DIRECTED STUDY PROGRAM

DHC - 4

Ref.: 1080-4f

HEATING AND VENTILATING

GENERAL

The flight compartment only is provided with a heating and ventilating system consisting of a combustion heater and ducting controls to automatically regulate the temperature in the cockpit to any desired setting within a range of 40° to 80°F. Ducting, installed in the cabin, provides for ventilation. The heating controls are located immediately behind the pilot. Fuel for the heating system is provided by an electrically driven fuel pump in the right side of the wing center section.

The 50,000 BTU heater is mounted in the nose section of the aircraft. Ram air enters the system through two ducts in the nose of the aircraft. One duct supplies air to the combustion chamber where it is mixed with fuel and ignited by a spark plug; the products of combustion then flow through heat exchanger passage and are vented to the atmosphere through the fuselage right side. The other duct allows air to pass over the hot walls of the heat exchanger and into the distribution ducts to outlets in the flight compartment. The components installed in the aircraft nose section includes:

a. Combustion heater rated at 50,000 BTU at a maximum fuel consumption of 0.66 gallons U.S. per hour.
b. Ignition equipment, which converts 28 volts DC to high voltage AC to a spark plug.
c. Reducing ducts, which couple the heater to the heating duct system.
d. A fuel control unit, sealed to meter fuel to the heater unit.
e. A fire extinguisher bottle and flood valve assembly.
f. Thermostats, temperature sensitive switches, and a bi-metal fire detecting element.
g. A junction box containing electrical wiring and relays number 1 and 2.
h. A ram air pressure switch.
i. An air control valve.

1. The flight compartment heater, mounted in the _____ section, has an output capacity of _____ BTU.	
2. Two ram air ducts provide air for the _____ chamber, and the walls of the _____.	nose; 50,000
3. The _____ unit meters fuel up to a maximum of _____ gal./hr.	combustion; heat exchanger
4. _____ DC is converted to _____ for _____ operation.	fuel control; 0.66

DIRECTED STUDY PROGRAM

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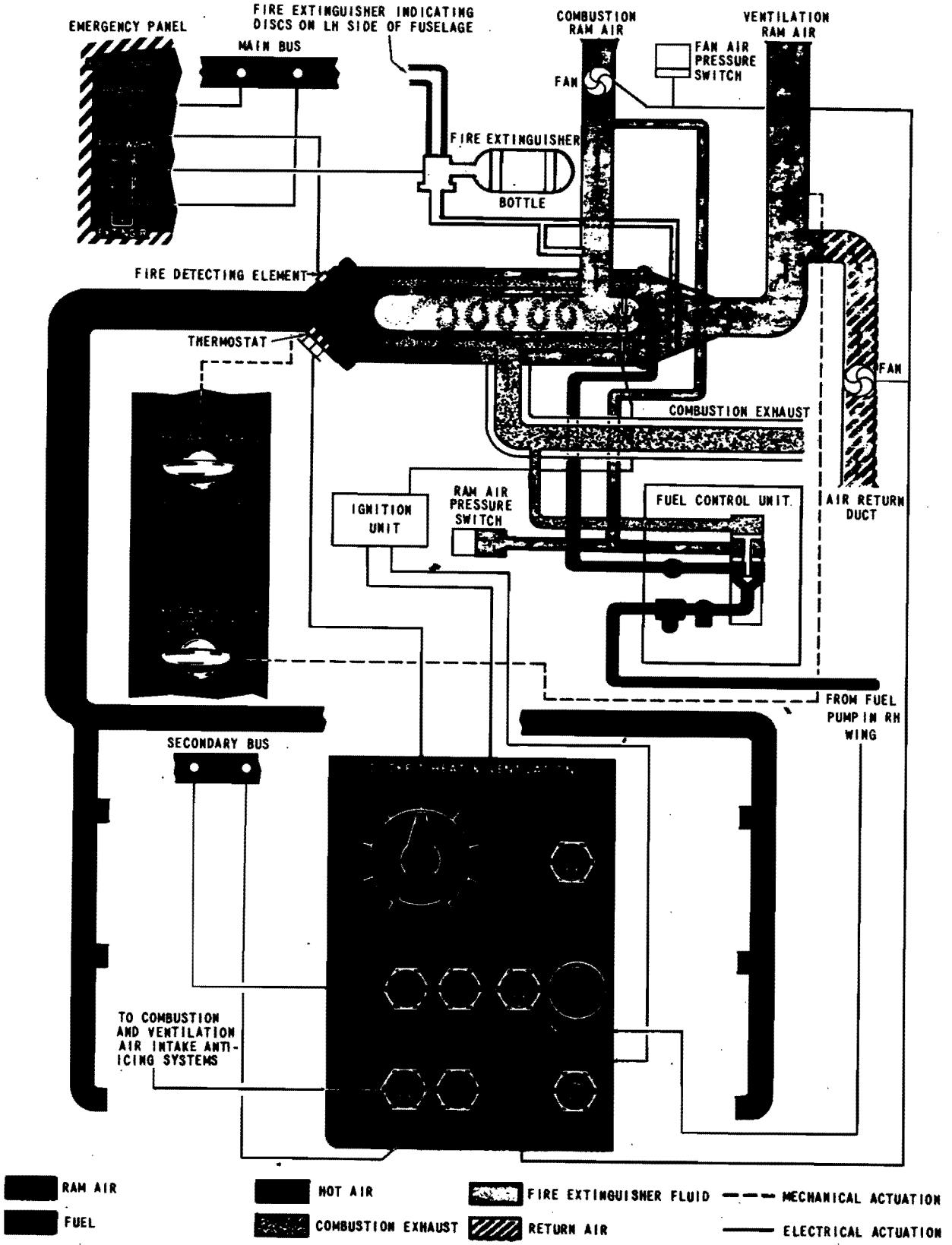


Flight Compartment Heating and Ventilating System - Schematic

5. A _____ fire extinguisher is located in the _____.	28 V; high voltage AC; spark plug
6. The heater fire detection is accomplished by a _____ which closes the warning circuit.	CO_2; heater ventilation duct
7. The heater fuel pump is located in the _____.	bi-metal element
	right outboard wing

HEATER FUEL SYSTEM

The heater fuel supply components are mounted in the right wing and provide fuel for the heater. Fuel is taken from number 1 fuel cell in the right wing, and is delivered to a solenoid-operated shutoff valve, through a filter to an electrically-driven pump and relief valve.

HEATER FUEL PUMP

A rotor type pump, rated to deliver fuel at 60 psi, and is driven by a sealed, 28 volt DC motor on the primary bus, is positioned in the right outer wing.

AIR CONTROL VALVE

A butterfly type valve manually operated by the air control handle mounted on the pilot's rudder pedestal which, when operated to the open position, allows ventilating air to flow from the heater into the air distributing system installed in the flight compartment.

RAM AIR INTAKE DUCTS

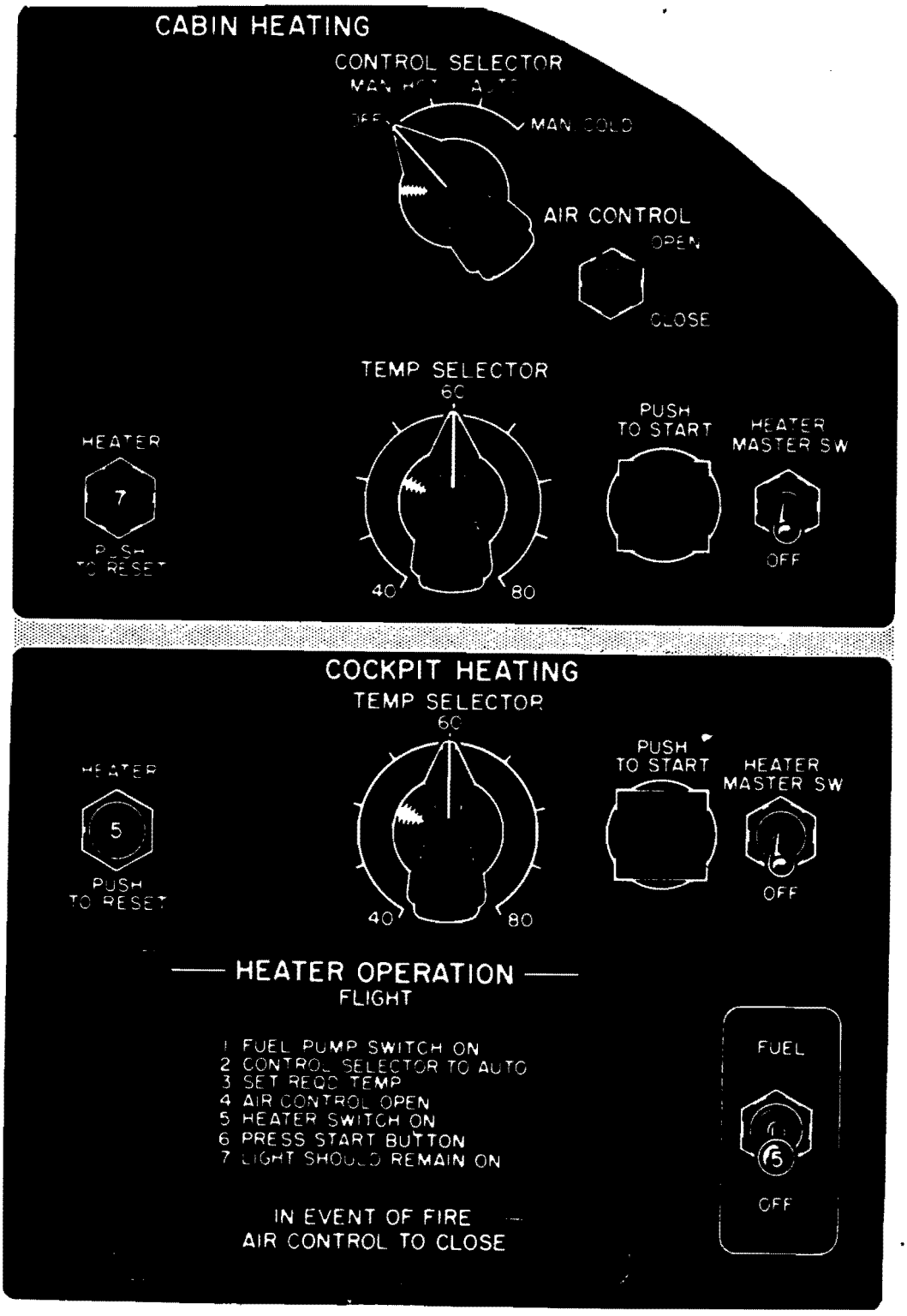
Ram air for the flight compartment heating system is taken from the nose of the aircraft through two intakes made of lamianted plastic with heater elements within the laminations for de-icing purposes.

1. Fuel for heater operation comes from the _____ in the _____ wing.	
2. The fuel pump is _____ type with a capacity of _____ psi.	No. 1 cell; right
3. A _____ motor operates the pump from the _____ bus.	rotary; 60

4. The air control valve is manually operated from the pilot's _____ pedestal.	28 VDC; primary
5. When the heater is not operating, the air control valve can be used for _____ purpose.	rudder
6. Two _____ intake ducts contain _____ _____ for de-icing.	ventilating
	laminated; heater elements

OPERATION

The flight compartment temperature control system is automatic and consists of a duct thermostat, flight compartment thermostat, temperature selector, and a temperature control box. Selecting the heater master switch ON arms the No. 1 relay. Pressing the start button switch allows the No. 1 relay to be energized provided the ram pressure is sufficient (approximately 65 knots) at the ram pressure switch, the heater discharge temperature is less than 350°F, and the air control valve is open. If these conditions exist, the entire system will be set into operation, and an indicating light in the heater start button switch will remain on. Maximum continuous operating temperature is 250°F cycling solenoid in the fuel control unit. On initial start-up, the heater is gradually brought up to operating temperature by means of the surge limit switch. In the event of failure of the limit switch, a high limit switch set at 350°F de-energizes No. 1 relay and thus renders the entire system inoperative. A further safety precaution is the provision of a fire detecting element which causes a red fire warning light on the emergency panel to flash on if the temperature rises to 550°F. All four switches are located in the heater reducer of the flight compartment air supply duct. Temperature is automatically controlled at the temperature set on the flight compartment temperature selector. The flight compartment and duct thermostats sense any variation from the selected temperature and, by means of a signal sent through a control box, cycle the temperature control solenoid in the fuel control unit. If the combustion air inlet duct suffers a loss of pressure for any reason, a ram air pressure switch will shut off the system when the air pressure is insufficient for normal combustion. A light in the heater start button switch indicates whether or not the system is operating. An air control valve handle marked PULL TO CLOSE on the pilot's rudder pedals pylon is used to control the amount of cold air entering the flight compartment when the heater is not in use. The valve should always be fully open when the heating system is in operation, but must be closed in the event of a fire. Closing the valve trips a microswitch which de-energizes relay No. 1 heater output is controlled by the amount of combustion air which regulates metering of the fuel.



Heating Control Panel

1. A pressure sensing switch prevents combustion if _____ is less than _____ knots.	
2. Heater discharge temperature must be less than _____ or the heater will not start.	ram air; 65
3. The _____ must be _____, or combustion will not occur.	350°F
4. Maximum continuous operating temperature is _____, controlled by a solenoid in the _____ unit.	air control valve; open
5. A high limit switch set for _____ will de-energize the _____ and render the system inoperative.	250°F; fuel control
6. In event of normal system failure a red _____ light will illuminate at _____.	350°F; relay
7. Closing the _____ will de-energize the system.	fire warning; 550°F
8. The _____ unit is cycled by a _____ in the heater duct to regulate the selected temperature.	air control valve
9. A light in the _____ will indicate whether the system is operating.	fuel control; thermostat
10. A _____ in the _____ provides continuous spark for combustion as long as the system is energized through the starter _____.	start button
11. When the heater is not in use the _____ handle may be _____ to regulate the amount of cold air entering the cockpit.	spark plug; combustion chamber; relay
12. This handle should always be _____ for heater operation.	air control valve; opened
	full open

DIRECTED STUDY PROGRAM

DHC-4

Ref.: 1080-4J

RADIO AND RADAR

LOCATION OF UNITS

The radio sets are mounted in a radio rack behind the copilot's seat in the flight compartment, and all control panels are mounted in a sliding console located between the pilot's and copilot's seats. The console slides forward under the flight instrument panel for convenience. Antenna locations have been established for each facility, and installation details are provided in the supplements. Radio navigation instruments are located on the pilot's and copilot's flight instrument panels.

POWER SUPPLIES

Primary power, 27.7 volts DC, to operate the equipment is obtained from the aircraft DC power system through circuit breakers on the circuit breaker panel, located above the flight compartment door on the front face of the bulkhead and distributed through the DC radio power panel located on the radio rack. AC power for such systems as require it, is supplied from the aircraft inverters and distributed through fuses on the fuse panel, located adjacent to the circuit breaker panels.

1. The radio sets are located behind the _____.	
2. The radio console _____ under the flight instrument panel.	copilot's seat
	slides forward

STANDARD RADIO FACILITIES

Equipment	Function and Capability.
Main VHF Communication (single only)	VHF voice communication air-to-air, and air-to-ground.
Standby VHF Communication (single only)	Standby VHF, voice communications air-to-air and air-to-ground.
HF Communication (single only)	HF, voice or telegraph communications, air-to-air and air-to-ground.
ADF Navigation (single only)	ADF (radio compass). Gives aural and visual indication of relative bearing of transmitting point.

Aircraft Radio Corporation 21A	CW or voice reception, LF and MF frequency bands.
VOR (Navigation)	Provides visual omnirange (VOR) and runway localizer facilities, and VHF reception. VOR station bearing displayed on RMIs (radiomagnetic indicators).
Glide Slope Receiver (Navigation)	Provides visual and aural guidance on runway approach, displayed on horizontal pointers of course-selector/cross-pointer indicator. Available only if VOR facility is installed, since glide slope channel selection is wired from VOR localizer control.
Marker Beacon (Navigation) (single only)	Provides visual and aural indication of position of aircraft when over 75 mc marker beacon. (Flight approach aid)

AUDIO SYSTEM

The basic interphone-audio distribution system is common to all Caribou aircraft and provides facilities for operation and interconnection of power, audio, and control wiring of all standard and special radio facilities. It also provides duplicated interphone, comprising the main interphone amplifier for normal operation, and a standby interphone system for use in the event of failure of the main interphone amplifier. The standard audio system incorporates a feature for standby audio in event of failure of the pilot's or copilot's audio isolation amplifier. Headset jacks are provided at the pilot's and copilot's stations and at a third station in the cabin above the left-hand door.

The basis of the audio system is provided by the isolation amplifier. The system provides normal and standby interphone between crew members and simultaneous monitoring of up to eight radio receivers as selected on the pilot's and copilot's signal distribution panels. The signal distribution panels also provide the pilot and copilot with individual control of a maximum of three transmitters.

1. The basis interphone audio system provides a _____ system in event of failure of the main interphone amplifier.	
2. The basis of the audio system provided by the _____.	standby interphone

3. The system provides normal and standby interphone between crew members and simultaneous monitoring of up to _____ radio receivers.	isolation amplifier
4. The signal distribution panels also provide the pilot and copilot with individual control of a maximum of _____ transmitters.	eight
	three

STANDARD AUDIO SYSTEM

Is common to all aircraft and consists of the following equipment:

a. Isolation Amplifier
b. Two Signal Distribution Panels
c. Two Headsets (including boom-type, noise-cancelling carbon microphone)
d. Two Headset Jacks
e. One Headset Jack
f. Two Microphone Foot Switches
g. Two Microphone Button Switches
h. No. 12 Audio Junction Box

STANDBY INTERPHONE SYSTEM

In the event of failure of the normal interphone amplifier, the standby audio interphone amplifier is brought into operation by switching on the STBY I/C circuit breaker. The I/C circuit breaker should be left on to supply power to the pilot's and copilot's audio isolation amplifier.

1. The standby audio interphone amplifier is brought into operation by switching on the STNY I/C _____.	
2. The I/C circuit breaker should left on to _____ to the pilot's and copilot's audio isolation amplifier.	circuit breaker
	supply power

ANTENNAS

Antenna	Position
VHF Antenna	On top of rudder, inside fiberglas cover.
Standby VHF Antenna	In left-hand wing tip inside fiberglas cover.
HF Antenna	Between attachment lug on vertical stabilizer and lead-through mast assembly just behind flight compartment.
Glide Slope Antenna	On nose section front bulkhead.
Marker Beacon Antenna	On underside of fuselage.
VOR Antenna	Inside fiberglas cover on vertical stabilizer tip, together with VOR antenna coupler. Single antenna for two receivers.
ADF Loop Antenna	On underside of fuselage under fiberglas cover. One antenna for each receiver. Forward loop for No. 1, aft loop for No. 2 ADF.
ADF Sense Antenna	Between two mast assemblies on underside of fuselage. One antenna for each ADF receiver. LH antenna for No. 1, RH antenna for No. 2 ADF.

DIRECTED STUDY PROGRAM

DHC - 4

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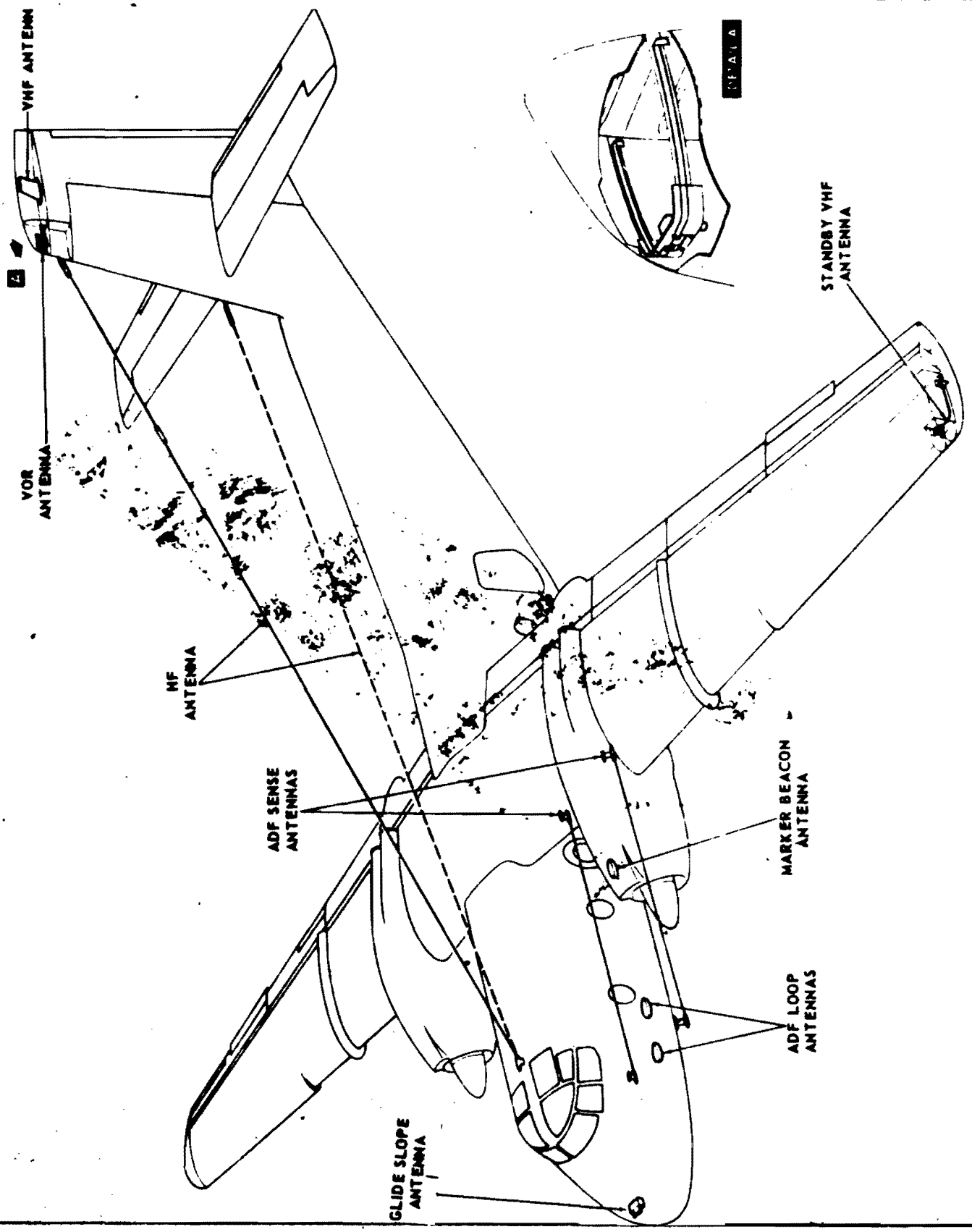
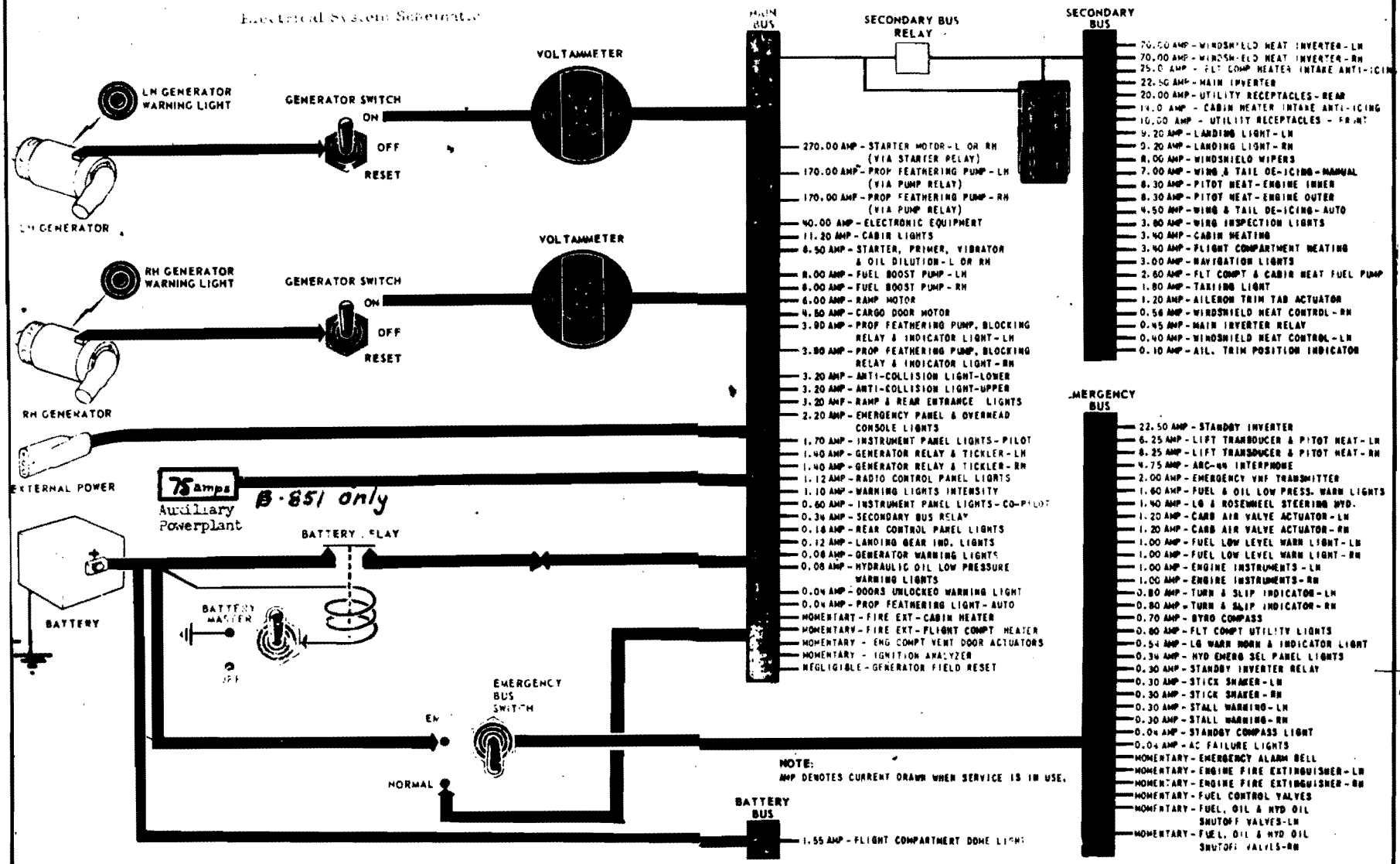


Antenna Locations

External System Schematic

DC Electrical System Schematic



NOTE:
AMP DENOTES CURRENT DRAWN WHEN SERVICE IS IN USE.

ELECTRICAL SYSTEM

GENERAL

The electrical system is primarily a 28-volt DC single-wire type installation, with the airframe structure used as a ground return, supplemented by a 115-volt, 400 cycle, AC installation, which is dependent upon the DC system for its operation. The DC system consists of two engine-driven generators which provide the prime source of power. The AC power is supplied by a main inverter, or an emergency standby inverter. A 24-volt battery serves as a standby, or emergency source of power for essential DC equipment and for operation of the standby inverter when the engine-driven generators are not working. An external power source can be connected to the aircraft for engine starting and test purposes. Certain instruments which require 26-volt, 400 cycle, AC power are supplied from a 115/26 volt stepdown transformer which derives input from the inverter in use. The DC circuits are protected by current limiters and thermal push-to-reset type circuit breakers, and the AC circuits are protected by fuses. Bonding strips are used to ground control surfaces and moving parts. Some fixed components are bonded where it is desired to insure a good ground. Junction boxes are used for interconnection and breakdown of circuits contained in cable assemblies.

1. The electrical system is primarily a _____ single-wire type installation.	
2. The DC electrical system is supplemented by a _____ volt, _____ cycle AC which is dependent upon the DC system for its operation.	28 VDC
3. AC power is supplied by a main inverter, or an _____ inverter.	115; 400
4. Certain instruments which require 26 volt, 400 cycle AC power are supplied from a 115/26 volt _____, which derives power from the inverter in use.	emergency standby
5. The DC circuits are protected by current limiters, and push to reset type circuit breakers, and the AC circuits are protected by _____.	stepdown transformer
6. Bonding strips are used to provide, or insure a good _____ between components of the aircraft.	fuses
	ground

DC POWER SUPPLY SYSTEM

GENERAL

The 28-volt DC power supply system includes: two engine-driven generators, one on each engine, which operate simultaneously or can be switched into operation separately to supply the primary source of power; two generator control panels, to regulate and control the output of the generators; main secondary, emergency, and battery buses, to distribute power to the electrical system; relays to complete circuits for control as required; and circuit breakers for protection of individual services. Number 1 and 2 junction boxes are the main interconnecting points for the DC power system. Both junction boxes are located in the cabin roof just aft of the flight compartment bulkhead on the left-hand side of the monorial. Number 2 junction box contains the main DC bus bar from which power is distributed.

1. The engine-driven generators are the _____ source of power.	
2. The generator control panels regulate and control the _____ of the generators.	primary
3. The _____, _____, _____, and _____ buses distribute power to the electrical systems.	voltage output
4. Number 1 and 2 junction boxes are the main interconnecting points for the _____ and are located in the cabin roof just aft of the flight compartment bulkhead on the left side of the monorial.	main; secondary; emergency; battery
	DC power system

DC POWER DISTRIBUTION

The DC power distribution within the aircraft is by the main, secondary, emergency, and battery buses. The main bus serves equipment considered essential to flight safety and may be powered by either or both generators, the battery, or (when on the ground) by external power. The secondary bus serves equipment considered of secondary importance to flight safety and is supplied from the main bus, via a secondary bus relay, which is automatically de-energized if either generator fails. However, if certain services supplied by the secondary bus are required, the pilot may switch off services not required and, by means of a secondary bus reset switch, reconnect the secondary bus to the main bus. The emergency bus serves the most essential equipment and is normally powered from the main bus. In the event of complete failure of the generator system, the emergency bus can be isolated from the main bus by selecting an emergency bus switch to

EMERG and selecting the battery master switch to OFF, thus connecting the emergency bus directly to the battery. The battery bus is connected directly to the positive terminal of the aircraft battery, and therefore remains energized at all times, regardless of the position of the battery master switch. All bus circuits are protected by current limiters, except for the battery bus, and the emergency bus when selected to EMERG.

1. The main bus serves equipment considered essential to _____.	
2. The main bus is powered by _____, the _____, or (when on the ground) by _____.	flight
3. The secondary bus is automatically de-energized if _____.	either or both generators; battery; external power
4. The pilot may by means of a secondary bus _____, reconnect the secondary bus to the main bus.	either generator fails
5. The emergency bus serves the most essential equipment, and is normally supplied by power by the _____.	reset switch
6. In the event of complete failure of the generator system, the emergency bus can be isolated from the main bus by selecting the emergency bus switch to EMERG, and selecting the battery master switch to OFF, thus connecting the emergency bus directly to the _____.	main bus
	battery

MAIN BUS

The main bus located in number 2 junction box, may be energized by either or both generators, the battery, or (when on the ground) by an external power source. The generators will energize the main bus through the generator relays (main contactors) if the output voltage of either or both generators is 0.35 to 0.70 volt greater than battery voltage. The left and right-hand generator relays are controlled by the respective generator control panels and by generator switches located on the electrical power panel. The battery will energize the main bus through the battery relay if the generators are not operating, or if generator output voltage is less than battery voltage. The battery relay is controlled by the battery master switch on the AC-DC power panel. An external power

source can be used to energize the main bus through an external power receptacle and relay, for engine starting and test purposes.

CAUTION The battery master switch must always be at OFF while external power is connected, otherwise the aircraft battery will be parallel led with the external supply.

1. The generators will energize the main bus through the _____ (main contactors).	
2. To supply power to the main bus, one or both generators must have a voltage output _____ greater than battery voltage.	generator relays
3. The battery will energize the main bus through the _____ if the generators are not operating, or if generator output voltage is less than battery voltage (with battery master switch ON).	0.35 to 0.70 volt
4. The battery relay is controlled by the battery _____.	battery relay
5. The battery master switch should be _____ when external power is connected.	master switch
6. An external power source can be used to energize _____ bus, for engine starting and test purposes.	OFF
	the main

BATTERY SYSTEM

The system consists of a lead-acid (or a special order nickel cadmium) storage battery with vent system and sump jar, a battery relay, and a battery master switch. The battery provides power to operate flight and emergency services when the generator supply is not available. When the battery switch is selected OFF, the battery supplies power to the battery bus only. When the battery switch is selected to BATTERY MASTER, the battery relay is energized, thus allowing the battery power to be connected to the main bus, in addition to the normal connections to the battery bus.

CAUTION The battery bus remain energized as long as the aircraft battery is connected, regardless of the position of the battery master switch.

BATTERY

The battery is located on the left side of the aircraft below the cockpit, it is normally a 24-volt, 34-ampere-hour, lead-acid storage battery, weights approximately 80 pounds.

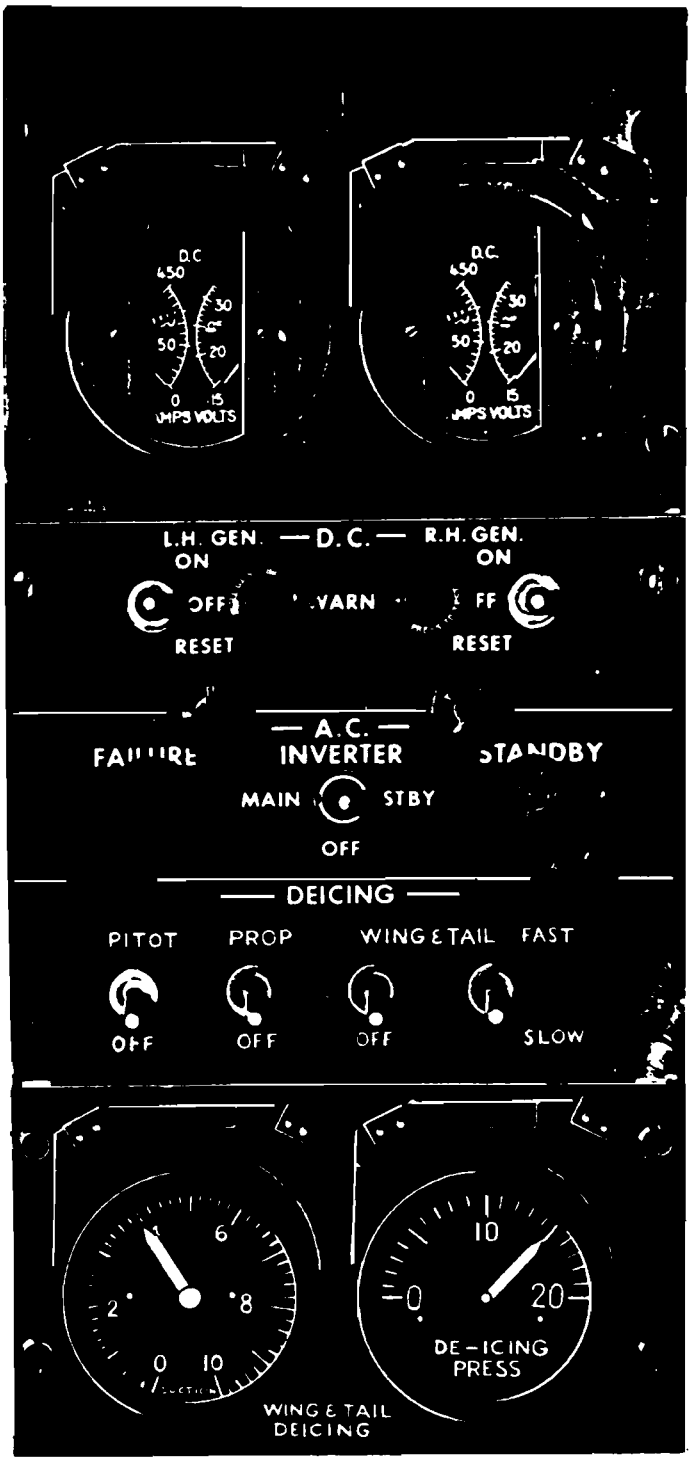
1. The battery is a _____, _____, lead-acid storage battery, located on the left side of the aircraft, below the cockpit.	
2. The battery provides power to operate flight and emergency services when the _____ is not available.	24-volt; 34-ampere-hour
3. The battery bus is energized when the battery is connected, regardless of the position of the _____ switch.	generator supply
	battery master

GENERATOR SYSTEM

The generator system consists of two, 30 volt, 300 ampere, air-blast cooled, direct current generators, one on each engine. Each is connected, via a generator relay (main contactor) and a current limiter, to the main bus. Regulation and control equipment is provided for each generator to stabilize voltage output, control cut-in and cut-out, prevent overloading, and to isolate a generator should it develop a fault or draw current from the main bus. The regulation and control equipment for each generator includes a generator panel. The generator control panel maintains the output voltage of the generator at a practically constant level of 27.7 volts, and controls the cut-in and cut-out point of the generator by energizing or de-energizing the generator relay. The generator relays connect the generators to the main bus, and are energized through the corresponding left-or right-hand generator control panel when the voltage output of a generator exceeds the bus voltage. When energized, the generator relay connects the output of the related generator to the main bus via a current limiter and also provides switching that supplied power to energize the associate secondary bus control relay, and interrupts the ground return of the directly-coupled negative ground fault circuit. A generator switch, a generator warning light, and a voltammeter are incorporated in each generator system.

GENERATORS

The generators each has a continuous output capacity of 30 volts at 300 amperes maximum, within a generator speed range of from 3,000 to 8,000 rpm. The ratio of generator rpm to engine rpm is 3.1. A cooling duct is fitted on the rear end of each generator.



AC-DC Power Panels

1. The generator system consists of two _____, _____ DC generators.	
2. Each generator is connected via a generator relay (main contactor), and a current limiter to the _____.	30 volt; 300 ampere
3. The _____ for each generator includes a generator panel, a ground fault detection system, a generator relay, and a bus control relay.	main bus
4. The generator relays connect the generators to the _____.	regulation and control equipment
	main bus

GENERATOR CONTROL PANELS

One for each generator, located on the cockpit floor behind the copilot's seat, maintain a constant output voltage under varying engine speeds and electrical loads imposed on the generators. Each incorporates a carbon pile voltage regulator, a polarized differential relay, an equalizer relay, a filed relay, a ground fault relay, and an overvoltage relay. The carbon pile which regulates the generator output voltage, is essentially an automatic rheostat fitted in series with the generator field supply. The differential relay (reverse current relay) operates to delay the energizing of the generator relay until the generator is delivering sufficient voltage to override the aircraft battery, and thus prevents the flow of reverse current in the generator circuit. The equalizer relays operate in conjunction to spread the load demand equally between the generators. The field relay functions as a switch that will trip out if overvoltage or a ground fault occurs. The ground fault relay functions in conjunction with the ground fault transformers to trip the field relay should an open or ground of the generator output lines occur. The overvoltage relay functions to sense generator output overvoltage and energize the field relay trip coil if generator output voltage reaches 32 to 34 volts.

1. The generator control panels are located on the _____.	
2. The purpose of the carbon pile in the voltage regulator is to regulate the voltage output of the generators by _____, _____, _____.	cockpit floor behind the copilot

3. The field relay functions as a switch that will _____ if an overvoltage, or a ground fault occurs.	varying the resistance; and current; of the generator field circuit
4. The overvoltage relay functions to sense generator output overvoltage and energize the field relay trip coil if generator output voltage reaches _____.	trip out
	32 to 34 volts

GENERATOR RELAYS

Main contactors function connect the generators to the main bus and are controlled by the respective generator control panels.

1. Main contactors function to connect the generators to the _____.	
2. Main contactors are controlled by the respective generator _____.	main bus
	control panels

CURRENT LIMITERS

Current limiters are located in the circuits between the main and secondary bus bars and circuit breaker panels, between generator relays and the main bus, and between the main bus and the emergency bus (when the emergency bus switch is at NORMAL). Current limiters are unaffected by momentary surge overload but melt under overload after a short duration of time.

1. _____ are located in the circuits between the main and secondary bus bars and circuit breaker panels, between generator relays and the main bus (when the emergency bus switch is at NORMAL).	
2. Current limiters are unaffected by momentary surge overload but _____ under overload after a short duration of time.	Current limiters
	melt

SECONDARY BUS RELAYS

Functions to connect the main bus to the secondary bus and is controlled normally two bus control relays which form an interlocking circuit that energizes the secondary bus relay only when both generators are delivering power to the main bus. A secondary bus reset switch marked SEC BUS RESET is located on the circuit breaker panel, and provides a bypass circuit when selected to RESET that energizes the secondary bus relay, should services supplied by the secondary bus be required when one generator is inoperative.

1. The secondary bus relay functions to _____ the main bus to the secondary bus.	
2. The secondary bus is normally energized when both generators are supplying power to the _____ bus.	connect
3. A secondary bus reset switch is located on the circuit breaker panel and can be used to restore power to the _____ bus after loss of an engine-driven generator.	main
	secondary

BUS CONTROL RELAYS

One for each generator circuit, these function to control the operation of the secondary bus relay. The two relays are connected by an interclocking circuit that energizes the secondary bus relay only when both generators are delivering power to the main bus. Each bus control relay is energized when the related generator relay is closed.

1. Bus control relays function to control the operation of the _____ bus relay.	
2. The bus control relays are energized only when _____ generators are delivering power to the main bus.	secondary
	both

EXTERNAL POWER RECEPTACLE

It is located in a recess on the left-hand side of the fuselage, under the third window forward of the passenger door.

1. An external power receptacle is located on the _____ side of the fuselage, under the third window forward of the passenger door.	
	left

EXTERNAL POWER RELAY

Functions to connect an external power source to the main bus.

1. The external power relay functions to connect an external power source to the _____ bus.	
	main

GROUND TEST RELAY

It is energized when an external power source is connected to the aircraft electrical system, thus the secondary bus relay is energized from the external power source.

1. The ground test relay is energized when an _____ power source is connected to the aircraft electrical system.	
	external

GROUND FAULT TRANSFORMERS

Provide a current differential in the ground fault detection system (if an open or short circuit occurs in generator output lines) and actuate a relay to isolate the faulty system. One ground fault transformer is used with the positive line cable and the other with the negative line cable. Each transformer is coupled to one of the coils of the ground fault relay. The positive and negative line cables each pass through the center of their respective transformers, thus the cable acts as the transformer primary. With normal loads and fault-free circuits, equal signals are imposed on the two coils of the ground fault relay

and this results in zero magnetic force on the relay armature. Should an open or short circuit occur, the current through one coil of the ground fault relay will become greater than the current through the opposing coil, causing the relay to close and complete a circuit to the generator field trip coil in the generator control panel, thus de-energizing the generator relay. An additional circuit, directly connecting the generator D terminal to the negative coil of the ground fault relay and grounded through the generator relay, will provide a strong signal to the negative coil of the ground fault relay if a fault is present during generator build-up. This would actuate the field trip coil, rending the generator relay inoperative.

1. The ground fault transformers function with the ground fault relays to trip the generator field relay should a short or open occur in the _____ output.	
	generator

GENERATOR SWITCHES

Provide control of the generators from the AC-DC power panel in the cockpit permitting a generator to be isolated from the system by selecting to OFF, or to be electrically reconnected to the system by selecting to RESET when the respective field relay has been triggered by a fault.

GENERATOR WARNING

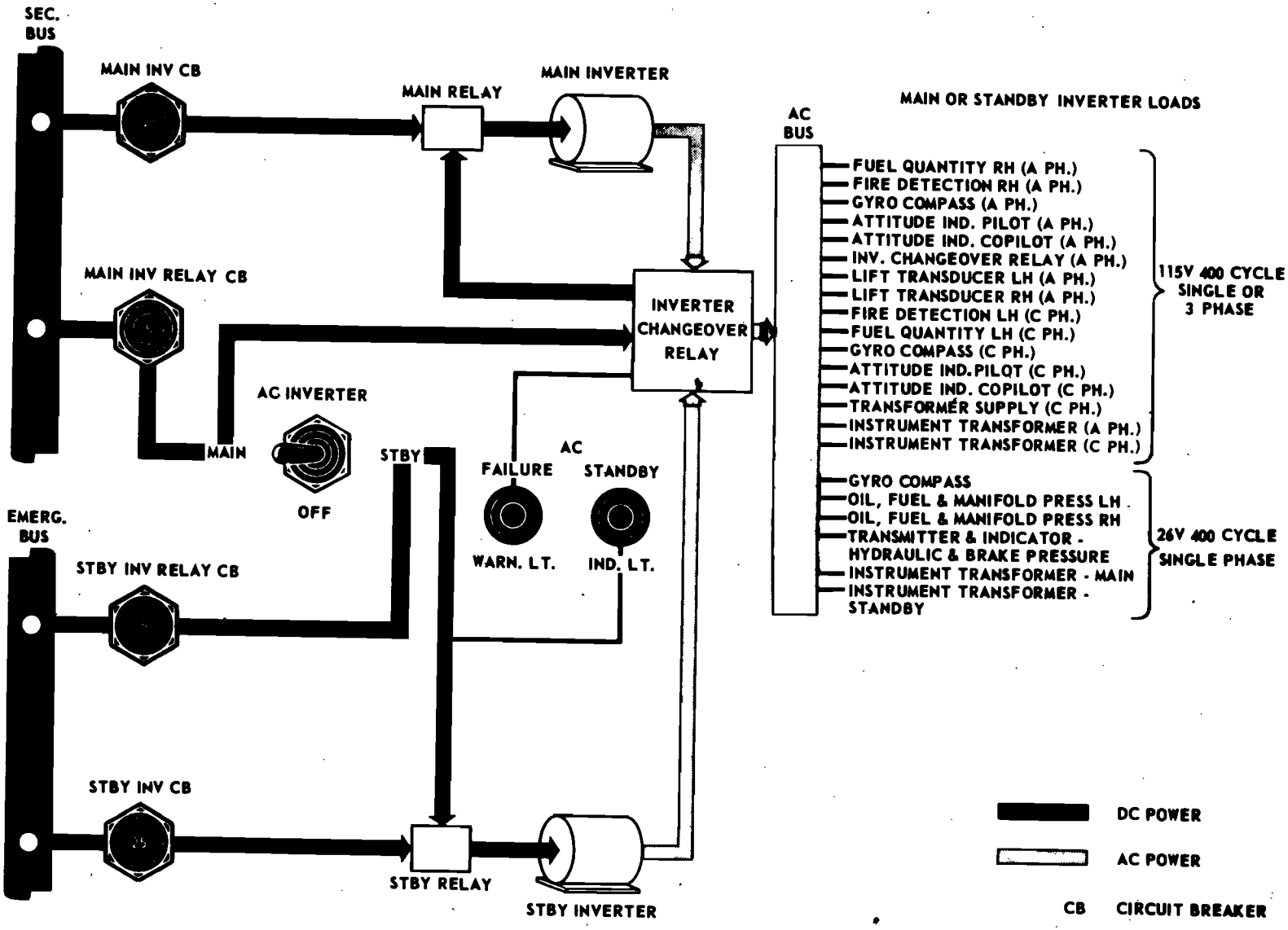
Provides a warning if the corresponding generators is <u>disconnected</u> from the main bus; located on the electrical power panel.

1. Generator switches provide control of the generators from the AC-DC panel in the cockpit, permitting a generator to be isolated from the system by selecting to _____.	
2. After the field relay has been opened by an overvoltage the generator can be reconnected to the system by selecting the _____ position on the generator switch.	OFF
	RESET

DC VOLTAMMETERS (two)

They are located just above the electrical power panel, indicate the voltage of the main bus and the current load of the respective left-or right-hand generator.

1. The DC voltammeters indicate the _____ and _____ of the respective left or right generator.	
	voltage; current load



/ AC electrical system - schematic

AC POWER SUPPLY SYSTEM

GENERAL

The AC power supply system consists of a main inverter, a standby inverter for use in the event of failure of the main inverter, an inverter changeover relay to effect automatic change from main to standby inverter in the event of main inverter failure, and AC main and AC instrument buses for power distribution. The AC main buses are not connected and the wiring is stowed. The inverters derive their input from the aircraft 28-volt DC system and deliver 115-volt, 400-cycle, three-phase output to those systems requiring this voltage. In addition a 26-volt, 400-cycle supply is provided by a stepdown 115/26 volts instrument transformer, which derives its input from the inverter in use. The inverters can be selected manually by an inverter switch on the electrical power panel. The panel also contains an AC failure light, which gives warning of complete AC power failure, and an AC standby inverter light, which comes on when the standby inverter is operating.

1. The AC power supply system consists of main inverter and a _____ inverter.	
2. The standby inverter is for use in the event of _____ of the main inverter.	standby
3. An inverter changeover relay effects _____ changeover from main to standby in the event of failure of the main inverter.	failure
4. The AC main buses _____ _____ connected.	automatic
5. The main and standby inverter output is _____, _____, _____ AC power.	are not
6. A 26-volt, 400-cycle supply is provided for instrument operation by a _____.	115-volt; 400-cycle; three-phase
7. The inverter input power is from the _____ system.	stepdown transformer
8. The AC failure light on the DC-AC power panel gives warning of _____.	28 VDC

9. The standby inverter light comes on when the standby inverter is _____.	complete AC power failure
	operating

AC POWER DISTRIBUTION

The alternating current power supply from the inverters is distributed through a multiple bus network, located on the aft face of the flight compartment bulkhead on the upper right-hand side. There are three AC main buses and three AC instrument buses, all supplied with 115-volts,400-cycles. The AC main buses are not used, and the wiring is stowed at the fuse panel. Power to the system requiring 115-volts, 400-cycles AC is distributed from the AC instrument buses through the fuse panel. Two 115/26 volt stepdown instrument transformers (main and standby) also in number 10 junction box, supply 26 volts, 400 cycles AC to those instruments requiring this power.

1. There are three AC main buses, and three AC _____.	
2. The three AC main buses _____ _____ used.	instrument buses
3. Power to the system requiring 115-volt, 400-cycle power is taken from _____.	are not
4. There are _____ stepdown transformers to supply 26-volt, 400-cycle AC power to the instruments requiring this power.	grounded
	two

AC MAIN BUSES

They are the A-phase, B-phase, and C-phase main buses. The B-phase bus is grounded through the airframe to the main inverter. The A-phase buses receive power directly from the main inverter, and the wiring is stowed at the fuse panel.

1. The three AC main buses are A-phase bus, B-phase bus, and _____ bus.	
2. The B-phase bus is _____ through the airframe to the main inverter.	C-phase
	grounded

AC INSTRUMENT BUSES

They are the A-phase, B-phase, and C-phase AC instrument buses. The B-phase is grounded to the B-phase connection of both inverters, through the airframe. Power is distributed from the A-phase and C-phase buses through fuses on the fuse panel. The buses receive power from the main inverter or the standby inverter, through the inverter changeover relay.

1. The AC instrument buses receive power from the main inverter or the standby inverter through the _____.	
	inverter changeover relay

INSTRUMENT TRANSFORMERS

Provide 26-volt, 400-cycle, single-phase AC for instruments requiring this power. The 115-volt, 400-cycle input to the transformers is supplied from the C-phase AC instrument bus, through the instrument transformer fuse on the fuse panel.

1. The 115-volt, 400-cycle power is supplied to the instrument transformer from the 115-volt, 400-cycle _____ of the instrument bus.	
2. The C-phase 115-volt, 400-cycle is supplied through a fuse on the fuse panel marked _____.	C-phase
	instrument transformer fuse

FUSE PANEL

It is located with the group of circuit breaker panels, above the cabin flight compartment doorway on the forward side of the bulkhead within reach of the pilot and copilot. The current rating is marked on the fuses, and they are labeled with the name of the service protected by them.

1. The fuse panel is located on the forward side of the bulkhead, above the flight compartment doorway within reach of _____.	

2. The current rating is marked on the fuse, and they are labeled with the name of the service _____.	the pilot and copilot
	protected by them

INVERTERS

Two, a main, and a standby inverter for use in the event of failure of the main inverter. Both are located below the floor of the cockpit. Each will deliver 115-volts, 400-cycles, at 250 volt-amperes, when supplied with 26 to 29 volts DC. The DC input supply for the standby inverter is taken from the emergency DC bus and the supply for the main inverter is taken from secondary bus. An automatic changeover function is provided by changeover relays. Manual control of inverter selection is provided through an inverter switch marked MAIN-OFF-STANDBY on the AC-DC power panel.

1. The main and standby inverters are located _____ of the cockpit.	
2. Each inverter will deliver 115-volt, 400-cycle AC power when supplied with _____ to _____ input power.	below the floor
3. Each inverter is rated _____.	26; 29 VDC
4. DC power for the main inverter is taken from the _____.	250 voltamperes
5. DC power for the standby inverter is taken from the 28 VDC _____ bus.	secondary bus
6. Manual control of inverter selection is provided through the inverter switch marked _____.	emergency
	MAIN-OFF-STANDBY

INVERTER CHANGEOVER RELAY

The unit consists of five individual relays and two bridge circuits, and functions to control main and standby inverter operation as follows:

a. With only the emergency bus energized, the standby inverter operates with the inverter switch on the electrical power panel selected to the STANDBY or MAIN position.

b. With both the emergency bus and the secondary bus energized, the standby inverter only operates with the inverter switch selected to STANDBY.

c. With both the emergency bus and the secondary bus energized, the main inverter operates with the inverter switch selected to main until the AC voltage from the main inverter falls below 90 volts, at which time the main inverter switches off and the standby inverter switches on automatically.

1. The inverter changeover relay consists of _____ and _____.	
2. With only the emergency bus energized the standby inverter operates with the inverter switch in the _____ or _____ position.	five individual relays; two bridge circuits
3. When the secondary bus and the emergency bus is energized the standby inverter operates only when the inverter switch is selected to _____.	STANDBY; MAIN
4. With the secondary bus and the emergency bus energized, the main inverter operates with the inverter switch positioned to main until the main inverter output voltage falls to 90 volts, then the main inverter will go off and the standby inverter will _____.	STANDBY position
	come on automatically

AC FAILURE LIGHT

A red-colored edge light, mounted on the AC-DC power panel, and will come on when AC power output ceases, as long as the emergency bus remains energized. When relay E in the inverter changeover relay box is de-energized, the circuit is completed.

1. The red AC failure light come on when the AC power ceases, as long as the _____ is energized.	
	DC emergency bus

An amber-colored edge light, mounted on the AC-DC power panel, and will glow when the standby inverter is operating, as long as the emergency bus remains energized. When the inverter switch is selected to STANDBY the circuit is completed.

1. The amber-colored standby inverter light will glow when the standby inverter is _____.	
	operating

LIGHTING SYSTEM

GENERAL

The aircraft lighting system can be divided into four groups: interior, exterior, panel, and warning lighting. All groups operate from the aircraft DC power supply system. Lights considered essential to aircraft safety are supplied from the emergency bus, and the remaining circuits are supplied from the main bus. An emergency lighting system, which operates independently of the aircraft electrical system, is provided to illuminate the aircraft exits in the event of a complete electrical failure.

1. All lights operate from the aircraft _____ system.	
2. Lights considered essential to aircraft safety are supplied from _____.	DC power
3. The remaining light circuits are supplied from the DC _____ bus.	the emergency bus
4. The emergency lighting system, which operates independently of the aircraft electrical system, is provided to illuminate _____ in case of complete electrical failure.	main
	aircraft exits

INTERIOR LIGHTING

Interior lighting comprises a cargo loading light, rear entrance light, flight compartment floor hatch light, radio rack utility light, copilot's and pilot's utility lights, hydraulic emergency selector panel lights, flight compartment

dome light, cabin dome lights, and passenger warning sign lights. The cargo loading lights, rear entrance light, passenger warning sign lights, flight compartment dome, and cabin dome lights, are supplied from the main bus; the pilot's and copilot's, and radio rack utility lights, hydraulic emergency selector panel lights and the flight compartment floor hatch lights are supplied from the emergency bus.

1. Lights supplied from the _____ bus are cargo loading lights, rear entrance lights, passenger warning sign lign lights, flight compartment dome lights, and cabin dome lights.	
2. Lights supplied from the _____ bus are pilots and copilots, and radio rack utility lights hydraulic emergency selector panel lights, and the flight compartment floor hatch lights.	main
	emergency

CARGO LOADING LIGHT

Mounted in the cabin roof near the left passenger door, is a clear spotlight, which can be changed to red by a shutter operated by a lever on the front of the lamp. The light can be pivoted downwards and sideways or it can be removed from the bracket and used as a hand-held lamp. The switch is mounted on the side of the light. A coiled cable 50-inches long is attached to the lamp and a stowage is provided in the cabin roof recess.

1. The cargo loading light is mounted in the _____ near the left passenger door.	
2. It is a clear spotlight but can be changed to red by _____.	cabin roof
3. It can be used as a _____ by removing it from the bracket.	a lever operated shutter
	hand-held light

REAR ENTRANCE LIGHT

A flush-mounted dome light, mounted in the cabin roof between the two passenger doors, is controlled by a toggle switch on the rear control panel in the cabin roof just above the left-hand passenger door.

1. The rear entrance light is controlled by a toggle switch on the control panel _____.	
	just above the left cabin

UTILITY LIGHTS

On each for pilot and copilot, and one for the radio rack. The lights are fixed to brackets by ball and spring fixtures.

1. There are three utility lights, one each for the pilot and copilot, and one for _____.	
2. The lights fixed to brackets by _____ .	the radio rack
	ball and spring fixtures

FLIGHT COMPARTMENT FLOOR HATCH LIGHT

A red-colored light is located on the aft wall of the hatchwell beneath the floor of the cockpit. A microswitch is actuated when the lower hatch door is open, and switches the light on.

1. The red-colored light is on the aft wall of the hatchwell _____ of the cockpit.	
2. A microswitch is actuated when the lower hatch door _____, and switches the light on.	beneath the floor
	is open

FLIGHT COMPARTMENT DOME LIGHT

Flush-mounted on the overhead console, it selected and operated by a three-position toggle switch marked WHITE-OFF-RED, located beside the light, on the pilot's side.

1. The flight compartment dome light is selected and operated by a switch marked _____ located beside the light.	
	WHITE-OFF-RED

CABIN DOME LIGHTS

Seven are provided in two rows on either side of the monorail in the cabin roof. Each dome light contains a red and a clear lamp which are selected by a three-position toggle switch marked WHITE-OFF-RED on the switch panel behind the pilot's seat.

1. Seven cabin dome lights are provided, mounted overhead in the cabin and controlled by a toggle switch on the switch panel behind the _____.	
	pilot's seat

EXTERIOR LIGHTING

The exterior lighting system comprises navigation lights, wing inspection lights, anti-collision lights, landing lights, and a tasiing light, all supplied from the main bus. The navigation lights, wing inspection lights, and anti-collision lights are controlled by switches on the electrical switch panel, and the tasiing light and the landing lights from switches on the overhead console.

1. The exterior lights receive power from the _____ bus.	
	main DC

ANTI-COLLISION LIGHTS

One on the underside of the fuselage and one on the top of the rudder, are rotating red beacons, each rotated by a 28-volt DC motor. Both lights and motors are actuated by a switch on the right of the electrical switch panel.

LANDING LIGHTS

A 250-watt, sealed-beam, landing light is set into the leading edge of each wing at a fixed angle. The lights are operated by separate T-handle toggle switches located on the overhead console.

CAUTION To prevent damage to the landing lights due to overheating, do not turn on light for more than a few seconds when the aircraft is on the ground.

TAXIING LIGHT

A sealed-beam light on the nose gear fairing at a preset angle, is controlled by a switch located on the overhead console adjacent to the landing light switch.

1. Anti-collision lights are located, one on the underside of the aircraft and one on top of the _____.	
2. The two 250-watt sealed-beam landing lights are set into the _____.	vertical stabilizer
3. The use of landing lights on the ground should be limited to prevent _____.	wing leading edge
4. The taxi light in the nose gear fairing is mounted at a _____.	overheating
	preset angle

PANEL AND WARNING LIGHTS

Eyebrow lighting is provided for the flight instruments and engine instruments; edge lighting is provided for all switch panels and consoles; and panel lights are provided in warning and indication circuits.

DOORS UNLOCKED LIGHT

A press-to-test, amber-colored panel warning light, marked DOORS UNLOCKED, is located on the emergency panel. The light will come on if the flight compartment floor hatch, the passenger doors, the cargo door, and the ramp door, are not all closed and locked.

1. The flight instruments and the engine instruments are provided with _____.	
2. All switch panels and consoles are provided with _____.	eyebrow lighting
3. Panel lights are provided in _____ circuits.	edge lighting
4. The doors unlocked warning light, located on the emergency panel will come on if flight compartment floor hatch, passenger door, cargo door or ramp door is _____.	warning and indication
	not closed and latched

EMERGENCY LIGHTING SYSTEM

The emergency system which operates independently of the aircraft electrical system, provided to illuminate the aircraft exits in the event of complete electrical failure, consists of a control unit which contains a battery and an inertia switch, and white exit lights beamed at the flight compartment roof hatch, cabin emergency door, the passenger doors, and the cargo door. The system is normally controlled by a guarded toggle switch on the cabin lights switch panel on the flight compartment bulkhead, but the inertia switch in the control unit operates automatically on crash-landing to switch on the exit lights.

EMERGENCY LIGHTING CONTROL UNIT

Mounted on the left side of the monorail beam aft of the wing rear spar, contains an inertia switch and a 6.6-volt, 4-ampere-hour, sealed, nickel-cadmium battery, and a terminal strip to which the exit light cables are connected.

1. The emergency lighting system consist of a control unit that contains an _____, white exit lights beamed at the flight compartment roof hatch, cabin emergency door passenger doors and the cargo doors.	
2. The inertia switch operates automatically to turn on the exit lights in the event of a _____.	inertia switch
3. The emergency lighting system receives power from a _____, _____, sealed, nickel-cadmium _____.	crash landing

4. The battery will operate the lights for a minimum of _____ hour.	6.6-volt; 4-ampere-hour; battery
	one

MISCELLANEOUS

DC UTILITY RECEPTACLES

There are three utility receptacles, one in the flight compartment on the step behind the copilot's seat, one in the rear fuselage, and one on the rear control panel, marked UTILITY OUTLET - 24 volts DC and are covered when not in use by a screw cap which has a safety chain attached.

JUNCTION BOXES AND JUNCTION PANELS

Junction boxes and junction panels are fitted at various locations in the aircraft to interconnect electrical systems and power supplies, and to mount switching components and relays associated with the systems.

NUMBER 1 JUNCTION BOX

Is located on the cabin roof on the left-hand side of the monorail, just aft of number 2 junction box. The junction box contains the external power relay, propeller feathering relays, both generator relays, ground fault transformers, and starter relays, and interconnections to number 2 junction box.

1. There are _____ utility receptacles on the aircraft.	
2. Junction boxes and junction panels are used to interconnet _____ and _____.	three
3. The number 1 junction box is located on the cabin roof on the left side of the monorail just aft of _____.	electrical systems; power supplies
4. _____ junction box contains the external power relay, prop feathering relays, both generator relays, ground fault transformers, the starter relays and interconnects to the number two junction box.	number 2 junction box
	Number 1

NUMBER 2 JUNCTION BOX

This is the main junction box, and contains the main bus bar, current limiters, dimming relays, landing light relays, cargo door relay, auxiliary fuel booster pump relays, pitot heater relays, bus control relays, stall warning relays, landing gear control relays, auto-feathering block relay, vent door relay, and ground test relay, in addition to terminal strips and plug-in cable connectors. It is located in the cabin roof on the left-hand side of the monorail just aft of the flight compartment bulkhead. The dimming relays are plugged into receptacles on the side of the junction box, and the remaining relays are mounted on a platform over the terminal strips.

NUMBER 6 JUNCTION PANEL

Houses main and standby inverter relays, and the inverter changeover relay. The panel is located in inverter compartment below the floor of the cockpit on the right-hand side.

NUMBER 9 JUNCTION BOX

Is on the left-hand side of the rear fuselage, just aft of the passenger door, and interconnects electrical components in the rear section of the fuselage. It contains cargo doors open and close relays, ramp door open and close relays, and terminal strips.

1. Number 2 junction box is the main junction box and contains the _____ bus.	
2. The number 2 junction box contains most of the _____ relays in the electrical system.	main
3. The number 2 junction box is located on the cabin roof on the left side of the monorail just aft of the flight compartment _____.	control
4. The number six junction panel is located below the cockpit floor on the right-hand side and contains the _____ relays and the _____.	bulkhead
5. The number nine junction box furnishes power for the rear section of the fuselage and is located just aft of the _____.	inverter; changeover
	passenger door

NUMBER 10 JUNCTION BOX

Is on the right-hand side of the aft face of the flight compartment bulkhead. It contains terminal strips used for interconnection of AC supplies, two 115/26 volt instrument transformers, and the AC main and AC instrument buses.

NUMBER 11 JUNCTION BOX

Interconnects all radio navigation instruments houses the power relays for the J-2 Gyro magnetic compass system, is located on the right-hand side of the aircraft beneath the flight compartment floor, aft of the floor hatch.

NUMBER 12 JUNCTION BOX

Is on the forward face of the bulkhead behind the copilot's seat. It is the main radio junction box.

INSTRUMENT JUNCTION PANEL

Is in the nose section behind the instrument panels, houses receptacles to facilitate interconnection of electronic instruments on the instrument panel, and lighting circuits connected to switch panels.

1. Number 10 junction box, on the aft face of the _____ contains two 115/26 volt instrument transformers and the AC main and AC instrument bus.	
2. Number 11 junction box interconnects all radio navigation instruments, the relays for the J-2 compass system and is located on the right-hand side of the airplane _____.	flight compartment bulkhead
3. The instrument junction panel is located _____.	under the flight compartment floor
	behind the instrument panels

FIREWALL JUNCTION BOXES

Two firewall junction boxes are provided, one on the inboard aft face of each engine main firewall. The junction boxes are accessible from the main gear wells. These junction boxes interconnect generator and starter circuits, and house ground fault transformers and ammeter shunts.

SPARE LAMPS AND FUSES

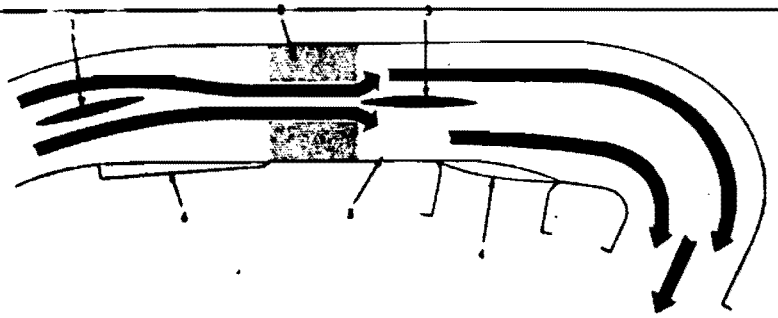
Are mounted on the bulkhead behind the pilot's seat. A fiberglas cover marked SPARE LAMPS and FUSES is clipped to the box and held by a retaining strap of webbing material. The box contains lamps for interior lighting, panel lighting, edge lighting, and cargo loading lights, and spare one-ampere and two-ampere fuses.

1. Two firewall junctions box mounted on the aft face of each main firewall, interconnect generator and starter circuits, and house ground fault transformers and _____ shunts.	
2. The spare lamps and fuses are mounted on the bulkhead _____.	ammeter
	behind the pilot's seat

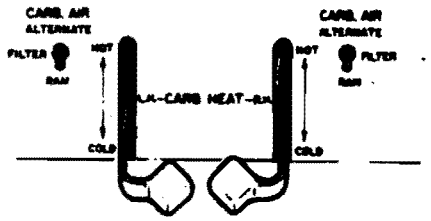
DIRECTED STUDY PROGRAM

DHC - 4

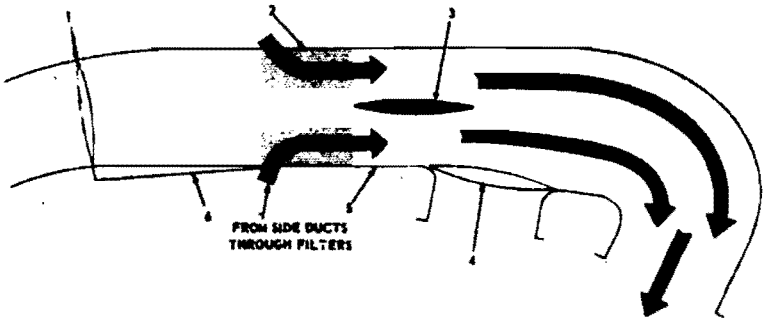
Ref.: 1080-4n



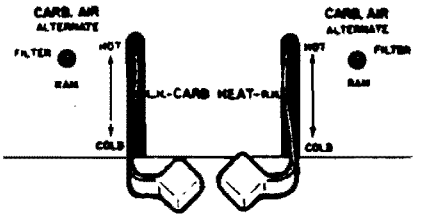
RAM AIR (UNFILTERED)

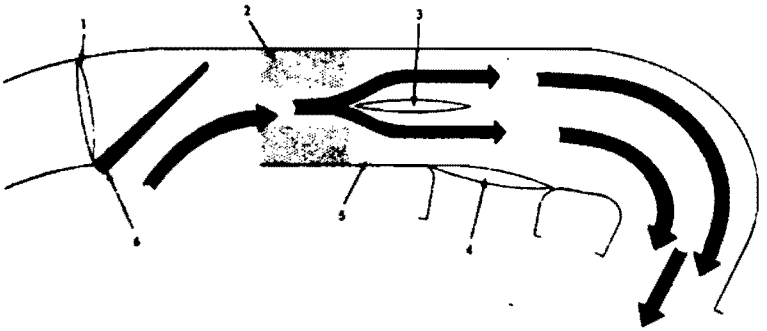


OVERHEAD CONSOLE

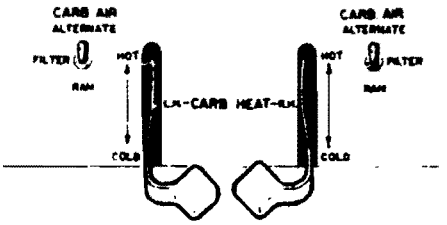


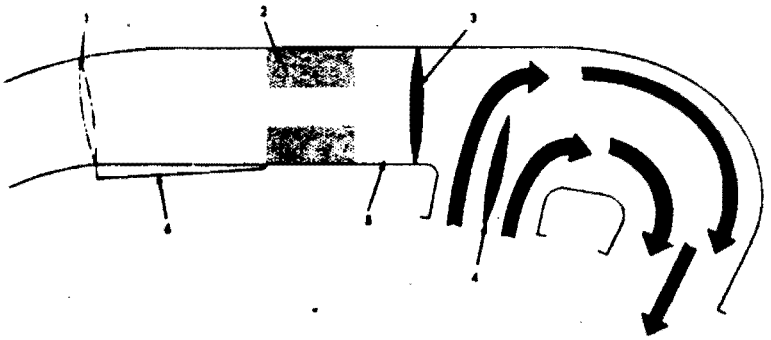
FILTERED AIR



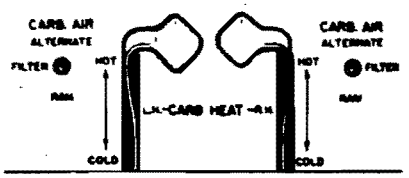


ALTERNATE AIR (UNFILTERED)





HEATED AIR (UNFILTERED)



1 RAM AIR VALVE
2 FILTER
3 CARBURETOR HEAT CONTROL VALVE (UPPER)
4 CARBURETOR HEAT CONTROL VALVE (LOWER)
5 CARBURETOR AIR INTAKE DUCT
6 ALTERNATE AIR VALVE

Air Induction System Schematic

AIR INDUCTION SYSTEM

Each power plant has a separate air induction system designed to maintain satisfactory engine operation over a wide range of temperature and weather conditions. The center duct within the top cowling supplies air to the carburetor and contains two dry filters, a ram air valve, an alternate air valve, and two carburetor air mixing valves. Both ram and alternate air valves are operated by 24-volt DC actuators. Looking aft, the left-hand actuator operates the ram air valve, while the right-hand actuator operates the alternate air valve. They are powered from the primary bus and controlled by the carburetor air induction switch, labeled CARB AIR, ALTERNATE, FILTER, and RAM, in the cockpit overhead console. The carburetor air mixing valves are interconnected by an adjustable rod and are controlled from the overhead console by the carburetor hot air lever. The two valves adjust simultaneously in proportion to lever movement.

OPERATION

For normal operation the CARB AIR switch is selected to RAM, which opens the ram air valve and provides the carburetor with unfiltered ram air. In dusty conditions the CARB AIR switch is selected to FILTER, which closes the ram air valve, allowing air from the oil cooler ducts to enter the air intake duct through the filters. If icing conditions obstruct the forward inlet duct, air from the front of the cylinders may be admitted through the alternate air valve by selecting the CARB AIR switch to ALTERNATE. The ram air valve is normally closed when ALTERNATE selection is made, but this will depend on the restriction imposed by the icing conditions. The required carburetor air temperature is obtained by selective positioning of the CARB HEAT LEVER. In the HOT position the cold air mixing valve is closed, and the hot air mixing valve is open to allow heated air from the vicinity of the exhaust pipes to be drawn into the intake. In the CLOSED position the cold air mixing valve is open and the hot air mixing valve closed. Thus, in any intermediate position, the hot and cold air will mix proportionately to lever selection.

NOTE: It is not possible to get HOT FILTERED AIR.

1. There are _____ main sources of carburetor air.	
2. These sources may be selected as _____, _____, _____.	three
3. The induction doors are _____ operated.	RAM; FILTERED; ALTERNATE
4. Carburetor heat is _____ adjusted.	electrically

5. The intake source of filtered air is from the _____ ducts.	manually
6. The intake source of _____ air is from the front of the cylinders.	oil cooler
7. It is not possible to get _____ air.	alternate
8. The mixing valves operate _____ and proportionate to _____ movement.	HOT FILTERED
	simultaneously; lever

DIRECTED STUDY PROGRAM

DHC - 4

Ref.: 1080-4o

DE-ICING AND ANTI-ICING

GENERAL

The aircraft is provided with anti-icing systems for the windshields, heater intake, and pitot heads, and stall warning lift transducer.

WINDSHIELD ANTI-ICING SYSTEM

This maintains the pilot's and copilot's windshields at a constant temperature, thus preventing ice formation and misting under all conditions, and consists of heating and temperature sensing elements in the pilot's and copilot's windshields; two controlled inverters which supply power to the windshield heating elements; two windshield power failure lights; a windshield heat switch; and control and power switching relays. Should the pilot's inverter fail, power can be obtained from the copilot's inverter, and the copilot's windshield anti-icing system is rendered inoperative.

The windshields are of triple laminate construction, the two outer layers made of a plastic material resembling plexiglas (or glass, as in the Company owned A/C) and the inner layer made of a soft vinyl material which is very resilient when heated. The inside surface of the front outer layer is coated with an electrically conductive film which is connected to bus bars at the upper and lower edges of the windshield and forms the heating element. The sensing element is a high temperature co-efficient wire embedded in the top inboard corner of the inner layer.

1. Anti-icing systems on the DHC-4 include _____, _____, _____, and _____.	
2. Two independant _____ supply power to the windshield heating elements.	windshield; heater intake; pitot heads; lift transducers
3. The windshield is a _____ laminate construction _____ bars and a conductive coating.	inverters
4. In event of inverter failure the pilot can select the _____ inverter.	triple; bus
	copilot's

WINDSHIELD INVERTERS

Mounted under the cockpit floor of the nose section, the inverters are supplied with 28 volt DC input from the secondary bus and deliver output power to the windshields to maintain a constant operating temperature of 105°F ± 5°F. The power required being proportional to outside air conditions. The power delivered to the windshield maintains the inner vinyl layer of the windshield (and hence the sensing element) at a constant temperature. In the event of failure of the sensing element due to an open or short circuit, power output is automatically reduced to zero. Failure-safe features are incorporated within the unit to isolate the 28 volt supply in the event of a component failure.

The windshield power failure indicators are amber lights, mounted on the electrical switch panel, which indicate inverter failure. When an inverter failure occurs, a relay in the unit is operated and completes a 28 volt DC supply to its failure light. The supply is taken from the secondary bus.

WINDSHIELD HEAT SWITCH

Mounted on the electrical switch panel, is a four-position rotary switch marked NORM-OFF-EMERG, with an unmarked detent position between OFF and EMERG. In the NORMAL position the pilot's and copilot's windshields are heated by their associated inverters. In the OFF position the system is inoperative. In the EMERG position, the pilot's windshield heater is supplied from the copilot's inverter and the copilot's windshield heater is inoperative. The unmarked detent position insures that the connections to the windshield are changed over before DC power is applied to the copilot's inverter.

1. The windshield inverters receive 28 VDC from the _____ bus.	
2. The inner vinyl layer is maintained at a temperature of _____ °F.	secondary
3. A sensing element protects the inverters in case of a _____.	105
4. An _____ light will show when AC power has failed.	short circuit
5. The heater control switch has _____ position, one position being an unmarked _____.	amber
6. The marked positions of the rotary switch are _____, _____, _____.	four; detent

7. In the _____ position the copilot's heater is inoperative.	OFF; NORMAL; EMERGENCY
	EMERGENCY

PITOT HEAD AND STALL WARNING LIFT TRANSDUCER HEATERS

There are six pitot heads and two stall warning lift transducers in the aircraft. All incorporate electrical heating elements which are controlled by the pitot heater switch on the de-icing panel. All systems are supplied from the emergency bus. Separate pitot heads are provided for the pilot's and copilot's instruments. These are located one on each side of the aircraft nose and incorporate 24-volt pitot heater. The circuit to the right pitot heater is from the emergency bus through the right pitot relay, and from the same relay contacts, a circuit is taken to the 24-volt heating element in the right stall warning lift transducer, located in the right wing leading edge. The circuit to the left pitot heater is from the emergency bus through the left pitot relay, and from the same relay contacts, a circuit is taken to the 24-volt heating element in the left stall warning lift transducer located in the left wing leading edge. There are four thrust indicating system pitot heads, each of which incorporates a 12-volt heater, two on each engine nacelle. The outer pitot heaters on both engines are connected in series, and the inner pitot heaters are connected in series. The outer and inner heaters are supplied from the secondary bus.

HEATER INTAKE ANTI-ICING

The ram air intakes for the flight compartment heater are heated for anti-icing purposes. The heater element is embedded in the plastic molding of the intake, controlled by the heater anti-icing switch on the heater panel, and by thermostats which are wired to relays. The circuit is protected by circuit breakers on the heater panel. The pitot heater switch must be on to provide a ground return for the relays.

1. There are _____ pitot heads and _____ lift transducers.	
2. Power for anti-icing is from the _____ bus and _____ bus.	six; two
3. All systems are controlled by the _____ switch.	emergency; secondary
4. All heater elements are 24 VDC except the _____ elements.	pitot heater

5. The flight compartment heater intake anti-icing has a separate control switch on the _____.	thrust indicator
6. The _____ switch must be _____ to provide a ground return for the heater intake anti-icing element.	heater control panel
	pitot heater; on

PROPELLER DE-ICING SYSTEM

For A/C with a propeller de-icing system, a separate system is used for each propeller. Each operates in an identical manner and consists of similar components and piping. Isopropyl alcohol is used to prevent the formation of ice on each propeller blade. A de-icing tank, pump, and pressure control components for each propeller and mounted on the forward face of each outer wing front spar, outboard of the engine oil tank. Fluid is piped under pressure to a nozzle which delivers the fluid into a slinger ring attached to the propeller hub. Centrifugal force expels the fluid through a short pipe and nozzle mounted on each blade shank. The pressure supply pump is controlled by a propeller de-icing panel.

DE-ICING TANK

The de-icing tank is on the outer wing front spar. Each tank has a capacity of 8.4 gallons U.S. and is replenished through an access panel in the wing leading edge. The filter neck and spill tray is on the outboard end of the tank.

NOTE: Alcohol is not normally carried on Company A/C.

1. Alcohol tanks are located at each outer wing _____.	
2. Tank capacity is _____ gals. each.	front spar
3. Fluid is distributed by a _____ on the prop hub.	8.4
4. The pump control switch is located on the _____ panel.	slinger ring
	de-icing