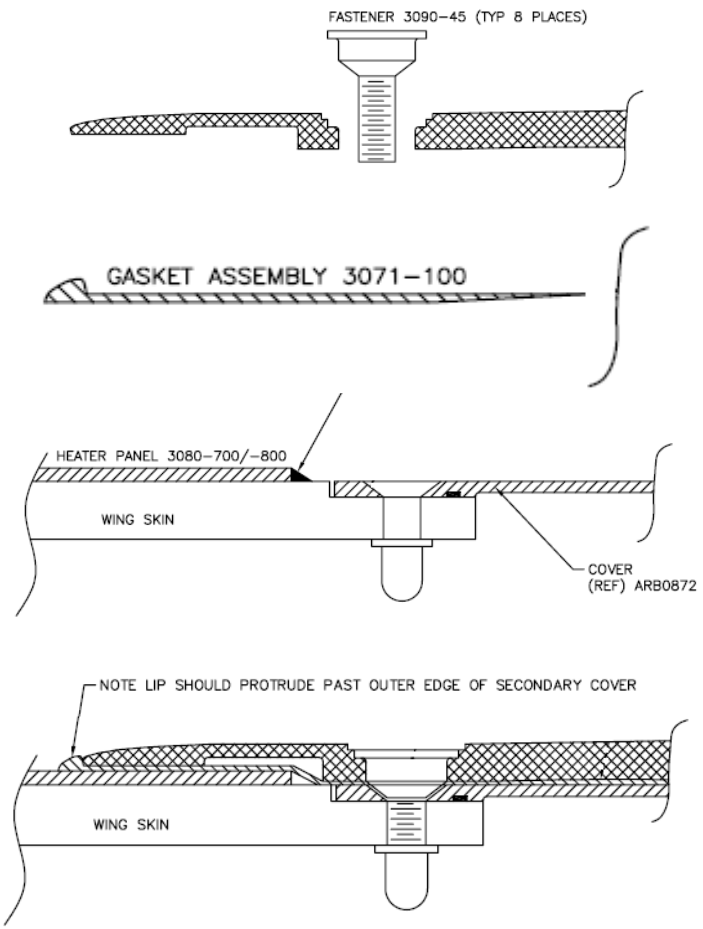
FUEL TANK & BOOST PUMP ACCESSCOVER PLATES

The NOFOD® heater panel is manufactured with cut-out areas for the fuel tank access and boost pump access covers; therefore, no heating elements exist over those two areas. Secondary Cover Plates are installed over the existing cover plates in the cut-out areas to allow the NOFOD® heater panel to be flush with the cover plates. Maintenance work can be accomplished in the inboard main fuel tank area as currently performed **and work on the booster pumps including replacement can be accomplished also in a normal manner.**

The NOFOD® heater panel was designed to deliver more power **(heat)**to the perimeter of the area surrounding each access cover. The Secondary Access Cover **Gaskets** incorporate 45 micron silver-coated spheres to conduct the heat from the panel to the Secondary Cover Plates.

The # 3070-100 Large Secondary Fuel Tank Access Cover Plate is attached with the # 3090-43 fastener kit which contains eight # 3090-45 fasteners.

The # 3075-100 Small Secondary Boost Pump Cover Plate is attached with # 3090-7 fastener kit which contains six # 3090-11 fasteners. Access to the fuel tank and boost pump is available without removing the NOFOD® heater panel. The Secondary Cover Plate fasteners pick up existing cover plate fastener holes.



NOFOD® HEATER COMPONENTS

SENSORS

There are four sensor locations per heater panel. Each sensor location has a primary and a backup sensor. The primary sensor is wired to the HCU/EPD to monitor the temperature in its location. The backup sensor is solely for use if there is any failure with the primary sensor. It must be wired to the HCU/EPD in the event of a primary sensor failure. All sensors utilized within the heater panels are identical in electrical design. They are all positive temperature coefficient resistive temperature devices operating in a range from 150 ohms to 350 ohms. They are constructed from a metal element with known resistive properties.

Sensor locations were chosen so that the temperature profile of the entire heater panel, and to some extent, the surrounding area could be accurately determined. Extensive testing during development was performed in order to locate the sensors in optimal locations.

General location and description of each sensor:

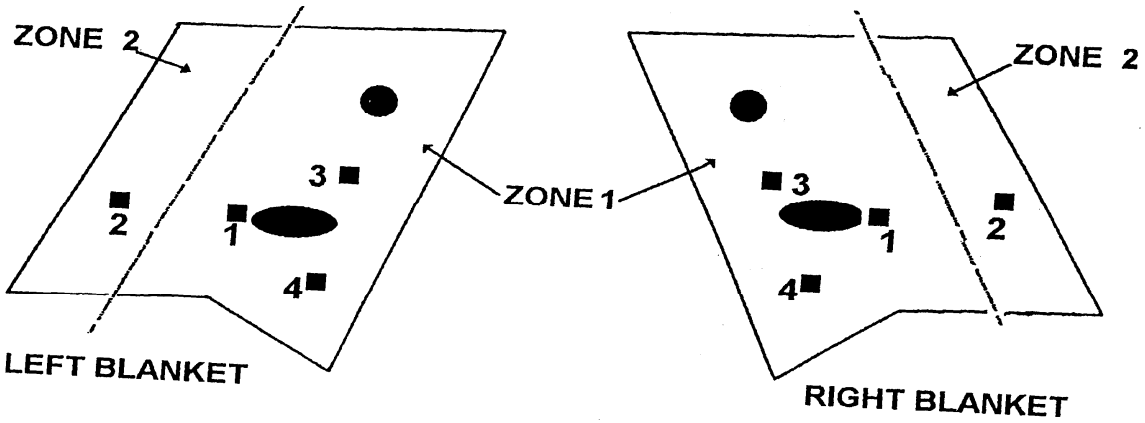
#1. Immediately adjacent to the fuel tank access panel /WARM, Overheat.

#2. In field of the channel 2 Zone/WARM, regulation, overheat.

#3. In field of the channel 1 Zone outside the area known to be influenced by warming effect of water run-off during heated de-icing/WARM, regulation, overheat.

#4. Directly atop the cold corner defined as intersection of rear spar and main-center tank bulkhead/WARM, regulation, overheat.

NOFOD® HEATER COMPONENTS

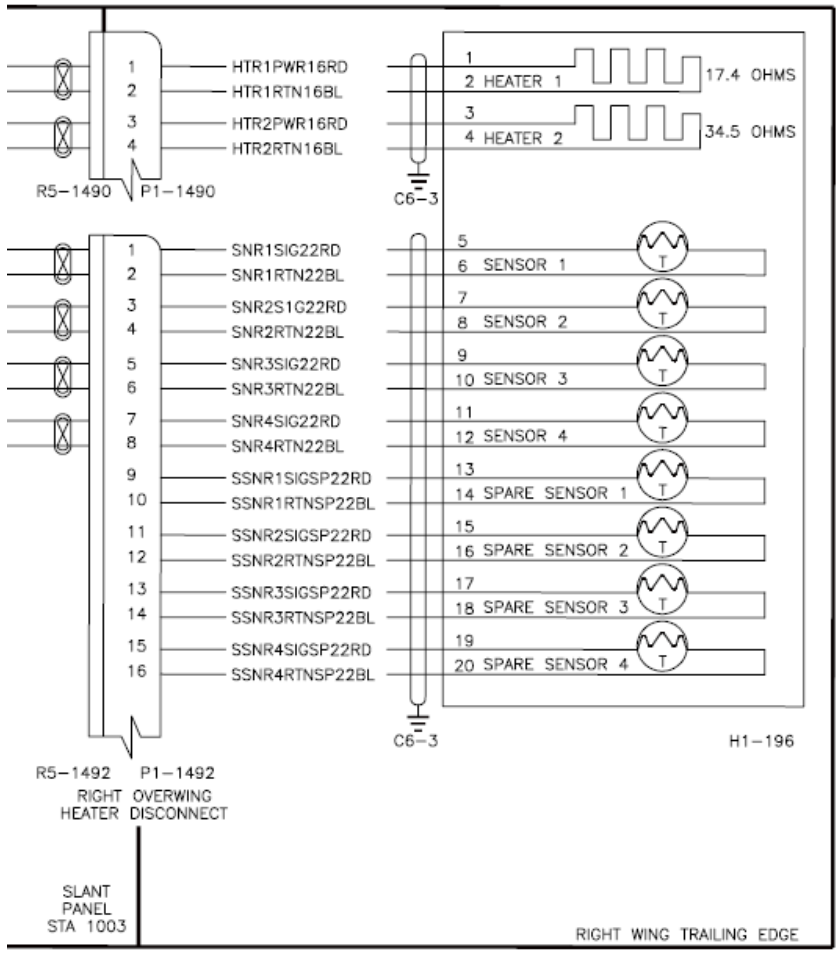


SENSORS

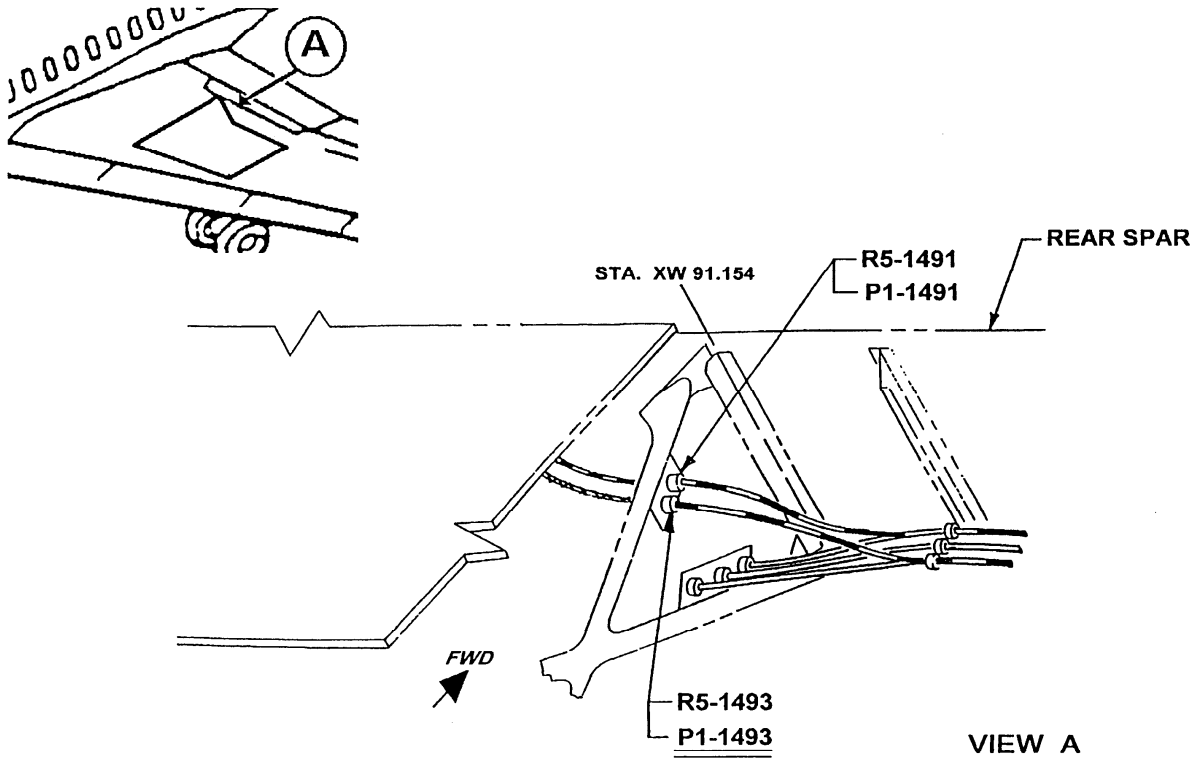
NOFOD® HEATER COMPONENTS

SENSORS, continued

Along with the Heaters, there are four (4) pairs of temperature sensors, four (4) active sensors and four (4) spare sensors. If a temperature sensor is tested inoperative, by moving minimum cannon plug pins the mechanic will be able to activate the spare sensor, and deactivate the defective sensor.



NOFOD® HEATER COMPONENTS



SENSORS continued

NOFOD® SYSTEM RELIABILITY

The TDG Overwing Heater System has been designed to provide the highest reliability available. It has a conservatively **predicted reliability of 28,410 hours mean-time-between-failures (MTBF)**. All of the components used are standard, proven high reliability microcircuits and semiconductors. No exotic specially-designed electronics were required to comply with Airworthiness Directive AD 2001-06-016.

The design of the TDG Overwing Heater System follows the concept of minimalist design. Basic system components consist of a pair of heater panels, two (2) identical Heater Control Units (HCU's), an Equipment Protection Devices (EPD's) and associated wiring. The design of the HCU's and EPD's follow basic high reliability guidelines:

- ✦ Proven reliability electronic components.
- ✦ High design margin (derated) circuit designs.
- ✦ No specialized microelectronics, all commercially available.
- ✦ Conservative reliability prediction using worse case guide lines produced high MTBF's

- ● For the HCU: 67,900 hours
- ● For the EPD: 172,600 hours

NOFOD® HEATER OPERATION

SYSTEM FUNCTIONS

Minimum regulation temperature limits

This limit serves to allow power to flow to a zone. When any regulation sensor for a zone is below its minimum regulation temperature limit, AC electrical power is commanded to flow to its respective zone assuming other conditions are met (i.e., no system faults are present).

Maximum regulation temperature limit

This limit serves to stop power from flowing to a zone. When all regulation sensors for a zone are above their maximum regulation temperature limit, AC electrical power is not applied to it's respective zone.

Over temperature limit

This limit serves as a secondary means of protecting the system from overheating. When any sensor is determined to be over its over temperature limit, a system fault is annunciated and the HCU/EPD that sensed that fault is shut down automatically.

Minimum no-ice Indication limit

Each sensor has a pre-established minimum limit such that if any of the eight sensors in the system are below their respective limit, the WARM indication will not illuminate. When all sensors reach their respective minimum no-ice indication value, the WARM indication can be given in the flight deck. (There is a 1 minute delay associated with the WARM light)

WARM Light Indication

On the pilot's instrument panel, a green WARM light is the signal to the pilot that there is **NO** ice on the heater panels. With the WARM light illuminated, the pilot does not have an overwing ice inspection requirement in conditions other than when environmental icing conditions (freezing rain, drizzle) are present.

WARM light operation

The WARM light is only illuminated once all eight system sensors have reached their minimum no-ice indication temperature. There is a dedicated WARM light interface line between HCU/EPD's to ensure all sensors monitored by each HCU/EPD are up to temperature. Once all sensors have reached their minimum, no-ice-indication temperature, the system will wait five minutes before illuminating the WARM light. If any sensor drops below its minimum, no-ice-indication temperature, it must rise to its minimum, no-ice-indication temperature and then the system will wait five minutes before illuminating the WARM light once again.

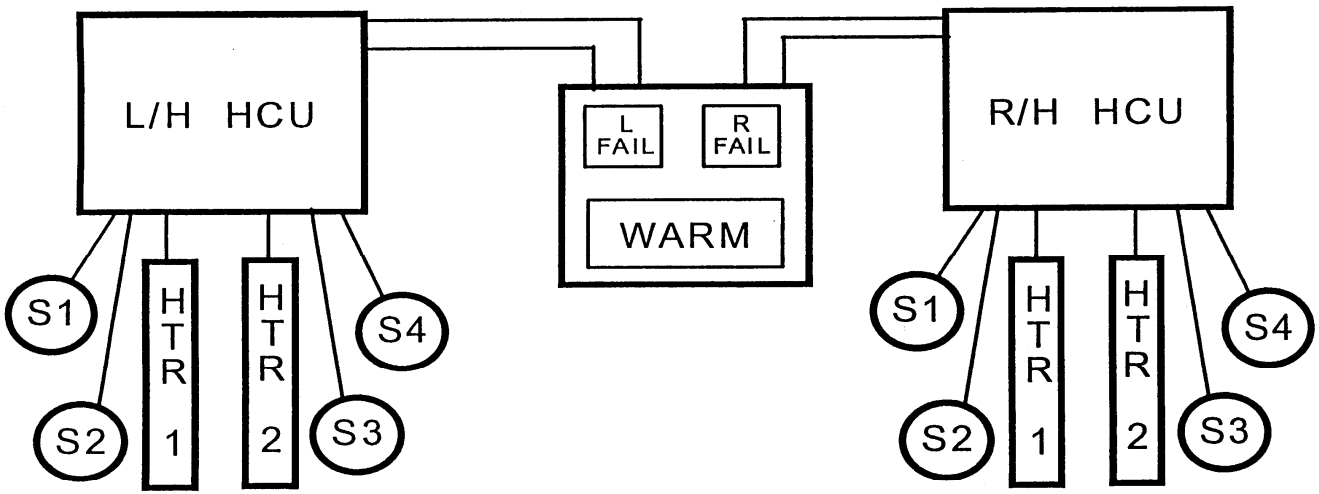
The WARM light will not be illuminated if any of the following conditions exist:

- Take-off inhibit is active.
- Any system fault is detected (If the FAIL indication is illuminated, the WARM light will not be illuminated).
- WARM light inhibit is activated.
- Any of the eight system sensors (L/H & R/H heater panels) are below their minimum no-ice indication value.
- 28 VDC power is lost to either HCU/EPD.

For the WARM light to be present, the following must occur:

- No system fault is detected.
- All eight panel sensors reach their minimum no-ice value and the system has waited its required 5 minute delay.
- The WARM light inhibit function has not been activated.
- The aircraft is not engaged in take-off mode.

NOFOD® HEATER OPERATION



WARM LIGHT INDICATION

NOFOD® HEATER OPERATION

SYSTEM FUNCTIONS

WARM Light Inhibit:

The WARM light inhibit is an option that, in instances where the panel has melted ice from its upper surface, will inhibit the WARM light from illuminating until the reset is pressed and the sensors have reached appropriate temperature.

The WARM Light Inhibit function does not affect the heating or regulation of the power to the panel zones. Because of the uniform, rapid heat-up of the heater panels in anti-icing conditions, the HCU/EPD's can detect when heater panels have melted ice from the wing upper surface. This function operates separately from the rest of the control and WARM functions; **it only acts to inhibit the illumination of the WARM light**. If power to the system is lost with the WARM light inhibit function activated, the function will still be activated when power is restored to the system. The WARM light inhibit function acts as an added level of safety for instances in which ice has formed on the upper wing surface.

WARM/FAIL Reset

The WARM/FAIL light acts as a reset switch (press to reset) for the warm light inhibit and is located on the captain's instrument panel.

WARM Light Inhibit Operation:

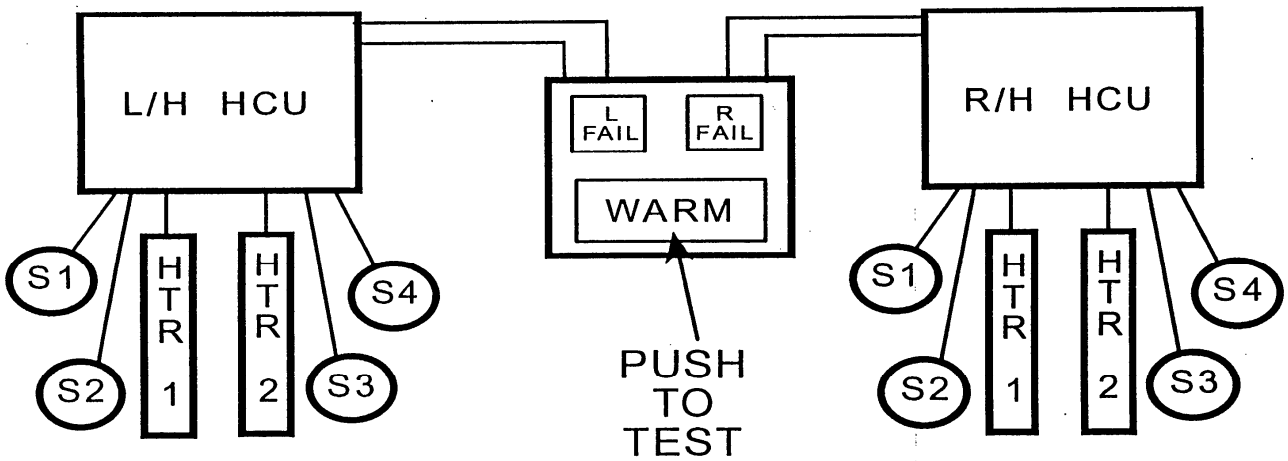
After initial power-up or landing, the WARM light inhibit will detect that ice has been melted from the panel upper surface. If the system melts a significant amount of ice (.060), the WARM indication will not be allowed to come on even if all ice is melted and all sensors reach their minimum no-ice indication value. The pilot will press the WARM/FAIL light to reset the function, and perform an inspection of the upper wing surface for any remaining ice. If all ice is removed from the upper panel surface, the WARM light will illuminate.

Specifically, when #2 or #3 sensors on either panel do not reach their minimum no-ice indication temperature within 10 minutes (corresponding to the system melting .060" of ice), the WARM light inhibit will be activated. This will indicate to the captain that the heater panel has melted ice from the wing upper surface. The pilot will press the reset switch (WARM/FAIL indication) and perform an inspection for ice remaining in the engine FOD zone.

WARNING

The WARM light inhibit function is not designed to alert the pilot to all conditions when ice may form on the inboard section of the wing upper surface. In particular, if the aircraft enters freezing rain conditions with the system already activated, the WARM light inhibit function will not activate.

NOFOD® HEATER OPERATION



WARM LIGHT INHIBIT

NOFOD® HEATER OPERATION

SYSTEM FUNCTIONS

FAIL Indications:

Amber RH FAIL and LH FAIL lights indicate a system fault as determined by the built-in test equipment in the heater control units. There is no connection of the FAIL indications to the MASTER CAUTION circuit.

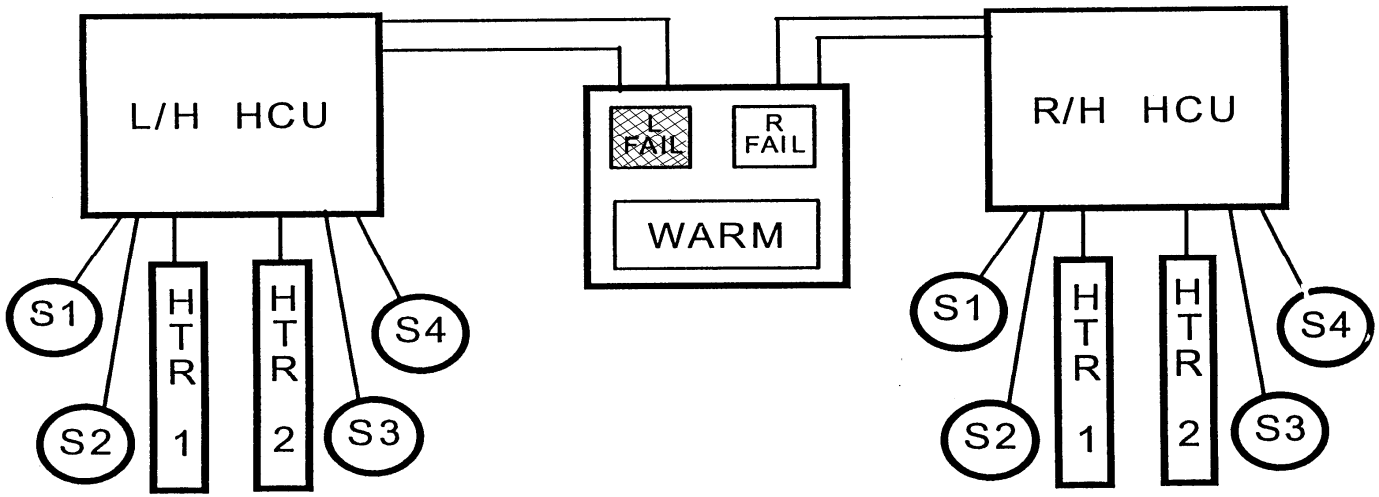
Built-in test equipment in the HCU/EPD's constantly monitors the system operation for faults. When a fault (type A through J below) is detected, the segment that caused the fault is tested twice and, if the fault remains, the failure is annunciated by the HCU/EPD that detected the failure. When a system failure occurs, the HCU/EPD that detected the fault is shut down, and all other NOFOD cockpit annunciation is inhibited.

The following events will illuminate a FAIL indication:

A. ANY of the eight panel sensors are over their over temperature value.
B. ANY of the sensors has a resistance less than 150 ohms.
C. Current greater than 25 amps is sensed flowing to a heater panel.
D. Any current is sensed flowing to the heater while not commanded.
E. Current is sensed not flowing to the heater when commanded.
F. Internal reference voltage sensed to be out of tolerance.
G. If ANY of the four heater zone circuits are open.
H. If ANY of the four heater zones are shorted to ground.
I. If all 8 sensors are above their minimum no-ice indication temperature, the five minute WARM light delay has passed and the WARM light is not illuminated.
J. If the WARM light is on when not commanded.

The above faults will shut the HCU/EPD that detected them down until the power is cycled. There is a unique fault external to the HCU/EPD that the HCU/EPD checks for, the HCU/EPD checks for a short in the wiring between the HCU/EPD and the WARM light. This condition would result in a WARM light independent of any sensor temperature. If a fault of this type is sensed, the HCU/EPD stops power from flowing to the panels until the fault is cleared. This fault scenario does not latch until power is cycled; it is continuously checked.

NOFOD® HEATER OPERATION



FAIL INDICATIONS

NOFOD® HEATER OPERATION

IN FLIGHT SYSTEM INHIBIT

The system is intended for ground use only. The 28 VDC power for HCU/EPD control is run through a relay (Nose Ground Sense) that inhibits the system in flight. This inhibits any cockpit annunciation from illuminating and any power from flowing to the heater panels.

The power for the HCU/EPD will be run through a relay hooked to the nose wheel landing gear in line with the On/Off switch and the Cross-tie shedding relay.

OPERATION

This function will completely inhibit system operation during flight, yielding it completely inert. No input or operator interaction is required.

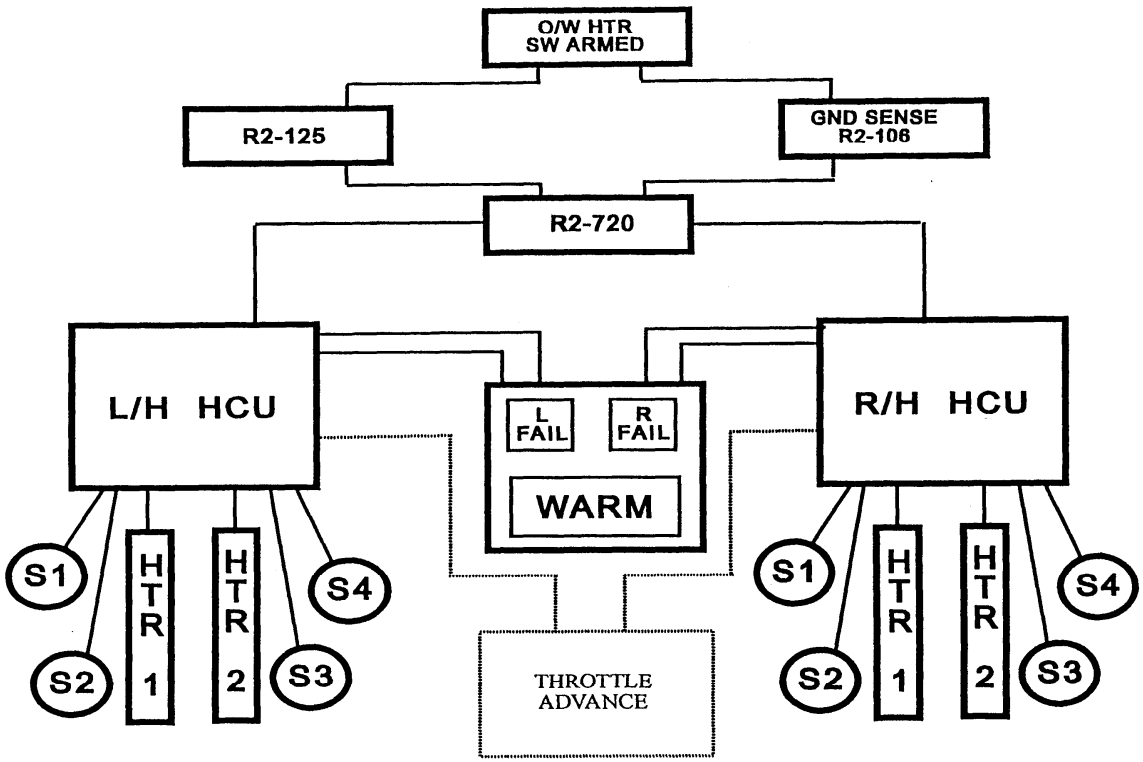
TAKE-OFF INHIBIT

The system is designed to inhibit the WARM, LH FAIL and RH FAIL lights once the takeoff roll has been initiated.

Wiring the system into the throttle advance circuit will allow this feature to be implemented.

The Take-off Inhibit function will prevent any status change of the system from affecting flight crew operation during takeoff roll. This cockpit annunciation will only be inhibited after the left and right throttles have been advanced for 5 seconds.

NOFOD® HEATER OPERATION



FLIGHT / TAKE-OFF SYSTEM INHIBIT

NOFOD® HEATER OPERATION

AUTOMATIC LOAD SHED (IF REQUIRED)

One generator operation modes are:

- external power
- APU operation
- single engine generator

The system will shed galley #2, #3, or #4 when, on the ground, the APU or external power is the sole source of power. This automatic application of the load shedding operation is accomplished by tying into the left and right APU relays and right and left auxiliary power relays.

When there is one generator operation (the cross-tie is closed) the Overwing Heater System will be shed (completely turned off).

This is accomplished by tying into the AC Crosstie.

This feature requires no input from the flight crew; it is fully automatic.

The following chart identifies the different generator configurations that will cause load shedding.

NOFOD® HEATER OPERATION

LH Ext Pwr	RH Ext Pwr	L APU	R APU	L Eng	R Eng	Crosstie	Single Gen	Galley Shed
ON	ON	OFF	OFF	OFF	OFF	NO	YES	YES
OFF	OFF	ON	ON	OFF	OFF	NO	YES	YES
OFF	OFF	OFF	OFF	ON	ON	NO	NO	NO
OFF	OFF	OFF	OFF	OFF	ON	YES	YES	YES
ON	OFF	OFF	ON	OFF	OFF	NO	NO	NO
ON	OFF	OFF	OFF	OFF	ON	NO	NO	NO
OFF	OFF	ON	OFF	OFF	ON	NO	NO	NO

shed3.tbl

AUTOMATIC LOAD SHED

TDG Customer Support

TDG Customer Support

TDG maintains a complete inventory of spare parts to support the NOFOD system.

- For NOFOD systems and spare parts sales:
  Email: sales@tdgaerospace.com
  Phone: (760) 466-1040, ext. 29

- For NOFOD system technical support:
  Email: support@tdgaerospace.com
  Phone: (760) 466-1040, ext. 14

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