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## INTRODUCTION

The environmental systems on the DC-3 provide heat by utilizing a Janitrol heater and ventilation using fresh air scoops and blowers. This chapter provides a general overview of the DC-3 Environmental Systems as well as normal operations and limitations.

## GENERAL

### HEATING SYSTEM

Heat is provided on the DC-3 by a Janitrol heater which is located in the heater compartment on the right side of the companionway. The heater is installed in the upright position and is enclosed on three sides by fire resistant material. The fourth side is formed by the bulkhead that separates the cockpit area from the cabin area.

During normal operations and in the coldest environmental conditions, the heater uses 1.5 gallons of fuel per hour. The heater control panel is located on the First Officer's overhead panel. This panel consists of a heater ON/ OFF switch, a duct temperature gauge, and an amber malfunction light.

#### Heater Fuel System

The Janitrol heater uses fuel from the right engine fuel pressure gauge line that is pressurized by either the right engine driven fuel pump or the right engine electric boost pump. A supply valve located on the forward bulkhead of the heater compartment is provided as means to shut off fuel supply to the heater system when necessary. The valve is open when the handle is parallel to the fuel line.

Fuel supplied to the heater is controlled by a fuel pressure regulator and an electrically operated fuel shutoff valve. The pressure regulator is controlled by airflow through the heater inlet air duct. The fuel shutoff valve is electrically controlled by a thermal cycling switch in the heater outlet air duct.

#### Heater Electrical System

The heater electrical system is protected by the No. 30 circuit breaker in the main electrical J-Box. The heater ON/ OFF switch on the heater control panel controls the heater operation and furnishes electrical power to the duct temperature gauge. The duct temperature gauge is an electrically operated gauge that indicates the heater outlet air duct temperature.

The heater is designed to operate only in flight. A ram air safety switch is mounted on the forward bulkhead of the heater compartment to disable the use of the heater when not in flight. This switch is operated by air pressure in the heater inlet duct. It completes the heater electrical circuit at airspeeds above approximately 74 KIAS. It opens the circuit to turn the heater off at airspeeds below approximately 52 KIAS. A malfunction light illuminates when the heater switch is ON and the heater is shut down because the electrical circuit is not complete.

A ram air bypass switch is mounted on the heater electrical J-Box on the forward bulkhead of the heater compartment. This is a guarded switch that can be used to bypass the ram air switch in the event that it becomes inoperative. The ram air switch light is an amber light mounted adjacent to the ram air bypass switch. It indicates that the electrical circuit is completed at the ram air switch.

The heater ignition unit is located on the forward bulkhead of the heater compartment. It incorporates two sets of ignition points. The alternate set of vibrator points can be selected by activating a toggle switch at the bottom of the unit.

The cycling switch is a thermal switch installed in the heater outlet air duct to automatically cycle the heater off when the duct temperature increases to 138°C. This switch controls the fuel shutoff valve in the fuel control, but does not affect ignition to the heater.

The cycling light is a green light mounted adjacent to the heater fuel pressure gauge. It illuminates when the cycling switch closes to complete the circuit and allow the heater to operate.

A heater overheat switch is located in the heater outlet air duct. It opens to shut off the heater in the event the cycling switch fails to open and duct temperature increases to 177°C. This switch shuts off fuel and ignition to the heater when it opens, and turns on the heater malfunction light.

The heater malfunction light is an amber light mounted on the heater control console which illuminates when the heater main switch is ON and either the ram air switch or the overheat switch has opened the electrical circuit to shutdown the heater.

**Heater Air System**

The heater air scoop protrudes from the fuselage above and aft of the First Officer's sliding window. The cockpit heat control is located aft of the Captain's seat and controls the amount of heated air which flows to the air outlets between both sets of rudder pedals. The control is open when it is pulled. The cabin heat control is located on the aft bulkhead of the heater compartment. It controls the amount of heated air that flows to the outlets in the cabin.

**Heater Fire Protection**

See the Fire Protection Chapter of this manual.

**VENTILATING SYSTEM**

The DC-3 is equipped with a nose air valve that allows ventilating air to enter the aircraft through a scoop in the nose of the fuselage. This valve is regulated by a control beneath the First Officer's instrument panel.

When the valve is open, air travels from the nose air scoop through a duct system under the floor and is distributed to various compartments. The cockpit cold air valve is located under the floor of the forward baggage bin and is operated by a control aft of the Captain's seat.

All heating and ventilating air enters the cockpit through outlet ducts located between each set of rudder pedals. Two controls, one for ventilating air and one for heating air, regulate the volume of air flowing to both outlets in the cockpit.

The cabin cold air valve is located in the aft baggage bin. It is safetied in the OPEN position for summer operation and safetied in the CLOSED position for winter operation. This valve controls the flow of ventilating air to air outlets in the cabin. By safetied the valve in a fixed position for seasonal operation, however, the supply of ventilating air to the cabin can be regulated from the cockpit with the nose air valve control.

Two electrically operated blowers are provided to force air to the outlets in the cabin. The blowers are supplied electrical power through the Anti-collision Light Switch, the Ram Air Switch, and the Cabin Fan Switch on the Heater Control Panel. For the blowers to work, the Anti-collision Light switch must be ON, the Cabin Fan Switch must be ON, and the Ram Air Switch must be open. Thus, the blowers are disabled in flight.

When the blowers are operating, a portion of the air is drawn into the duct from the outside through a small air scoop on the side of the fuselage, while the remainder of the inlet air is drawn from the forward end of the cabin through a flapper type check valve. In flight the check valve is held closed by ram air pressure from the outside air scoop and outside air is supplied to the ventilating air outlets.

**OPERATION****VENTILATION****For cockpit ventilation:**

Cockpit cold air valve .....	Pull/ OPEN
Heat ram air control .....	Push/ OPEN
Cabin-cockpit heat control .....	Pull/ COOL
Heat spill valve .....	Pull/ COOL

**For cabin ventilation:**

Cabin blowers .....	ON
Fresh air controls .....	PUSH
Heater ram air control .....	Push/ OPEN
Cabin-cockpit heat control .....	Push/ COOL

**NOTES:** The heater controls are used for heating and are also used for additional cooling with the heater off. Ventilation from the nose air valve is not available to the cabin on this aircraft.

**HEAT****For cockpit heat:**

Heater switch .....	ON
Heater ram air control (Push to open) .....	OPEN
Cabin-cockpit heat control .....	Pull/ HEAT
Heat-defrost control .....	Push/ HEAT
Heat spill valve .....	Pull/ HEAT
Cockpit cold air valve (Push to close) .	CLOSED

**For cabin heat:**

Heater switch .....	ON
Heater ram air control (Push to open) .....	OPEN
Cabin-cockpit heat control .....	Push/ HEAT (Push for more cabin heat)
Fresh air controls .....	PULL

**NOTE:** The cabin-cockpit heat control in the cabin divides the heater output between the cabin and cockpit. Therefore, when pushed to increase cabin heat the cockpit heat will be decreased and conversely when pulled to decrease cabin heat the cockpit heat will be increased.

The maximum heated air that can be directed to the cabin is approximately two thirds of the total supplied by the heater.

If it is necessary to direct an excess of heated air to the cockpit in order to maintain a comfortable temperature in the cabin, the heat spill valve can be adjusted to spill the excess heated air overboard to control cockpit temperatures. Do not spill heat until certain that satisfactory cabin heat is being provided.

**NOTE:** The heat-defrost control divides the cockpit heat supply between the cockpit air outlets forward of the rudder pedals and the windshield defrost outlets. Therefore, when pushed to increase cockpit heat, the defrost heat will be decreased.

**To operate blowers:**

1. Battery switch ..... BAT CART or BATTERY
2. Anti-collision light switch ..... ON
3. Cabin fan switch ..... ON

**HEATER FUEL PRESSURE**

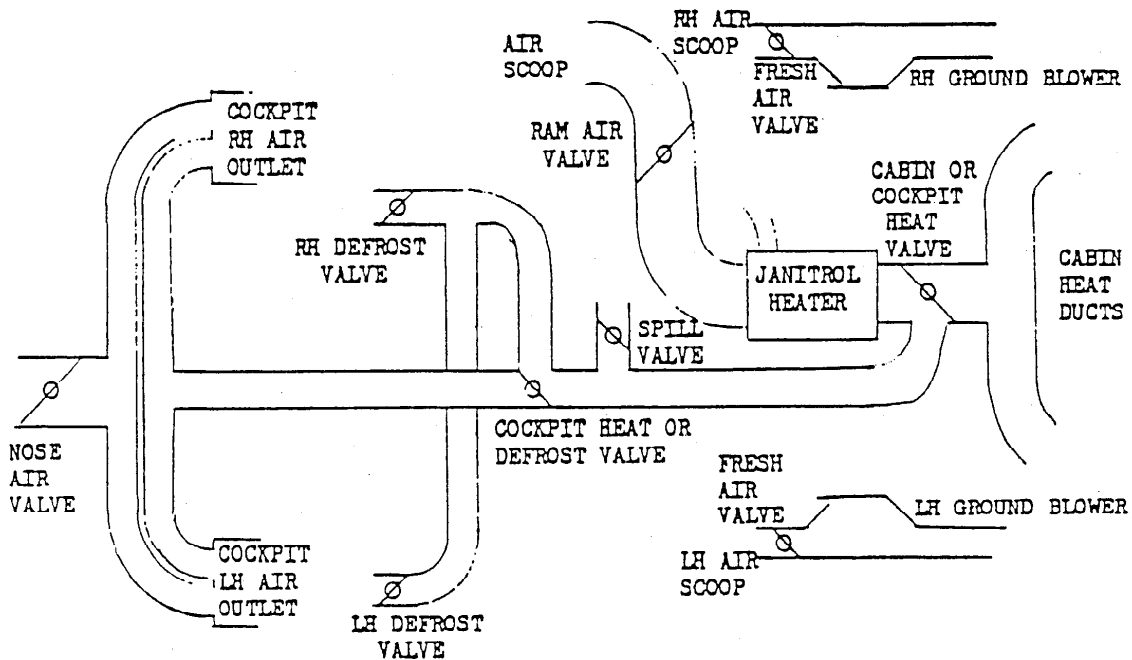
**Note:** In the event the right engine has been shut down and secured for reasons other than fire, the heater may be operated normally using fuel pressure obtained from the right electric boost pump. It is not necessary to take the right mixture control out of the idle/cutoff position. The heater will function normally as long as fuel pressure is supplied via the boost pump and the right fuel selector has been positioned to a fuel tank containing fuel.

**LIMITATIONS**

Heater Cycling Temperature ..... OFF at 138°C.

Heater Ram Air Switch Settings

Close ..... 74 knots  
Open ..... 52 knots



Heating and Cooling System

