CHAPTER 13

UTILITY SYSTEMS

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ILLUSTRATIONS

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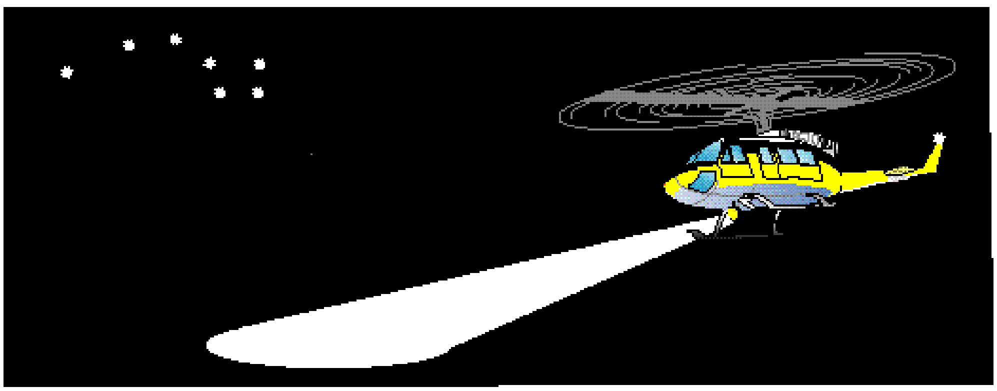
CHAPTER 13
UTILITY SYSTEMS

INTRODUCTION

The Model 212 utility systems consists of six systems that are standard equipment in the helicopter. These systems do not include the optional equipment available in kits for the helicopter, except the cargo suspension unit. The systems are:

Lighting Systems, Ice and Rain Protection Systems, Fire Protection System, Environmental Systems



LIGHTING

INTRODUCTION

The Bell 212 lighting systems provide cockpit and cabin illumination as well as exterior navigation, landing, and searchlights. The lighting systems provide full night and IMC flight capability. The standard passenger warning lights and step area lights for loading and unloading are also included. All lighting systems are DC powered, protected with circuit breakers, and operate by the pilot from conveniently located cockpit switches. Optional lighting such as the “Night Sun” is discussed in Chapter 25 , “Kits and Accessories.”

GENERAL

The Bell 212 has two lighting systems, Interior and Exterior. Most of the lighting controls are located on the overhead console along with the lighting system circuit breakers. Controls for the landing light and searchlight are located on the pilot’s collective head. Some of the individual lights are equipped with switches located near the devices themselves.

INTERIOR LIGHTING

Lighting for the cockpit, cabin and baggage compartment is accomplished through the interior lighting system. Most of these systems are supported by the DC essential buses. Figure 13-1 shows the lighting controls for the Bell 212.

Cockpit Lighting

General

Cockpit lighting includes the pilot and copilot flight and engine instruments, lighting of the overhead console and center pedestal, and miscellaneous lights. Miscellaneous lights include the OAT gauge light, standby compass lights, movable cockpit lights, approach plate lights, and map lights (Figures 13-2 and 13-3).

Instrument Panel Lights

Instruments and panels viewed directly by the pilot's are indirectly illuminated to prevent loss of night vision. The pilot's instrument panel, the engine instrument panel, and the copilot's instrument panel are illuminated with 5-VDC lights controlled with rheostats on the overhead panel.

Rotating the PILOT INSTR LT rheostat from the OFF position toward the BRT position increases the pilot's instrument panel brightness. In addition, the PILOT INSTR LT rheostat, when rotated out of the OFF position, allows the caution panel BRIGHT-DIM switch function to change the brightness of illuminated caution panel lights. The PILOT INSTR LT rheostat also controls the brightness of the pilot's standby compass light, smoking/seatbelt light, and the Blue lights for the Bell System should be bright with the rheostat off.

The copilot's instrument panel lights and standby compass light are similarly controlled by the COPLT INSTR LT rheostat. Engine instrument lights are controlled by the ENG INSTR LT rheostat.

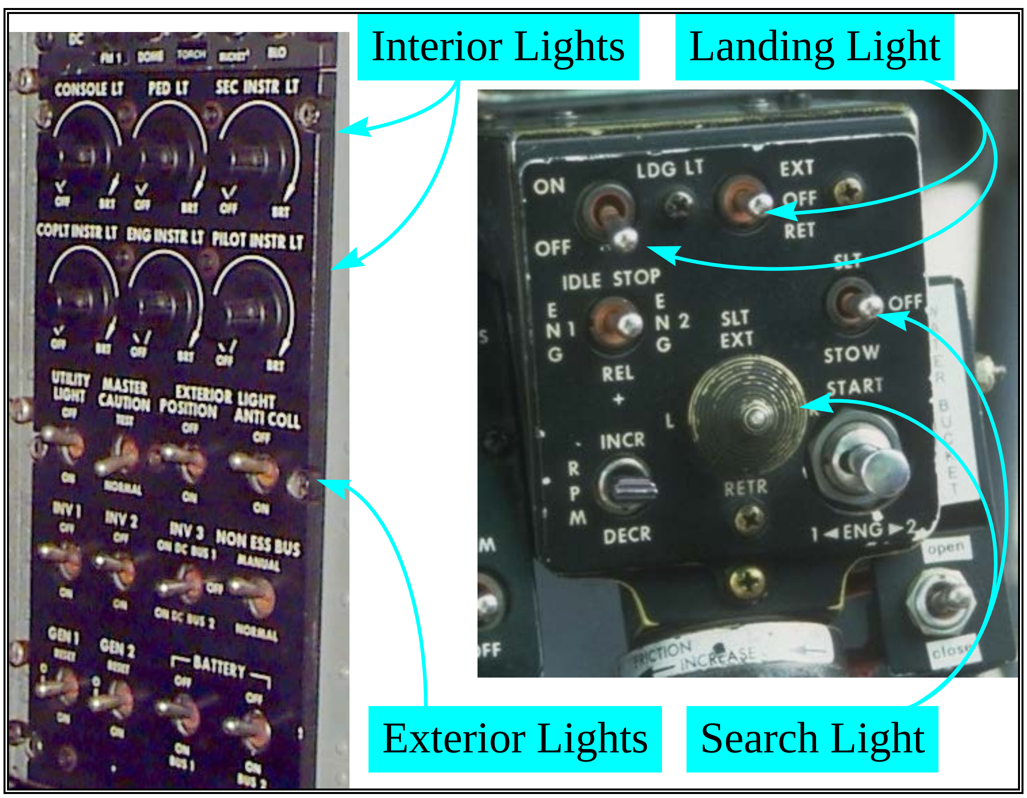


Figure 13-1 Lighting System Controls

Overhead Console, Pedestal, and OAT Lights

Overhead console and center pedestal lighting is powered by 28 VDC and is controlled by the CONSOLE LT and PED LT rheostats, respectively. The CONSOLE LT rheostat also provides power but not brightness control to the OAT light. A push-button switch marked "SWITCH O.A.T. LIGHT" is located on the front right side of the overhead console.

Approach Plate and Map Lights

Approach plate and map lights may be located on each windshield side post to illuminate fold-away approach plate holders at each end of the instrument panel. The 28-VDC lights are powered by the same circuits as the pilot's and copilot's cockpit lights. Each light has an individual APPROACH PLATE AND MAP LIGHT rheostat located at the outboard end of the instrument panel.

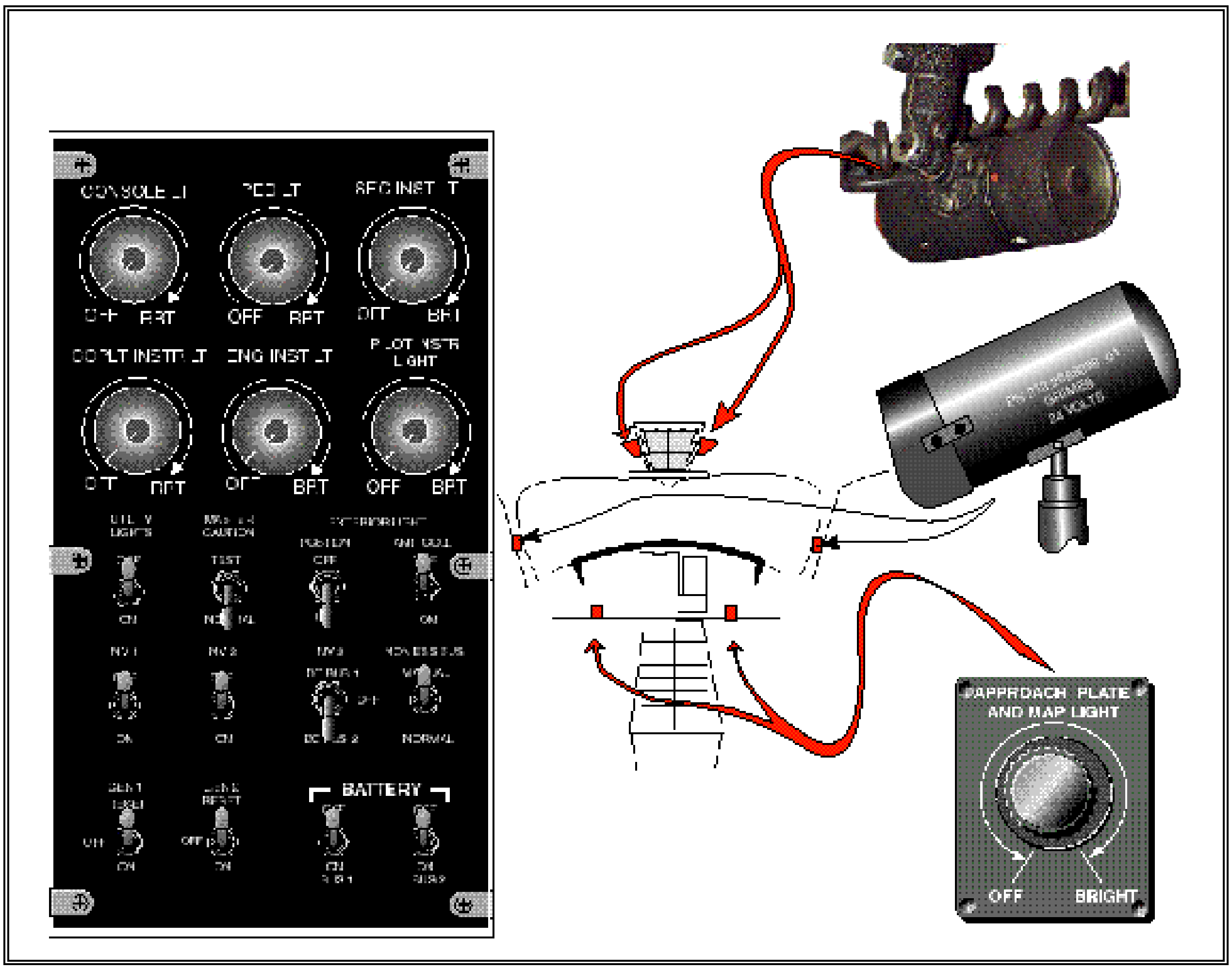


Figure 13-2 Additional Cockpit Area Lighting

Pilot's and Copilot's Cockpit Lights

Two movable cockpit lights, located in "pullout" ceiling mounts on each side of the overhead console, are controlled by integral switches. The rear-mounted **OFF-BAT** rheostat changes brightness, and the red push-button switch allows momentary illumination at full brightness. The side-mounted push-button switch changes color from white to red, and the rotatable case changes the light image to a flood or spot pattern. See Figure 13-2

Secondary Instrument Lights

Five 28-VDC floodlights, mounted beneath the instrument panel glare shield, are controlled by the overhead console **SEC INSTR LT** rheostat. The lights are designed to flood the instrument panel with white light.

Figure 13-3 Glare shield Lights

NOTE: In aircraft with a BF Goodrich/J.E.T., emergency battery, the power for secondary instrument lights is supplied through the standby attitude indicator switch. This switch must be turned on to use the glare shield lights.

PASSENGER AND CARGO AREA LIGHTING

General

Lighting for the passenger and cargo areas includes the cabin dome lights, passenger warning lights, and baggage compartment lights. Figure 13-4 shows the passenger and cargo area lighting locations.

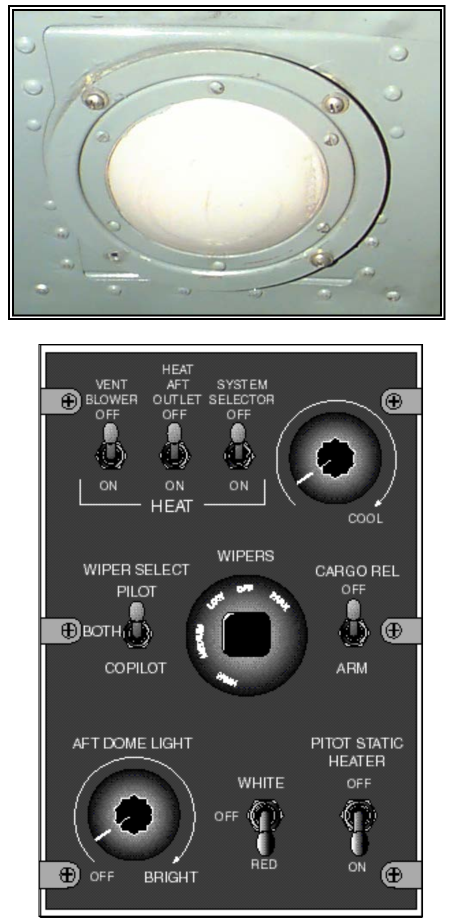


Figure 13-4 Cabin Lighting

Passenger Cabin Lighting

The passenger cabin is illuminated by three 28VDC lights controlled with the AFT DOME LIGHT switches on the overhead console. The WHITE-OFF-RED toggle switch selects the color of cabin lighting.

The OFF-BRT rheostat turns on the lights and controls brightness. The switch is wired to the Non-Essential Bus and therefore with the engines off the Non-Essential Buss Switch must be in the Manual Position for the lights to function.

Passenger Warning Lights

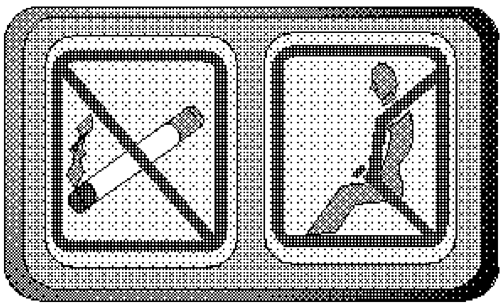


Figure 13-5 Passenger Warning Lights

A warning light with the international symbols for not smoking and fasten seat belts is located just aft of the overhead console facing toward the rear of the helicopter. It is illuminated any time the PILOT INSTR LIGHT switch is rotated out of the OFF detent. On some SN's an identical second light is mounted near the tip of the forward wall of the transmission pylon facing forward.

Baggage Compartment Lights

Two 28-VDC lights in the ceiling of the baggage compartment illuminate any time the baggage compartment door is opened and the non-essential buses are powered. Switching is controlled by a micro-switch in the baggage compartment door latch. The micro-switch also activates the **DOOR LOCK** caution panel light whenever the baggage compartment doors open. (See Figure 13-6).

EXTERIOR LIGHTING

General

The exterior lighting consists of position, anti-collision, landing, search, utility/step, and Pulse lights (Figure 13-7). All exterior lights utilize 28-VD power. Control of the exterior lighting is by means of switches located on the overhead console or pilot's collective head (Figure 13-8).

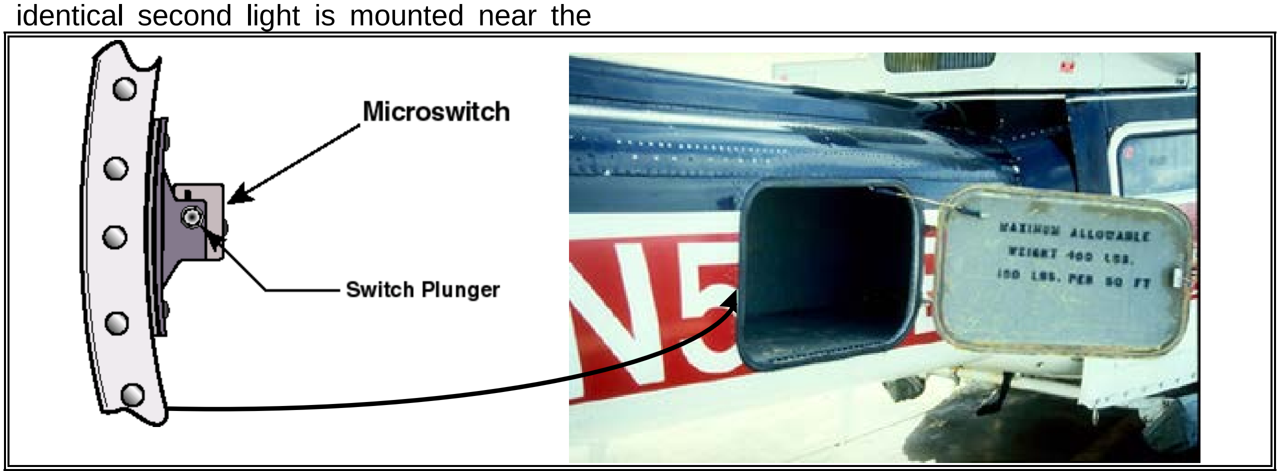


Figure 13-6 Baggage Door Microswitch Location

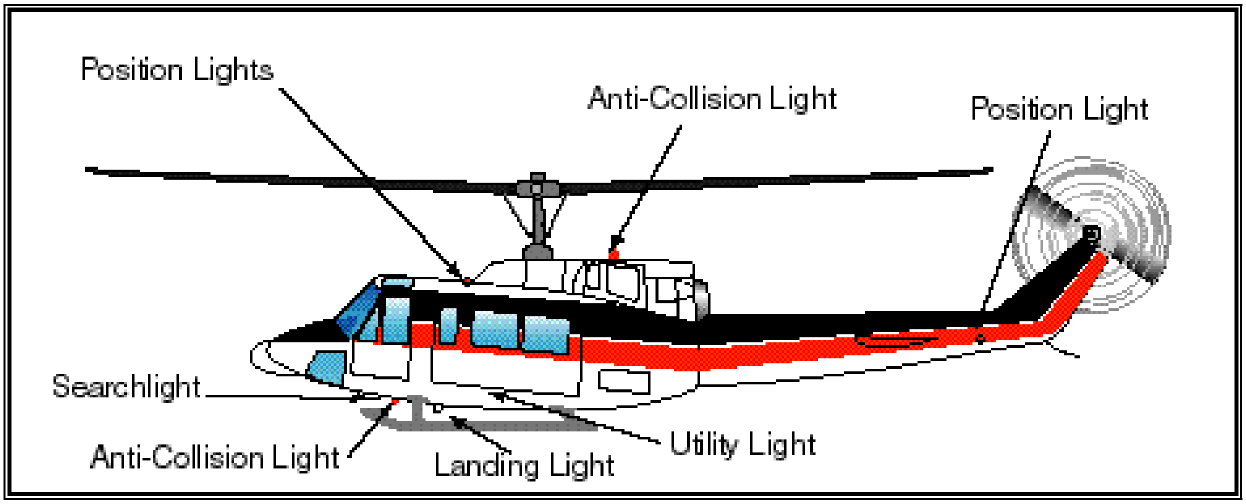


Figure 13-7 Exterior Lights

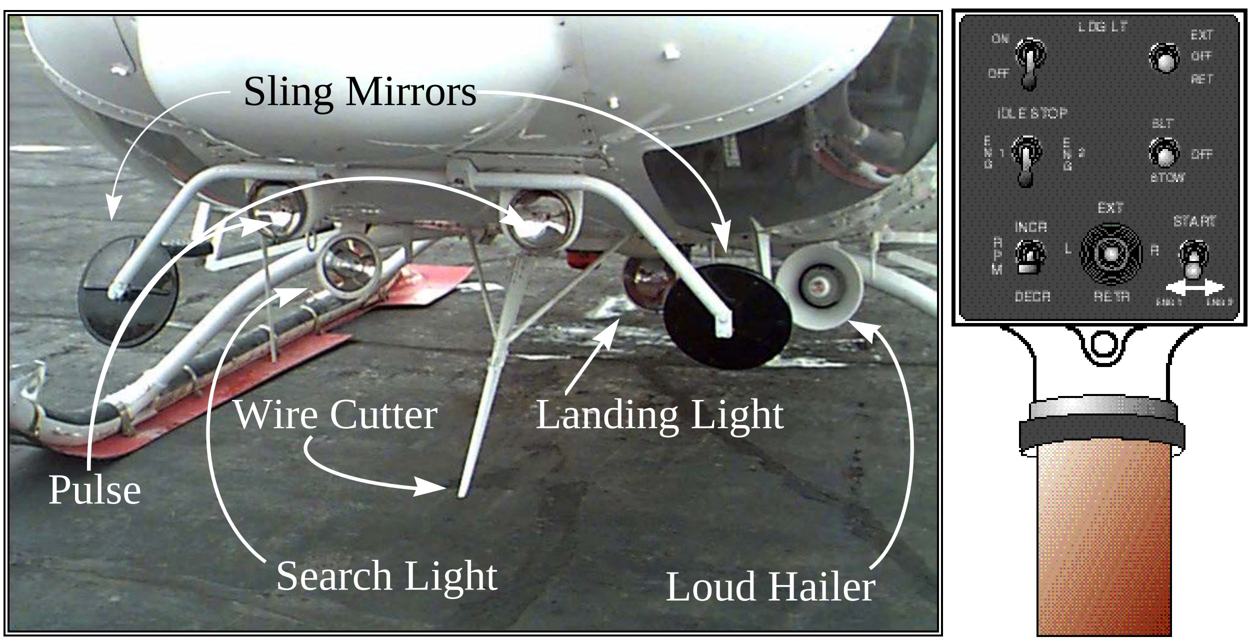


Figure 13-8 Pulse, Landing and Search lights/ Collective Head Controls

Position Lights

Two red position lights on the left side of the helicopter, two green position lights on the right side of the helicopter, and two white position lights, one on each side of the aft end of the tail boom, are controlled by the POSITION ON/OFF switch on the overhead console.

Anti-Collision Lights

Two anti-collision lights, one on the belly of the helicopter and one on the cowling aft of the rotor mast, are controlled by the **Anti-**

Coll ON-OFF switch on the overhead console. These lights may be either rotating beacons or strobes

Searchlight

The searchlight is flush-mounted in the belly of the helicopter, just forward of the forward landing gear cross tube. The light is controlled by two SRCH LT switches located on the pilot's collective control head. The ON-STOW switch (spring-loaded to center off) controls illumination and allows the pilot to stow (fully retract) the searchlight after use. The five-position "Chinese Hat" switch (spring-loaded to center neutral) allows the pilot to direct the searchlight's beam in two planes of motion. The EXT and RET positions allow fore and aft movement of the light throughout approximately 120° of arc. The R and L positions rotate the searchlight's beam right or left through 360° in either direction.

The Landing Light switch ON/OFF switch is in the top left corner of the Collective Head. The EXT/OFF/RET switch is in the top right corner of the Collective Head and allows for extension and retraction of the Landing Light

Landing Light and Searchlight Hazards

While there are no limitations on either the searchlight or the landing light, exercise caution during periods of extended ground operation in areas of tall grass and brush. The heat these lights generate poses a fire hazard. Additionally, operation of the landing light and/or searchlight during flight in heavy rain or snowfall may induce spatial disorientation.

Pulse/Steady Light

The Pulse/Steady Light system consists of two fixed Landing Lights located under the aircraft nose, a warning light, and a three position switch (PULSE, OFF, STEADY) located on the Pedestal.

System is powered by 28 VDC from the No.2 essential bus, and protected by the PULSE LT circuit breaker.

When switch is in PULSE, 28 VDC power is supplied to the two landing lights, alternating between the right and left light (approximately .5 second each) to provide a pulsing light. The pulsing light is an effective "Anti-collision" warning for use in poor visibility conditions. When the switch is in STEADY, both lights are On continuously, providing addition forward lighting for Night operations. The warning light is ON when lights are turned on the STEADY, the warning light will flash when system is in PULSE.

Utility Lights

Below the sliding passenger doors on either side of the aircraft are utility lights (one per side). These lights are provided to illuminate the step area for passengers boarding or exiting the aircraft. The switch to activate the lights is located on the overhead console and is labeled UTILITY LIGHT ON-OFF.

RAIN AND ICE PROTECTION

INTRODUCTION

Era's' fleet of Bell 212 helicopters are certificated for operations in non-icing conditions. Our aircraft are, however, equipped with numerous systems that are designed to protect against the hazards created by ice, rain, and other unpleasant forms of visible moisture. In addition to the standard forms of weather protection, our IFR helicopters are also equipped with electrically heated windshields.

General

The Bell 212 utilizes numerous different systems to counter the effects of inclement weather. Both the pitot and static ports are electrically heated to prevent the accumulation of ice. The aircraft is provided with windshield wipers that clear the windshield of ice and snow accumulations. There is also a defogging system which helps to keep the inside of the windshield clear, (especially important on those muggy days when the humidity is high).

Pitot Tube And Static Port Anti-Icing Systems

The pitot tubes and static ports are electrically heated by conventional internal heating elements.

Figure 13-9 illustrates the pitot tube and static port anti-icing systems. System power is 28 VDC. The pilot's system (the upper static ports, one each side) is supplied from the No. 1 essential bus, and the copilot's system (the lower static ports, one each side) receives power from the No. 2 essential DC bus. Both systems are controlled with a single PITOT STATIC HEATERS switch (Figure 13-10) located on the overhead console.

Figure 13-9 Pitot Tubes and Static Ports

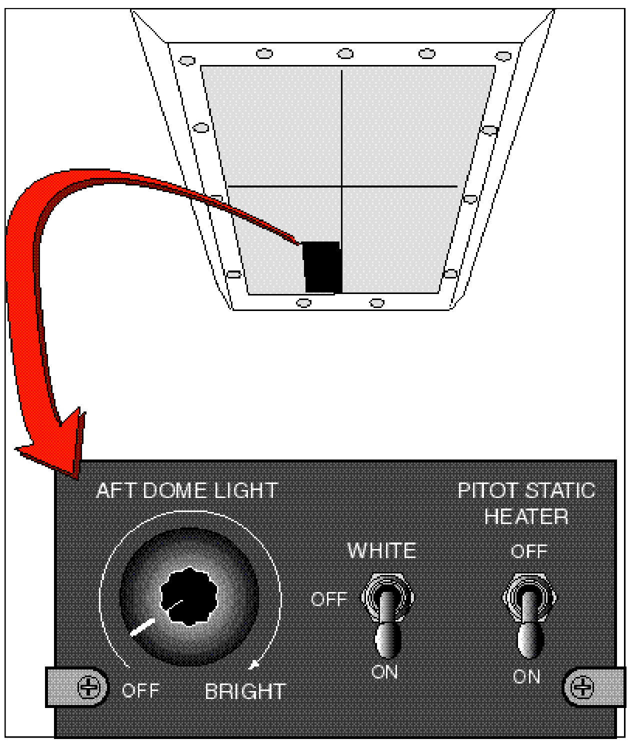


Figure 13-10 Pitot Heat Switch

Although no specific criteria is provided by the manufacturers RFM, it is recommended that the pilot static heaters be turned on at a temperature of 40°F (4°C) or below, when visible moisture is present or any time icing could occur. It is also recommended that the pilot check for proper operation of the pitot static heaters before takeoff by placing the control switch in the ON position while checking the dual ammeter (Figure 13-11) for a slightly increased load indication for each generator.

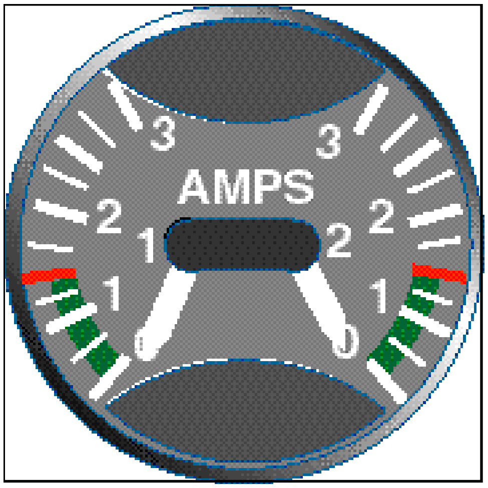


Figure 13-11 Dual Ammeter

Windshield Wiper Systems

An electrically operated windshield wiper is located at the top of each pilot's windshield (Figure 13-12).

Figure 13-12 Windshield Wipers

Windshield Wiper Installation

There are two wiper units, one for each windshield. Each unit (Figure 13-13) consists of a head guard, motor, converter, mounting bracket, arm, and wiper assembly. The motor and converter are mounted on the bracket inside the cockpit and are covered by the foam rubber and plastic head guard. The arm and wiper assembly are mounted on the converter shaft outside the cockpit.

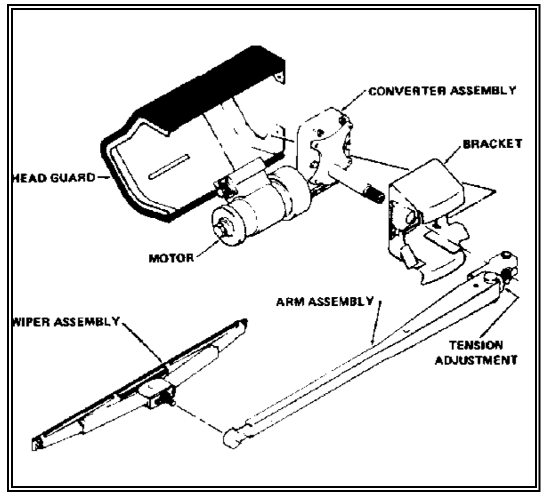


Figure 13-13 Wiper Installation

Windshield Wiper Controls

Each system uses 28 VDC supplied from the respective essential bus and is controlled with a three position WIPER SEL switch, and a five position rotary switch, both located on the overhead console (Figure 13-14). The selected wiper is activated by choosing PILOT, BOTH, or COPILOT on the WIPER SEL switch, then placing the WIPERS rotary switch out of the OFF position to LOW, MED, or HIGH. When turning the wiper off, the switch should be momentarily held to the PARK position so that the wiper moves up into the "catch" bracket at the tip of the windshield. The switch is spring loaded to OFF from the PARK position.

There is no Flight Manual limitation on wiper use; however the wipers should not be operated without moisture present. Operation on dry glass could damage the wiper blades and or the windshield. The wipers should always be "parked" when not in use, but avoid holding the switch in the PK position too long to prevent damage to the motor.

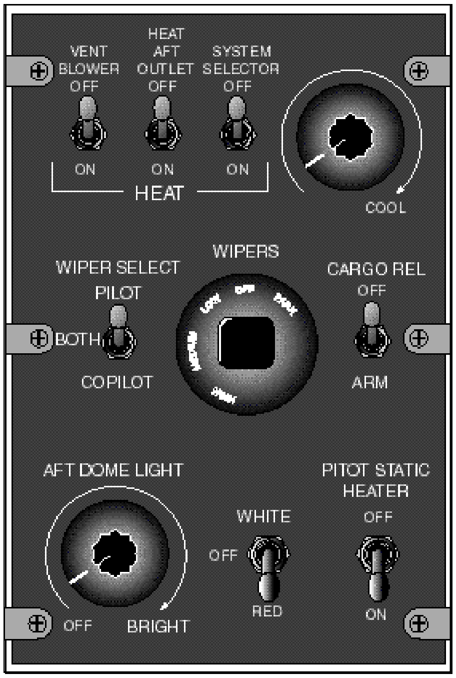


Figure 13-14 Wiper Controls

Wiper in Detail

The wiper speed control switch is a 5-position rotary switch, with an OFF, LOW, MEDIUM and HIGH position, and a momentary contact PARK position. This rotary switch controls the speed of the wipers, OFF and PARK.

The wipers consists of a headguard, motor converter, bracket, arm assembly, wiper assembly and a 3-resister panel for each crew position. The motors operate on 28 volts DC from the essential bus, pilot on bus No.1 and co-pilot on bus No.2, and the speed is controlled by the resister panels installed in the cabin roof. The speed control switch in LOW, MEDIUM or HIGH connects the necessary resistor configuration to attain the selected speed.

The converter assembly changes direction of the wiper arm/blade assembly and limits the movement of the blades.

The bracket mounts the entire wiper assembly to the airframe structure.

The arm assembly attaches to the converter shaft, and holds the wiper assembly in position. The arm contains a spring assembly to provide blade pressure.

The rotary switch momentary contact position PARK will position the wiper assembly, when properly installed, to the parked position which is approximately 5.5 inches below the top of the windshield.

The spring in the arm assembly provides blade pressure of 6.75 pounds on the windshield. The wiper moves through an arc of 64 degrees. during operation.

Defrosting And Defogging Systems

Defrosting of the windshields requires the use of heated air from the cabin/cockpit heating system. Defogging of the windshields can use either cockpit heating or ambient outside ventilating air.

Windshield Defrosting System

Frost may occur whenever moisture in the air comes in contact with the colder windshield. For defrosting, heated air is directed onto the windshields from nozzles connected to the heating and ventilation system.

When the heating system is switched on and the temperature is adjusted, warm air can be felt exiting the two "chin bubble" nozzles and the two double vents at the bottom of each side of the center pedestal. Figure 13-15 illustrates the cockpit heating system and chin bubble defrosting.

> **NOTE:** The heating system should not be operated at an OAT of 70° F (21° C) or above to prevent damage to the "chin" windows.

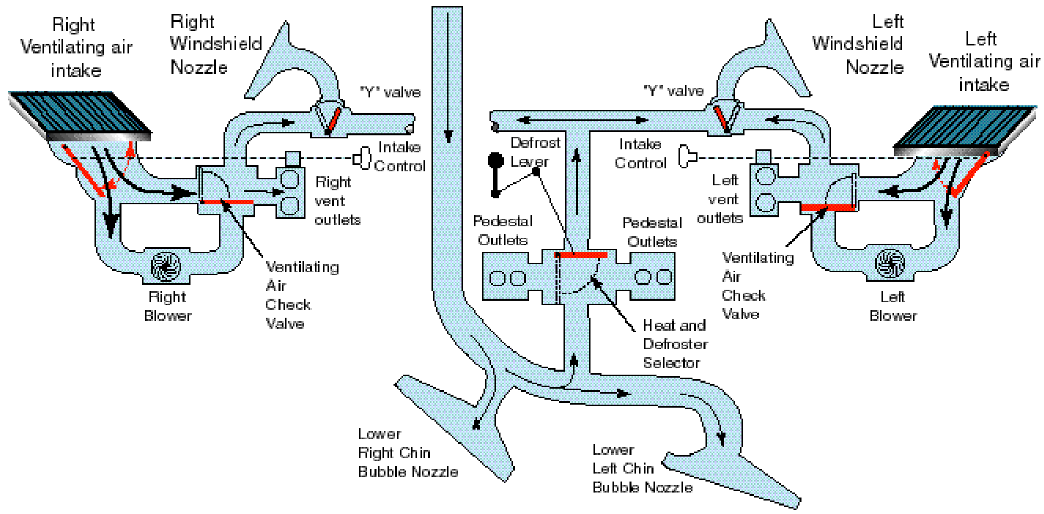


Figure 13-15 Cockpit Heating and Defrosting System

Heated air from the pedestal vents may be diverted for windshield defrosting by use of the DEFROST lever (Figure 13-16) located at the forward right corner of the center pedestal.

Figure 13-16 Defrost Control

With the DEFROST lever in the rear (off) position, helicopter heating system air flows to the door post vents, the center pedestal base vents, and the chin bubble nozzles for heating (Figure 13-17). Moving the DEFROST lever to the forward (on) position blocks off the pedestal vents and closes a microswitch, which stops airflow to the doorpost vents. All heated air then flows to the chin bubble nozzles and the Y-valves in the ducting for the windshield defrosting nozzles. The heated air, now under increased pressure because of the closed doorpost and pedestal vents, moves the Y-valve and allows the air to exit the windshield nozzles for defrosting.

Windshield Defogging System

Fogging of the windshields may occur when warm moist air comes in contact with and condenses on the cooler glass. This condition often occurs during warm weather rain showers and results in fogging of the interior windshield.

Although the defrosting system may be used to defog the windshield, if the OAT is above 70°F (21°C), defrosting could damage the chin bubble windows. An alternate method of defogging the windshields during warm temperatures is by using the cockpit ventilation systems.

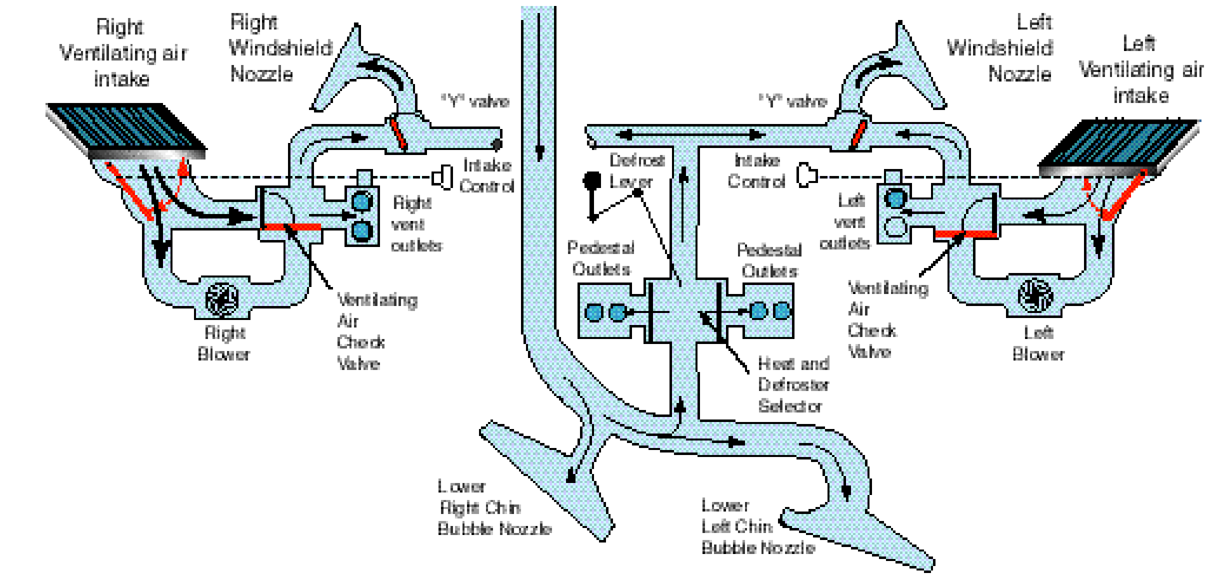


Figure 13-17 Defrosting System

Cockpit Ventilation Systems

Cockpit ventilation consists of two separate but identical systems (Figure 13-18), one for each pilot. Outside air for each system enters the aircraft through an air inlet located on top of the nose fuselage just forward of the center of each windshield. The air is distributed into the cockpit by a pair of vents located at the outboard end of the instrument panel. Each system is controlled by a separate intake control knob located just below the associated pair of vents. The airflow can be assisted by a 28 VDC powered motor. Both the pilot's and copilot's ventilation blowers are controlled with the same VENT BLOWER switch. In addition, each system is connected into the aircraft's heating and defrosting system at the Y valve of the windshield defroster nozzle.

Windshield Defogging

If windshield defogging is required and the OAT is too high for defroster system use, the pilot should use the cockpit ventilation system in the following manner.

With the HEATER switch positioned to OFF, open the ambient air intake for the desired cockpit ventilation system by pulling the intake control knob out. This action opens a valve at the Air intake and, allows outside ram air to enter the system. The Ram Air pressure positions the flap valve, and air exits through the instrument panel vents into the cockpit. Some of the outside air bypasses the vents and moves on to the Y-valve. Ram-air pressure positions the valve so that ventilating air exits the windshield nozzle and is directed onto the interior of the windshield. The instrument panel vents are adjustable and can be pointed in various directions, and airflow can be regulated by rotating the vent nozzle. Rotating the vent fully clockwise closes the vent, and counterclockwise motion opens it. If maximum defogging is desired, the instrument panel vents should be closed fully to ensure all ventilating air is directed to the windshield nozzle.

Vent Blower Operation

If outside air is required for defogging when the helicopter is stationary, the pilot should position the VENT BLOWER switch (Figure 13-19), located on the overhead console, to ON. The vent blower increases outside air intake, closes the flap valve, and increases the airflow for defogging. If the instrument panel vents are closed, all of the increased airflow is directed to the windshield for defogging.

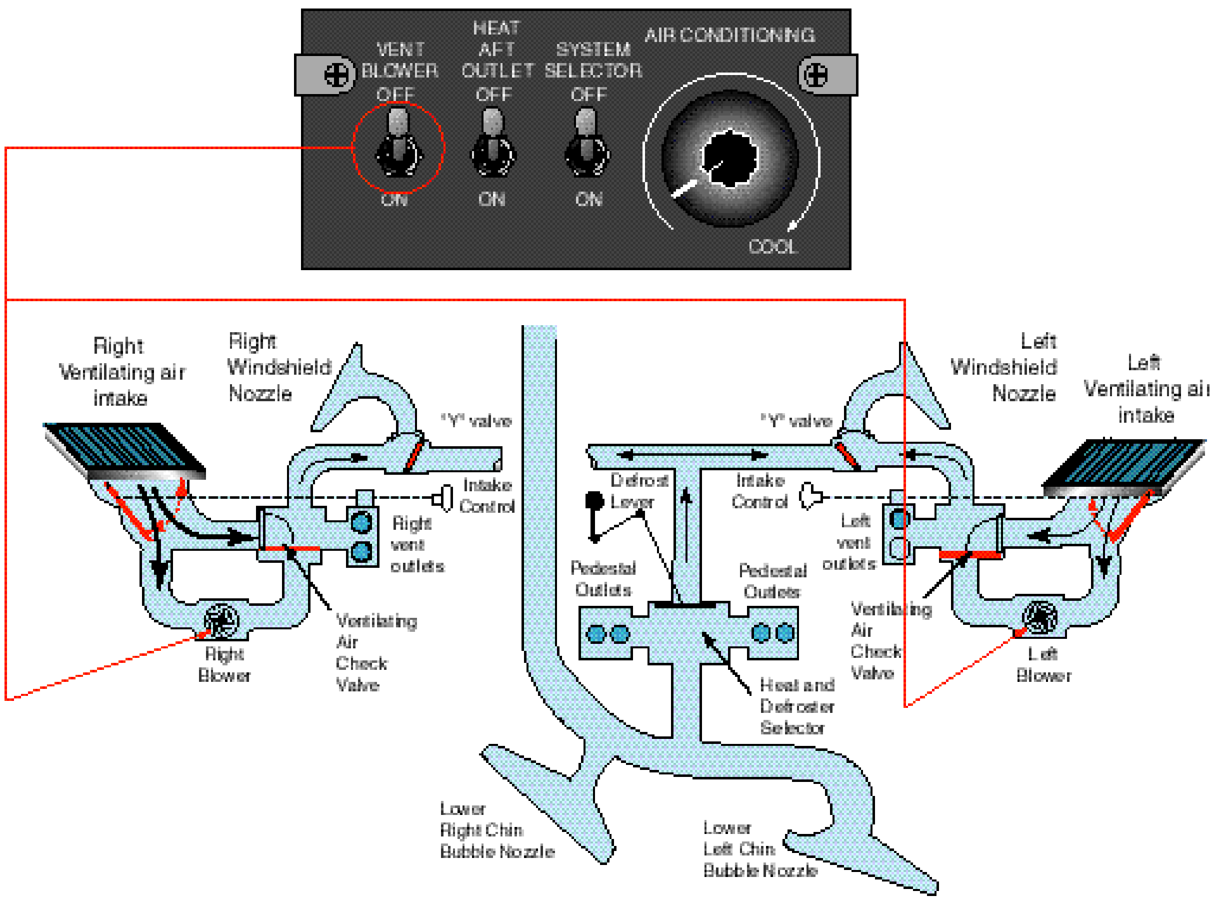


Figure 13-18 Defogging and Cockpit Ventilation System

Note, Figure 13-18 shows the Ventilating Air Check Valve Open

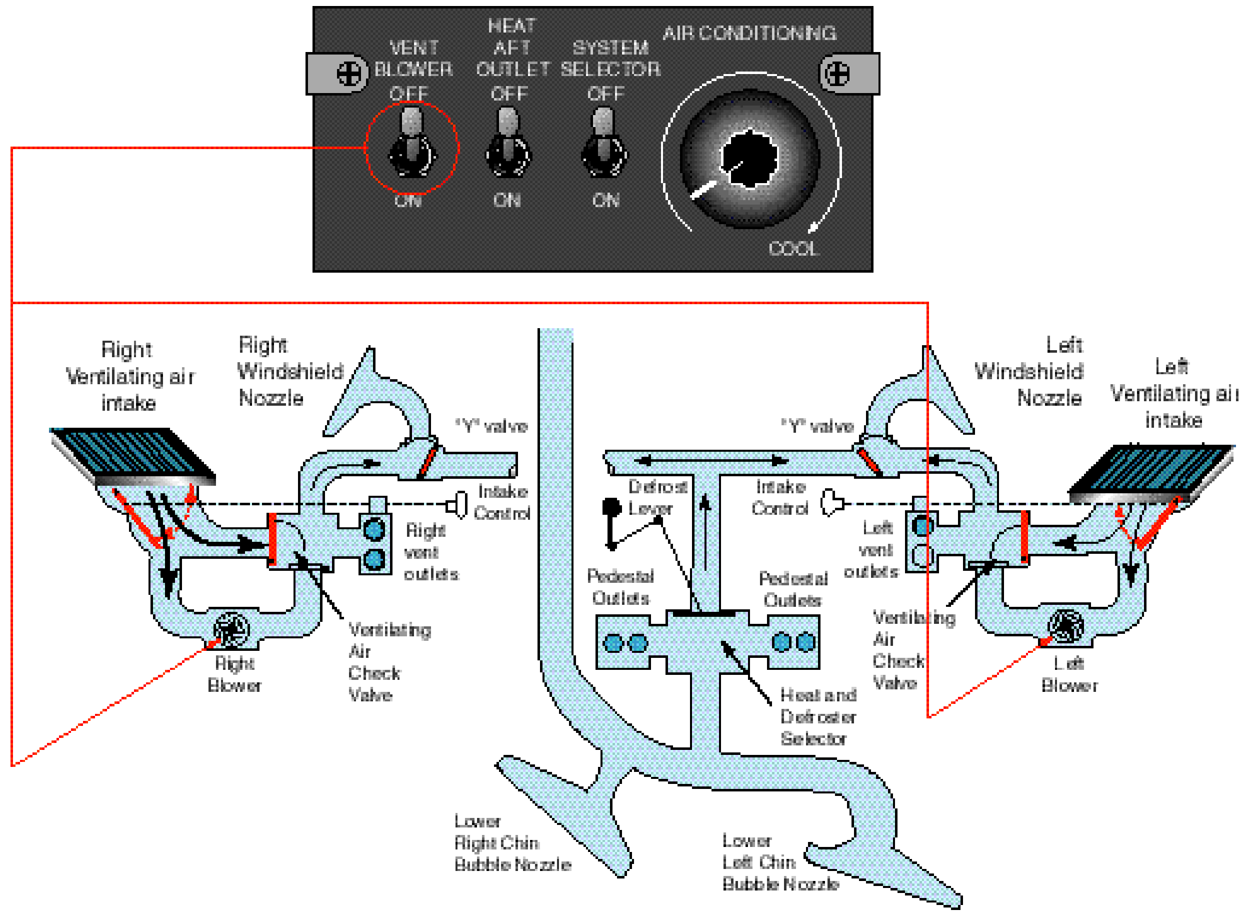


Figure 13-19 Vent Blower

Note, Figure 13-19 shows the Ventilating Air Check Valve Closed

FIRE PROTECTION

INTRODUCTION

As rare as they are, an inflight fire is one of the most dreaded of all emergencies. The current state of engineering and quality control has, fortunately, made these events extremely unusual. In spite of this, the possibility exists nonetheless, and there are systems that help us deal with a fire should it occur. The Bell 212 has essentially two systems for fire protection: detection and extinguishing. In the following pages we'll examine both of these systems and learn the design and use of a system we will hopefully never need to use.

General

Detection systems warn the crew of the existence of fire by illuminating warning lights. The extinguishing systems provide electrically controlled and hand held extinguishers. The powerplant is protected by fire detection and extinguishing systems. The tailboom baggage compartment incorporates a smoke detection system. In addition, design features such as firewalls, rupture resistant fuel cells in individual structural compartments, flexible fuel lines, and fire retardant materials greatly reduce the possibility of fire. Crew compartment and passenger cabin fire protection is provided by hand held portable fire extinguishers.

ENGINE FIRE PROTECTION SYSTEMS

General

Each engine compartment is equipped with a separate fire detection system (Figure 13-20). An airframe mounted fire extinguishing system with main and reserve fire extinguisher bottles is capable of discharging fire extinguishing agent into either or both engine compartments. Although the fire detection and extinguishing systems are totally separate from each other, the instrument panel mounted FIRE PULL handles actuate functions for both systems.

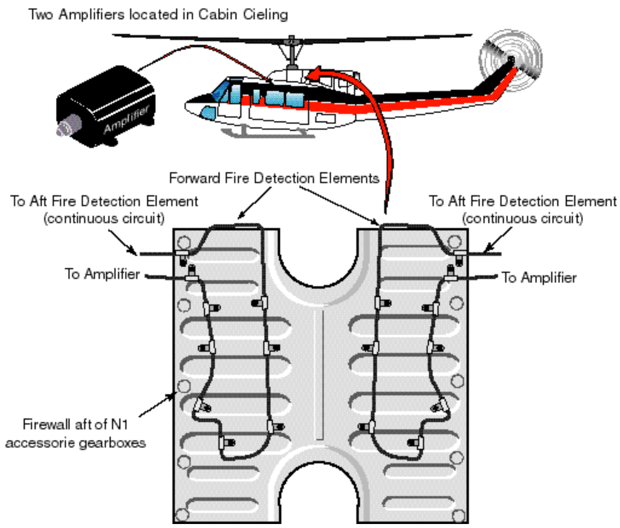


Figure 13-20a Forward Fire Detection Elements

Figure 13-20b Fire Pull Handles

Figure 13-20c Extinguisher Bottles

Fire Detection

GENERAL

Each engine fire detection system includes two heat sensing elements located in the power sections (one forward and one aft), a fire detector amplifier, a **FIRE PULL** warning light, and associated electrical circuitry. Figure 13-21 illustrates the typical engine fire detection system in schematic form.

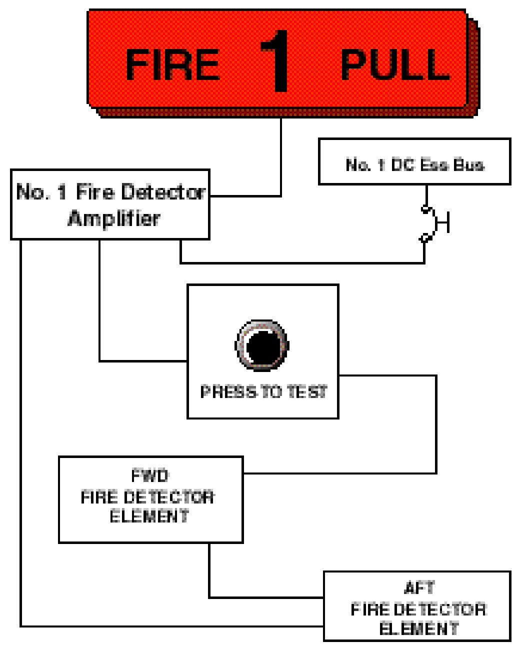


Figure 13-21 Fire Detection, Engine

System Operation

Electrical power (28 VDC) is supplied through the respective ENG FIRE DET circuit breaker located on the overhead console to a fire detector system amplifier. Circuitry in the amplifier sends a balanced electrical current through the fire detector elements and back to the amplifier. The amplifier detects any imbalance in the electrical signal.

The fire detecting elements are located in two areas with the greatest potential for fires. The forward element is on the aft fire wall of the N1 accessory gearbox section, near to the starter/generator, engine oil reservoir and pump, and fuel control assemblies. The aft element is located across the top fire wall of the engine compartment surrounding the power (hot) section of the engine. The power section has the combustion chamber, N1 turbine section, N2 turbine section, exhaust tubes, fuel lines and nozzles.

In the event of a fire in the engine compartment, heat causes the heat sensitive material in the fire detector elements to decrease in resistance value. The electrical current in the fire detector element slowly short circuits to ground and causes an imbalanced electrical signal in the amplifier. A relay in the amplifier closes and illuminates the associated FIRE PULL warning light. If the fire is extinguished, the heat sensitive element regains the higher resistance value, balances the electrical signal, and extinguishes the warning light.

A FIRE EXT PRESS TO TEST switch is connected to a circuit in each system which tests the detector circuit continuity and amplifier operation. It does not check the detector element operation. Pressing the PRESS TO TEST button, centered between the two FIRE PULL handles illuminates both the No. 1 and No. 2 engine fire warning lights located within the handles.

A discriminator circuit is also incorporated to ensure system integrity in the event of a short or open circuit in the detector loops.

ENGINE FIRE EXTINGUISHING SYSTEM

General

There are two separate engine fire extinguishing systems: one designated main and the other designated reserve. Components of the systems include the main and reserve fire extinguisher agent bottles, associated plumbing and manifolds to direct the agent to either engine, a FIRE EXT activation switch with MAIN, OFF, and RESERVE positions located between the engine FIRE PULL handles, and separate electrical power systems for each bottle. The plumbing and bottle layout is illustrated in Figure 13-22.

Fire Extinguisher Agent Bottles

The two fire extinguisher bottles (Figure 13-23) are identical except for their location in the helicopter and their designation as main or reserve.

Each bottle is equipped with a pressure gauge, a temperature/pressure metal decal, a fill and thermal relief fitting connected to a red discharge disc, and two electrically actuated ballistic squibs. The pressure gauge provides the pilot a visual indication of bottle charge level during the walk-around inspection. In the event a fire extinguisher container is subjected to excessive heat, the fill and thermal relief fitting opens and blows out the red disc, indicating that servicing is required prior to the next flight.

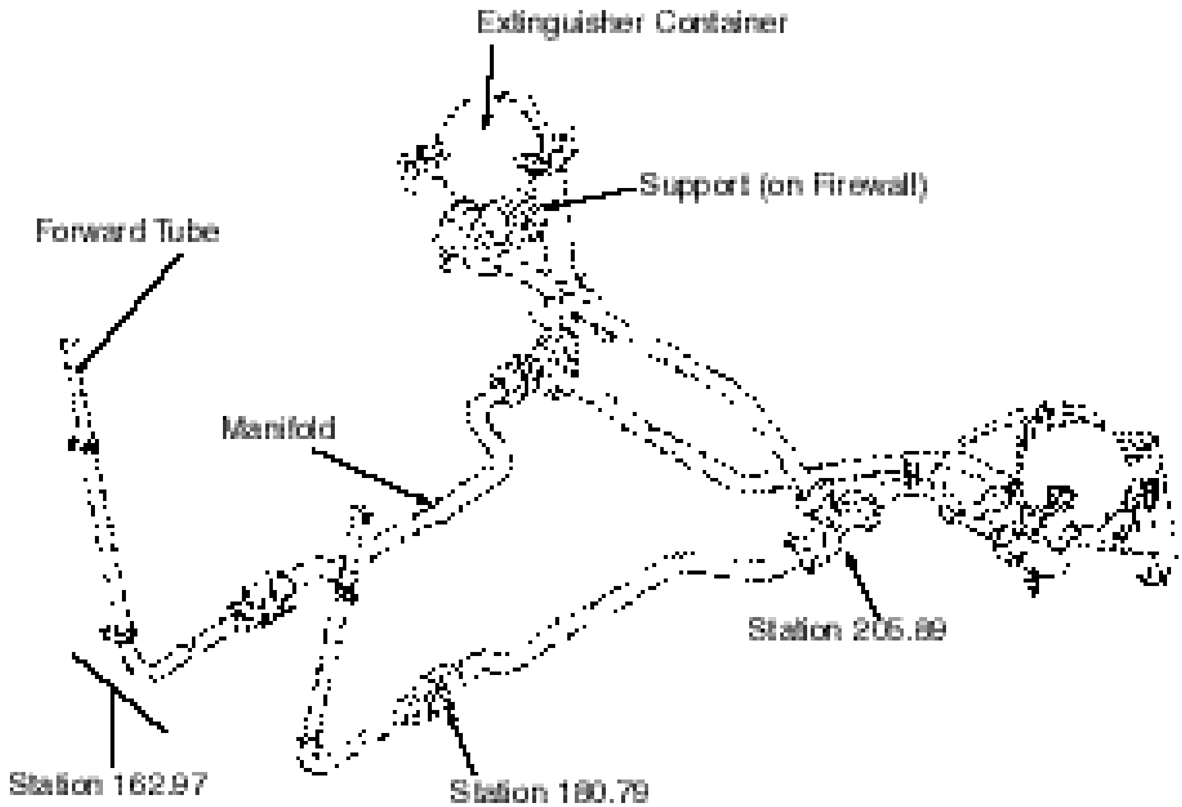


Figure 13-22 Engine Extinguisher System

The decal indicates minimum and maximum container pressures for a given range of temperatures. The pressure gauge glass is marked with a green arc to provide a quick visual indication of container charge. With a minimum pressure of 271 psi at -65°F (-54°C) and a maximum pressure of 902 psi at 125°F (52°C), the arc should indicate a suitable range for the geographical area in which the helicopter is operating. Visually checking that the red disc is present indicates that the thermal relief fitting has NOT been opened, but does not necessarily indicate an accurate charge. The electrical squibs allow the agent to be remotely directed to either engine through the manifolds

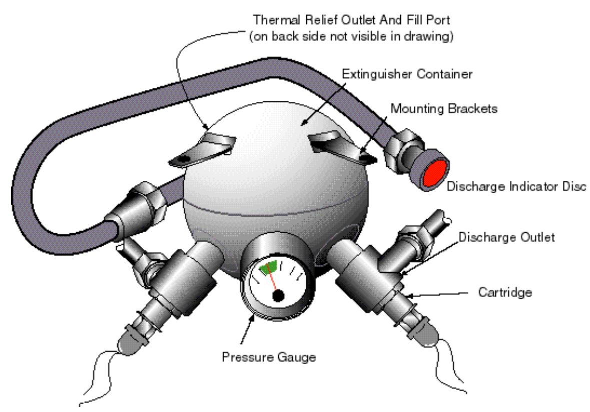


Figure 13-23 Extinguisher Bottle

Fire Extinguisher Manifolds

Fire extinguisher manifolds are installed in two sections of each engine compartment and connected through a tee to both the main and the reserve fire extinguisher agent bottles. The manifolds are designed to discharge the fire extinguisher contents to the floor of the power section compartment and at the base of the fuel control assemblies in the forward compartment. The fire extinguishing agent is directed to the same areas that the fire detecting elements are located. The plumbing of these manifolds is such that either engine's manifold can receive fire extinguisher agent from either or both bottles.

FIRE PULL Handles

The FIRE PULL handle for each engine incorporates functions of the associated engines fire detection and extinguishing systems. The FIRE PULL handle contains the warning lights that are illuminated by the detection system. Actually pulling a FIRE PULL handle arms both fire extinguisher bottles and selects which engine the agent is released to.

Since the FIRE PULL handles are primarily designed and installed to assist the pilot during an in-flight engine fire emergency, each FIRE PULL handle also interconnects to the associated engine's fuel valve, particle separator system, and the customer bleed air port valves for both engines.

Pulling a FIRE PULL handle completes four electrical circuits. One circuit closes the engine's fuel valve, cutting off fuel to the engine, thereby removing one of the potential sources of fire. A second circuit closes the particle separator door for that engine, causing the ram air entering the engine inlet to be directed into the engine for cooling, and to cut off air flow into the power section compartment. A third circuit closes the customer bleed air ports on both engines and ensures that the remaining operable engine has full compressor discharge pressure air for OEI operation. The last circuit selects which engine receives fire extinguisher agent from either of the fire bottles. Figure 13-24 illustrates the fire extinguishing system in schematic form.

Fire Extinguisher Electrical Power

Separate 28 VDC power is provided to each fire extinguishing system through the MAIN FIRE EXT and RES FIRE EXT circuit breakers located on the overhead panel. Each system is actuated separately through the FIRE EXT switch.

System Actuation

To prevent inadvertent release of fire extinguisher agent, two separate actions must be taken to actuate a fire extinguisher bottle (Figure 13-24).

First, the appropriate FIRE PULL handle must be pulled out to select the correct squib on both fire bottles. This action ensures that no matter which fire bottle is activated, the agent of that bottle is directed to the fire extinguisher manifold in the proper engine compartment.

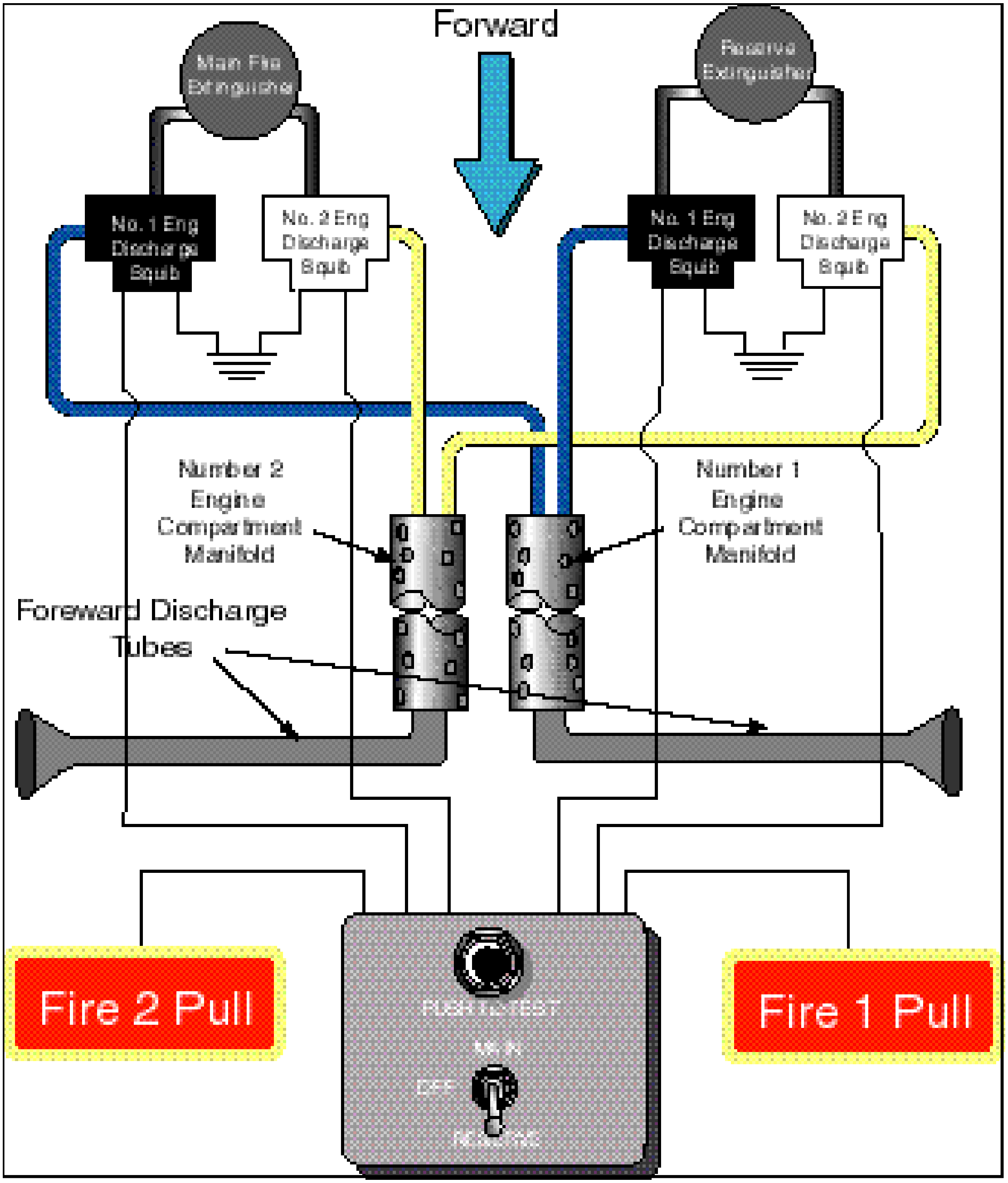


Figure 13-24 Engine Fire-Extinguisher Electrical Schematic

Secondly, the FIRE EXT switch must be positioned to either MAIN or RESERVE to actually activate the selected squib. It takes approximately 10 to 15 seconds for the agent to put out the fire and for the warning light to extinguish. In the event that the agent from one bottle does not completely extinguish the fire, as indicated by the warning light remaining illuminated after 10 to 15 seconds, the remaining bottle should be activated. If only one bottle is used to extinguish a fire, and after all engine shutdown procedures are accomplished, it is recommended that the FIRE PULL handle be pushed in to prevent accidental discharge of the remaining bottles agent.

BAGGAGE COMPARTMENT FIRE DETECTION SYSTEM

GENERAL

The baggage compartment is located in the tailboom just aft of the tailboom/main fuselage attach point and is not accessible to the passengers or crew in flight. A fire in the baggage compartment during flight would be an extremely dangerous situation. For this reason, Bell designers have installed a fire detection system in the baggage compartment. Unlike the engine fire detection system which uses the thermistors, the baggage compartment detection device is a smoke detector. This smoke detector is designed to give the flight crew the earliest possible warning should a fire occur in the baggage compartment. (This is particularly important as there is no fire suppression device installed in the baggage compartment).

Smoke Detection System

The baggage compartment smoke detection system includes a detector unit, a detector amplifier, a BAGGAGE FIRE warning light, and associated 28-VDC electrical circuitry. The smoke detector (Figure 13-25) is mounted on the forward ceiling of the baggage compartment. Fire extinguishing capability is not provided for the baggage compartment.

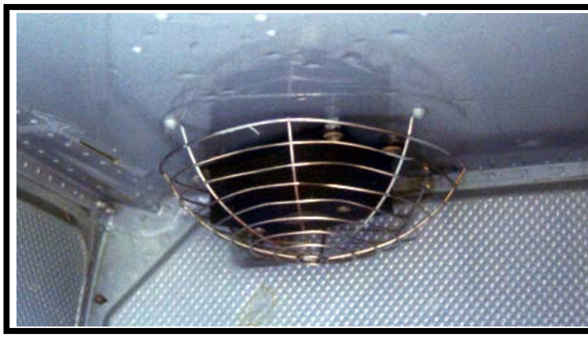


Figure 13-25 Baggage Fire Detector

System Operation

The 28-VDC electrical current supplied through the BAG COMPT FIRE circuit breaker located on the overhead console provides power for both the smoke detector unit and the smoke detector amplifier.

The smoke detector amplifier incorporates a relay/flasher circuit activated by a signal from the detector unit photo diode. The photo diode unit (Figure 13-26) consists of a chamber containing two lamps and a photo sensitive diode. Under normal circumstances light from one lamp is directed through the chamber at 90° to the photo diode. If smoke or other particles enter the chamber, some of the light is deflected towards the diode. The diode is actuated when the equivalent of a 30 to 35% reduction of the light (below that of clear air) occurs. The photo diodes signal is amplified and actuates a relay in the amplifier unit which causes illumination of the BAGGAGE FIRE warning light. When the relay closes and illuminates the warning light, power is also turned off to the beam of light in the detector unit. Loss of light causes a loss of photo diode signal and a resulting opening of the relay. This process continues to repeat as long as smoke is present and results in flashing of the BAGGAGE FIRE warning light.

System Test

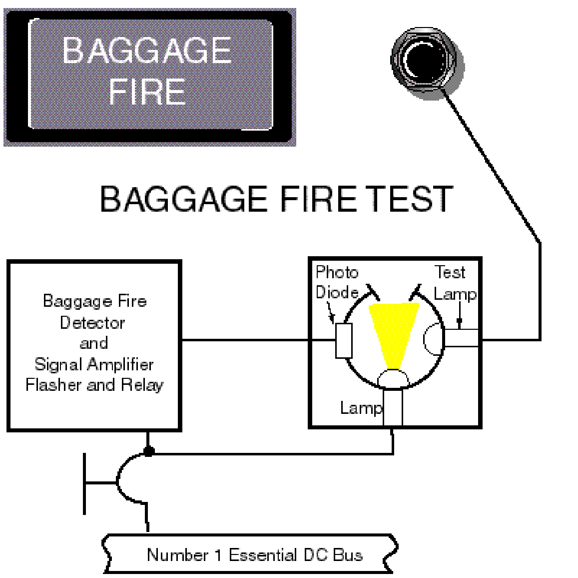


Figure 13-26a Baggage Fire Test

Figure 13-26b Baggage Fire Test

A black BAGGAGE FIRE TEST button, located just to the right of the BAGGAGE FIRE warning light, is provided to test the smoke detection system. When the test button is pressed, a test light shines directly on the photo diode unit and actuates the system in the same manner as if smoke were present, causing the BAGGAGE FIRE warning light to flash.

Portable Fire Extinguishers

Hand held portable fire extinguishers (Figure 13-27) are provided for the crew and passenger areas of the helicopter. One fire extinguisher is located on the crew compartment floor to the right of the pilot's seat. The other is located on the left door post at the front of the passenger cabin.

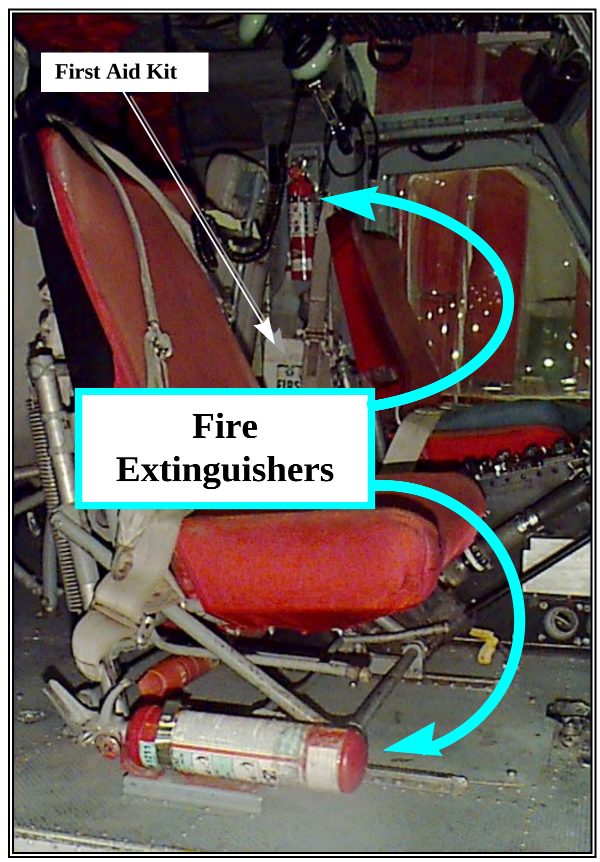


Figure 13-27a Portable Fire Extinguisher Location

Each extinguisher is mounted in a quick release bracket and includes a safety ring pin to prevent accidental actuation. The extinguishers are filled with Halon, which is suitable for use on all types of fires. Halon is also known as the chemical combination Bromo-chlorodiflouromethane. The necessary operating instructions and maintenance procedures are printed on each extinguisher. It should be noted that the extinguisher is charged to provide only about 8 seconds of use. This would be adequate providing that the user follows the instructions carefully. It is recommended that pilot's be familiar with the proper use of these devices and include the proper use of the extinguisher as part of the passenger briefing. Partially or fully discharged extinguishers should be replaced immediately after use.

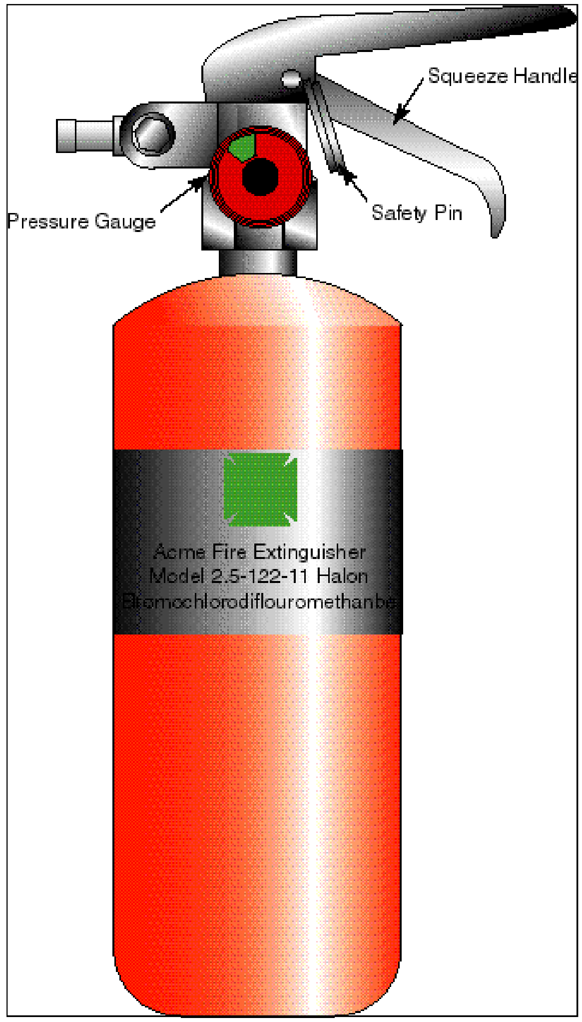


Figure 13-27b Portable Fire Extinguisher

Environmental Systems

INTRODUCTION

No matter how good an aircraft may be in terms of engineering, aerodynamics, performance, and reliability, it must also be able to provide a reasonably comfortable environment for the passengers and flight crew. This is not only necessary for the purpose of comfort, but also for reasons of safety. An uncomfortable crew is more likely to make errors of judgment or become fatigued. Therefore it is important that all pilot's are familiar with the operation and function of the environmental controls on board the aircraft. All of Eras 212 helicopters are equipped with the standard Bell environmental controls, and most are additionally equipped with the optional winterization kits.

General

The systems described in this section concern control of the amount, direction, and temperature of the air entering or contained in the appropriate areas of the helicopter. The systems are divided into cabin heating and ventilating, cockpit ventilation, fresh air ventilation, and the optional winterization heater.

Heating and Ventilating Systems

Heating, defogging, and ventilating systems (Figure 13-28) are incorporated in the nose, floor, and aft compartments of the helicopter to provide the following:

- Cockpit and cabin heating (engine bleed air)
- Windshield and chin bubble defogging (bleed air)
- Fresh air ventilation and defogging (ventilating air)

The systems are controlled by three switches (Figure 13-29) located on the overhead console. These switches, labeled "VENT BLOWER," and "AFT OUTLET," each have ON and OFF positions. The "SYSTEM SELECTOR" switch has a "HEATER" position and "AIR COND-ITIONER" position.

A HEATER AIR LINE caution panel segment (Appendix B) illuminates to warn the pilot of overheating (220°F/105° C) in the heating Plenum.

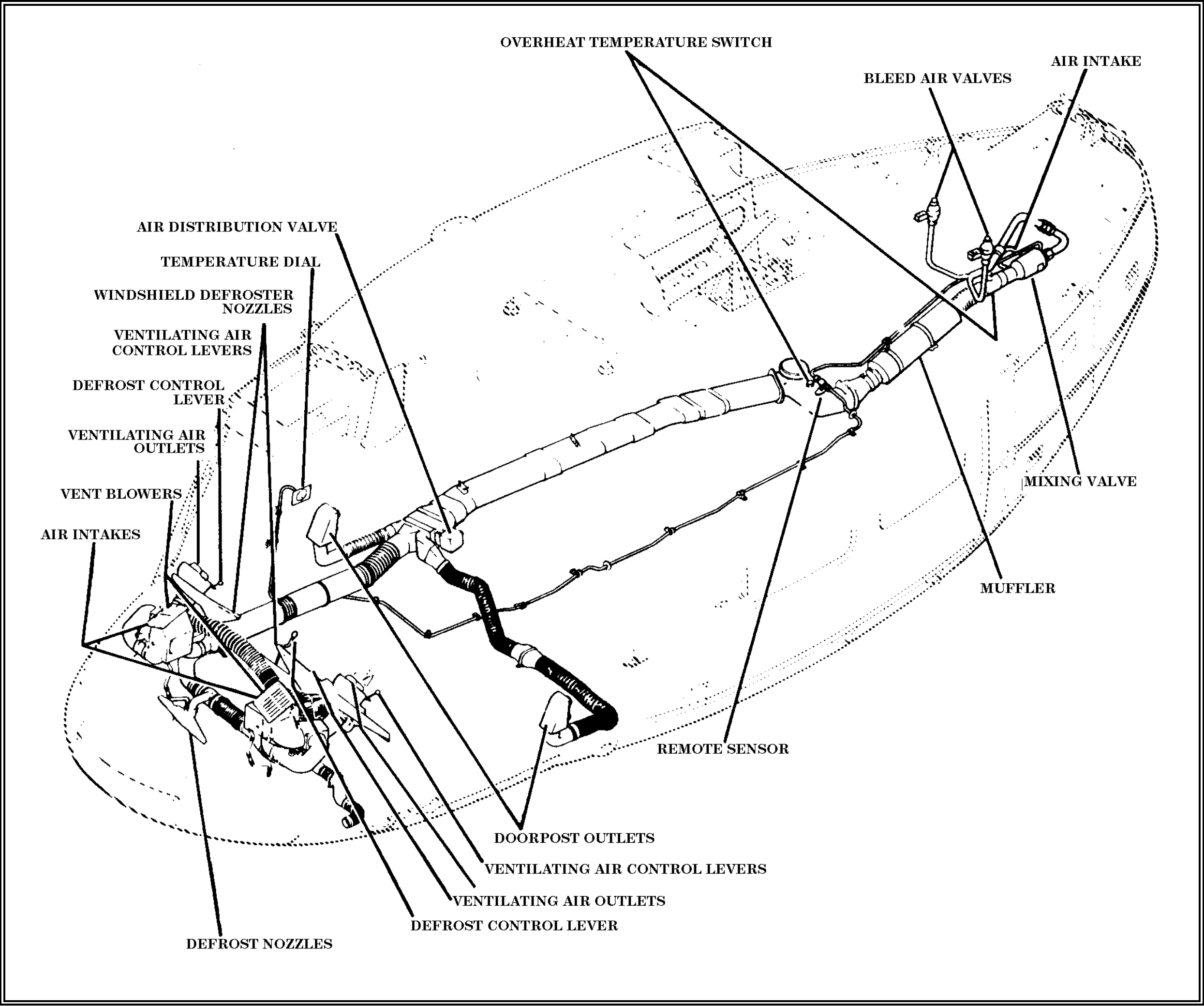


Figure 13-28 Cabin Heating and Ventilating Systems

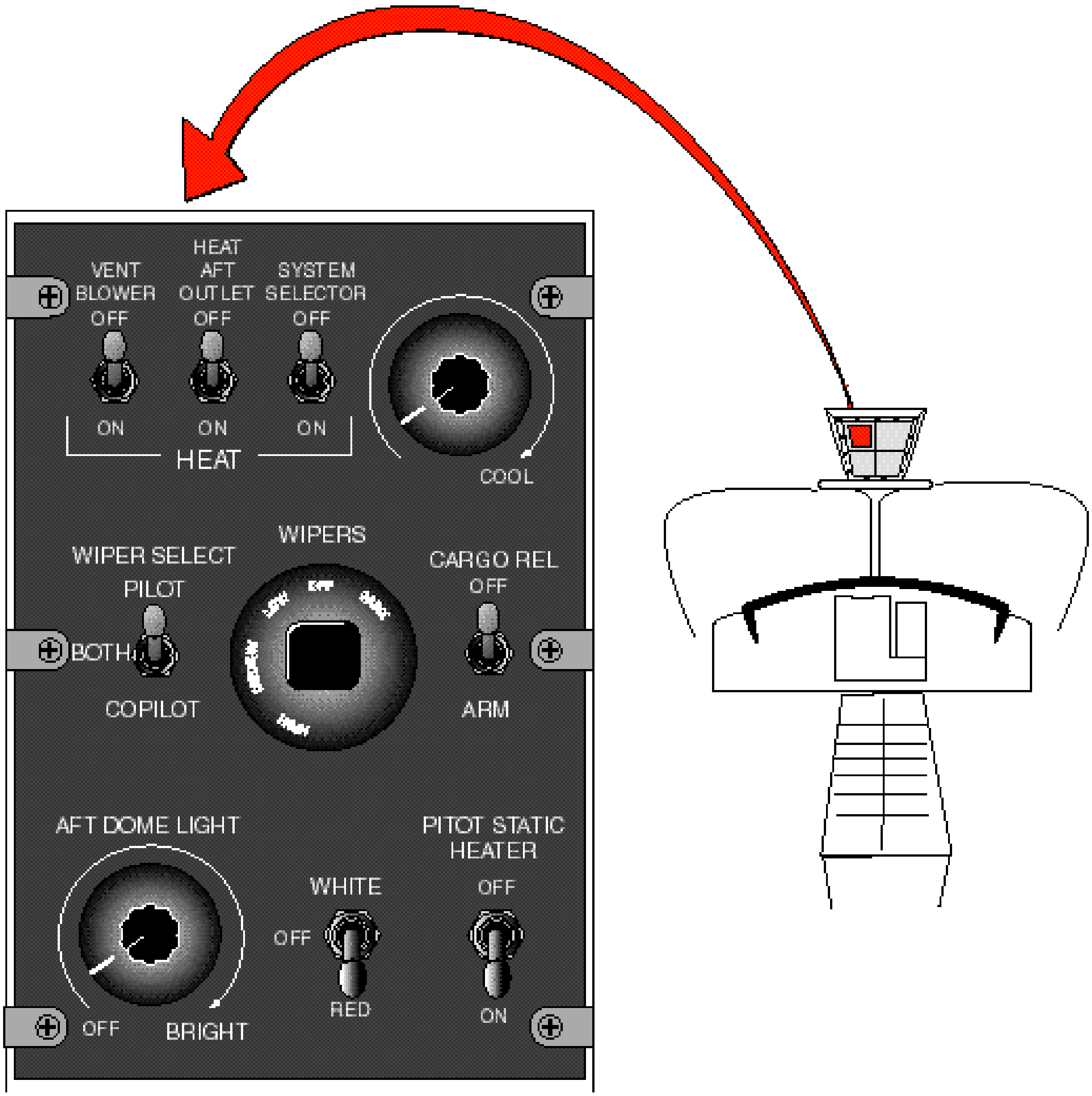


Figure 13-29 Vent Blower, AFT Outlet and Heater Switches

Heater Operation

The heating cycle is activated by turning the SYSTEM SELECTOR switch to HEATER. This action causes 28 VDC to open two bleed air valves (one for each engine) and allows engine compressor bleed air to flow to a mixing valve. The heating system is shown in Figure 13-31.

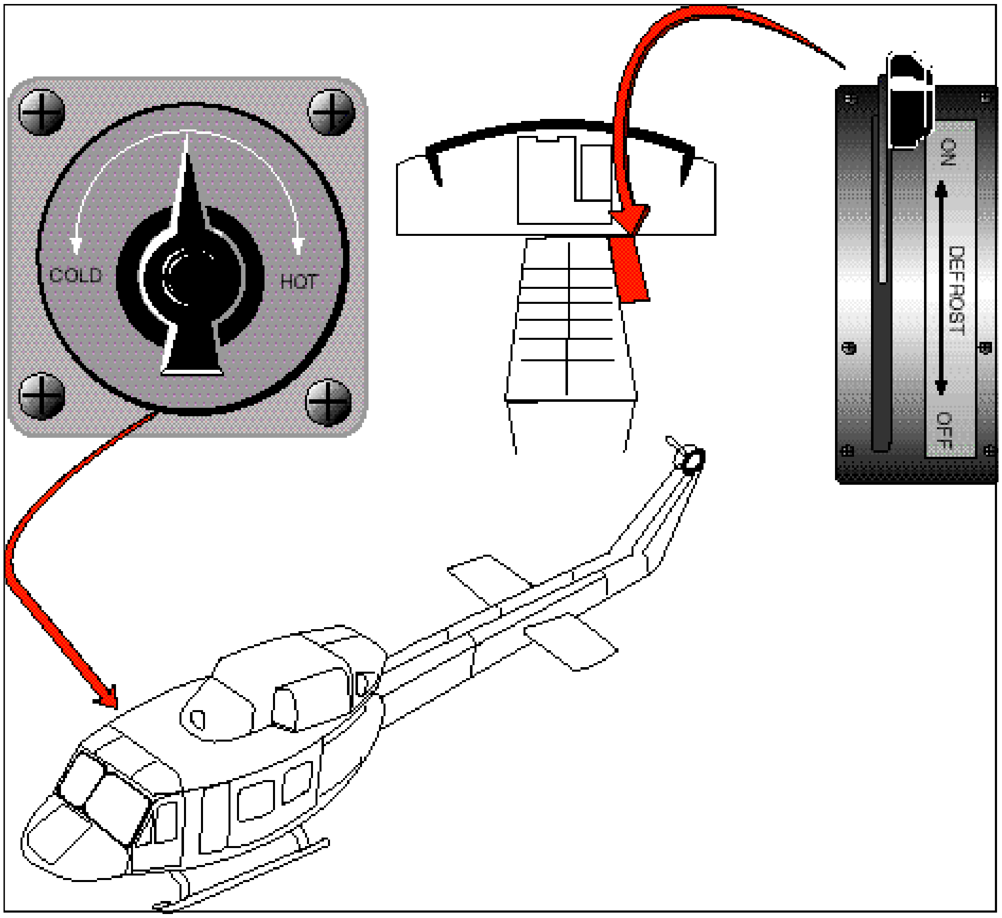


Figure 13-30 Defrost Lever and Temperature Selector

In the mixing valve bleed air is mixed with ambient air to obtain the desired temperature. Mixing of bleed and ambient air is accomplished by increasing or decreasing bleed air in response to a heat sensor in the plenum regulated by the temperature selecting dial on the doorpost.

An overheat switch is mounted in the outlet of the mixing valve which activates at 220° F (104°C) to close the bleed air valves and also "pop" the “CABIN HTR" circuit breaker in approximately 30 seconds.

Mixed air passes through a noise suppresser muffler to the plenum and then through ductwork to the air distribution valve and a second overheat switch mounted in the plenum, which activates at 220°F and illuminates the HEATER AIR LINE caution panel light. The second overheat switch will NOT close the bleed-air valves.

At the air distribution valve, heated air is either totally distributed forward to the crew area or, if the AFT OUTLET switch (Figure 13-31) is in ON, diverts some of the heated air to the aft outlets on the rear side of the forward cabin doorposts, and the remainder to the crew area.

At the Intake control knob There is a micro switch to close the aft doorpost vents even if the aft vent switch is on.

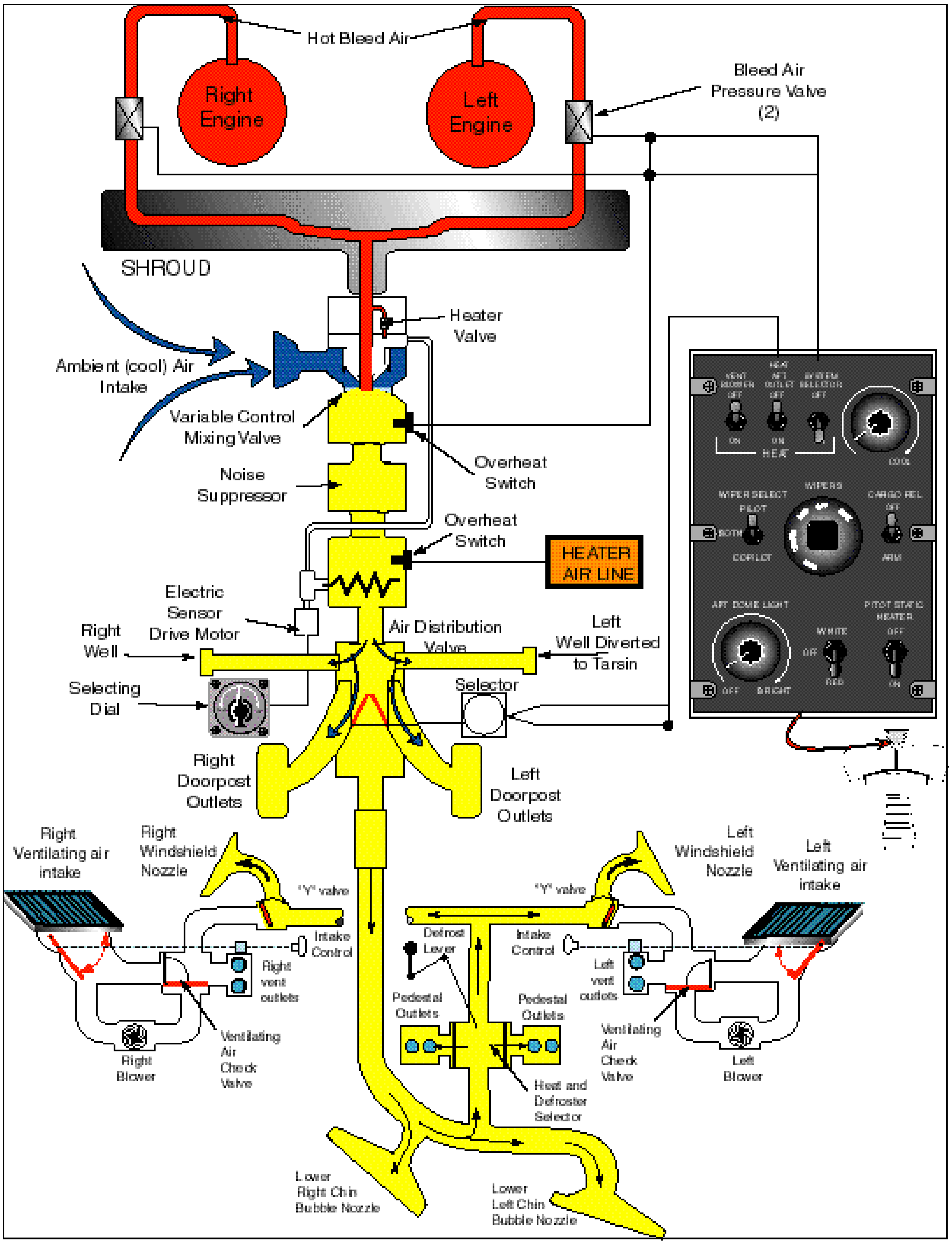


Figure 13-31 Heating System Schematic

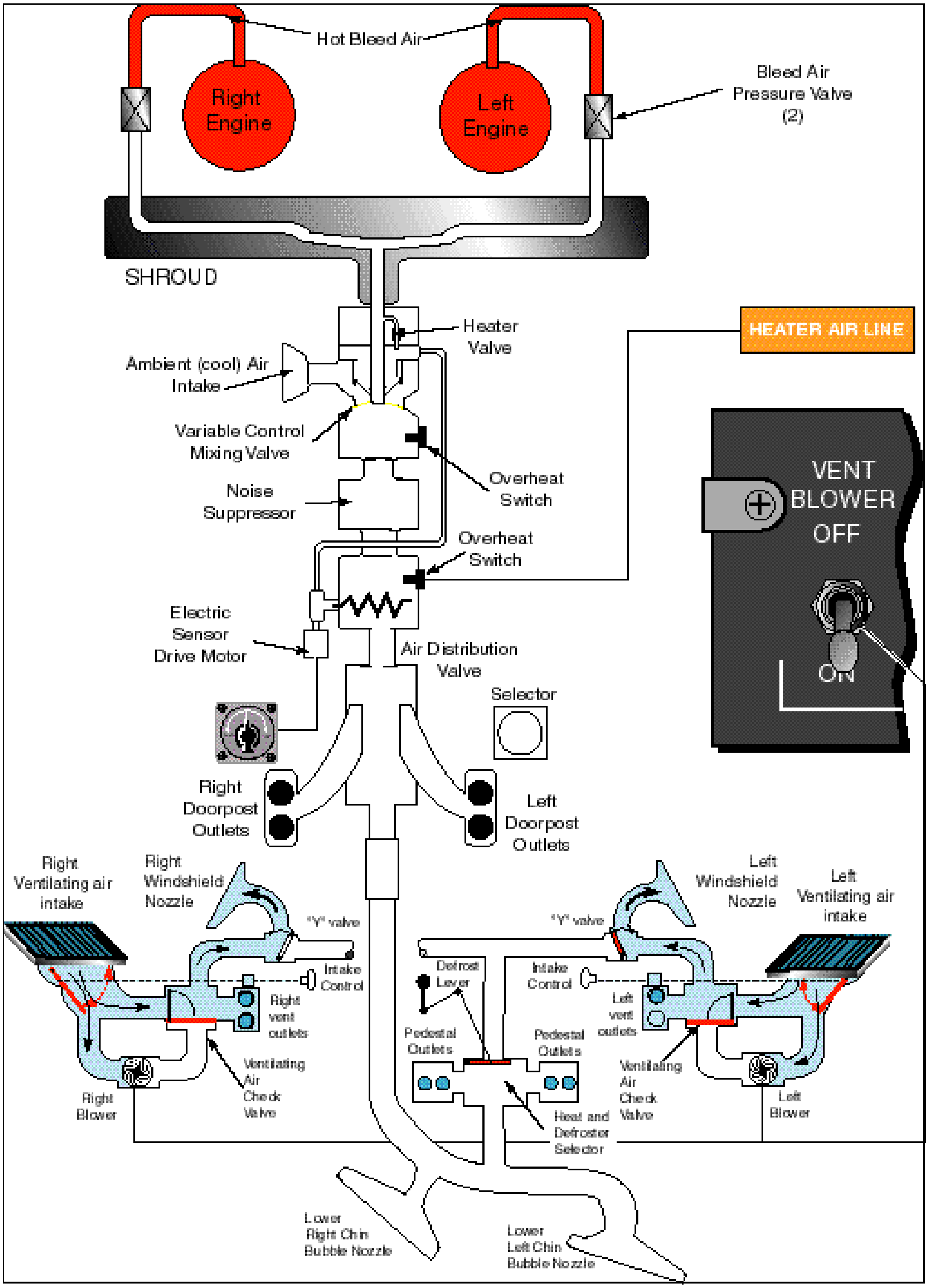


Figure 13-32 Ventilating System

Heated air to the crew compartment is further divided as follows:

A portion of the air is routed directly to the lower chin bubble.

The remaining air is directed to the lower pedestal outlets as long as the DEFROST lever is in the OFF position.

If the DEFROST lever is in ON, part of the airflow is directed to the right and left windshield nozzles. The air pressure from the heater will position the Y-valve to direct all the air to the windshield nozzles.

NOTE: If the air intake control knob is open, ram air pressure from the nose intakes will overcome heater air pressure, and Y-valve will not swap over. No heated air will go to the windshield nozzles.

Intermediate positions of the DEFROST lever between OFF and ON provide proportionate airflow between the pedestal outlets and the windshield outlets.

The heater should **not be operated above 21°C** to prevent damage to the chin bubbles.

A temperature selector (Figure 13-31), located on the right cabin doorpost, controls heater air temperature.

NOTE: Heater operation causes changes in helicopter performance; refer to Section 5 of the *RFM* and the appropriate *RFM Supplement* if the winterization heater is installed.

Cockpit Ventilation System

Two air inlets, located on the upper nose of the helicopter, allow outside ram air to enter the system for ventilation and defrosting. Both the pilot and the copilot have separate ventilating nozzles and controls located on the instrument panel.

The air entering each inlet is directly controlled with push/pull knobs located directly below the pilot's and copilot's ventilation nozzles. With the knob in, the respective air inlet is closed; with the knob out, the air inlet is open and allows ram air to reach the instrument panel nozzles and the windshield nozzle.

The instrument panel nozzles can be manually controlled and positioned for optimum airflow. Rotating the nozzle ring clockwise opens the nozzle, and rotating the nozzle ring counterclockwise closes the nozzle. All ventilating air may be directed to the windshield defroster nozzles by closing the instrument panel nozzles.

Two vent blowers provide forced airflow to the ventilating and windshield nozzles. The blowers use 28 VDC and are controlled by the VENT BLOWER switch located on the overhead console. The vent blowers should not be activated with the air inlet valves closed (Figure 13-32).

Cabin Ventilation System

A ram-air ventilation system is installed in the cabin roof structure and is available at all times to provide fresh outside air as desired to crew and passengers (Figure 13-33).

There are 16 ventilating air nozzles; each may be manually operated in the same manner as the cockpit ventilating nozzles to control the inflow of outside air. There are no other controls, indications, or operating procedures for the ventilation system. However, an optional air conditioning system normally uses the cabin ventilation system to distribute conditioned air.

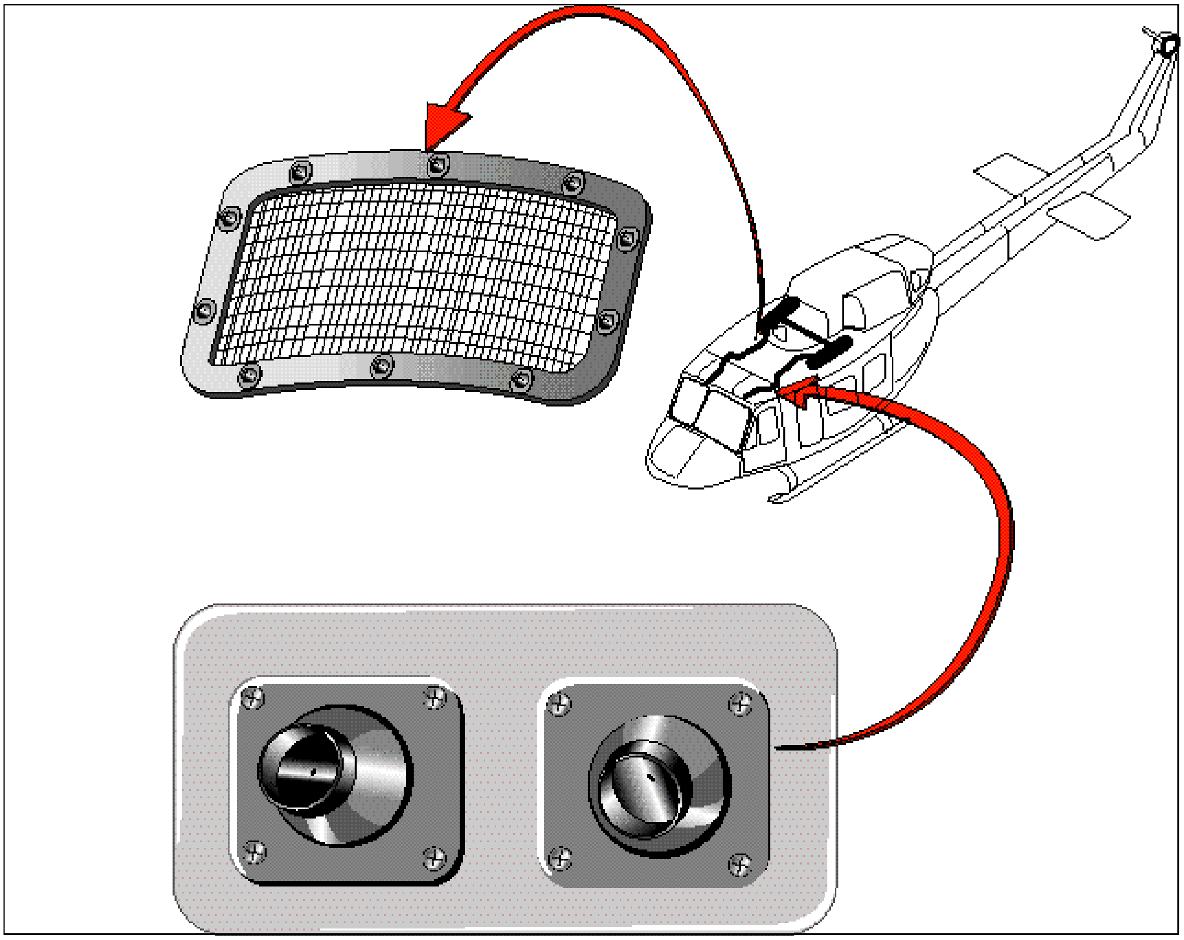


Figure 13-33 Cabin Ventilation System

WINTERIZATION HEATER

The winterization heater system is offered as a kit and increases the existing bleed air heater capacity by adding extra outlets, ducting, a larger mixing valve, and noise suppressers. The additional ducting connects the existing bleed air heater output to two additional dual outlets located at the lower outboard corners of the rear cabin wall. The additional outlets are the same as the existing heating and ventilating air outlets. The HEAT AFT OUTLET switch - ON opens the valve to the additional outlets. The microswitch in the defog lever overrides the switch.

Operation of the winterization heater is identical to the standard heater. The procedures for heater operation are contained both in the RFM and in the supplement.

As with the standard heater, operation of the winterization heater affects helicopter performance. The appropriate RFM *Supplement* should be referred to any time the heater is used since operation causes a decrease in engine performance.