

CF-105 SERVICE DATA

AIR CONDITIONING AND PRESSURIZATION

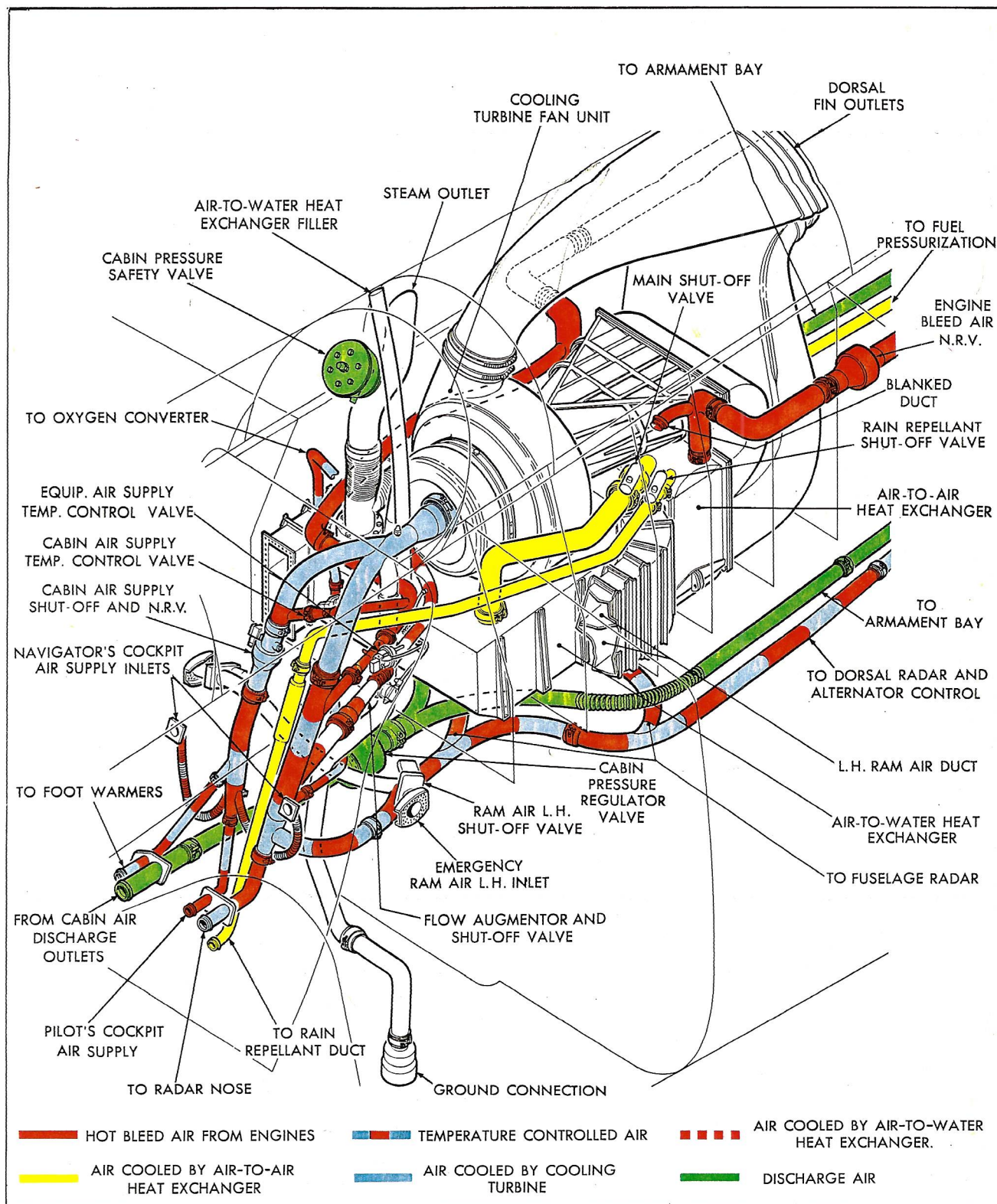
TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	5
Engine Bleed Air	5
Air-to-air Heat Exchanger	6
Air-to-water Heat Exchanger	6
Cooling Turbine and Fan	7
Cabin Air Supply	7
Equipment Air Supply	8
Cabin Pressurization and Discharge Air	9
Ramp and Ram Cooling Air Supply	9
Cockpit Controls and Operation	11
FUNCTION TEST	(To be issued later)
INSPECTION	(To be issued later)
COMPONENT SERVICE DATA	
Flow Augmentor and Shut-off Valve	15
Main Shut-off Valve - Turbine Pressure Control	17
Shut-off Valve - Rain Repellant	19
Regulator Valve - Cabin Pressure	21
Air-to-water Heat Exchanger	23
Shut-off Valve - Radar Nose	25
Pressure Reducing and Non-return Valve	27
Non-return Valve - Engine Bleed	29
Ram Air Valve	31
Cooling Turbine/Fan Unit	33
Non-return and Electric Shut-off Valve - Cabin Air Supply ...	35
Safety Valve - Cabin Pressure	37
Controller - Cabin Pressure	39
Filter - Cabin Pressure Control	41
Air-to-air Heat Exchanger	43
Ground Connection - Low Pressure	45
Temperature Control Valve - Cabin Temperature Control	47
Temperature Control Valve - Radar Temperature Control	49
Shut-off Valve - Engine Air Bleed	51
Pressure Relay Valve - Cabin Pressure Control	53

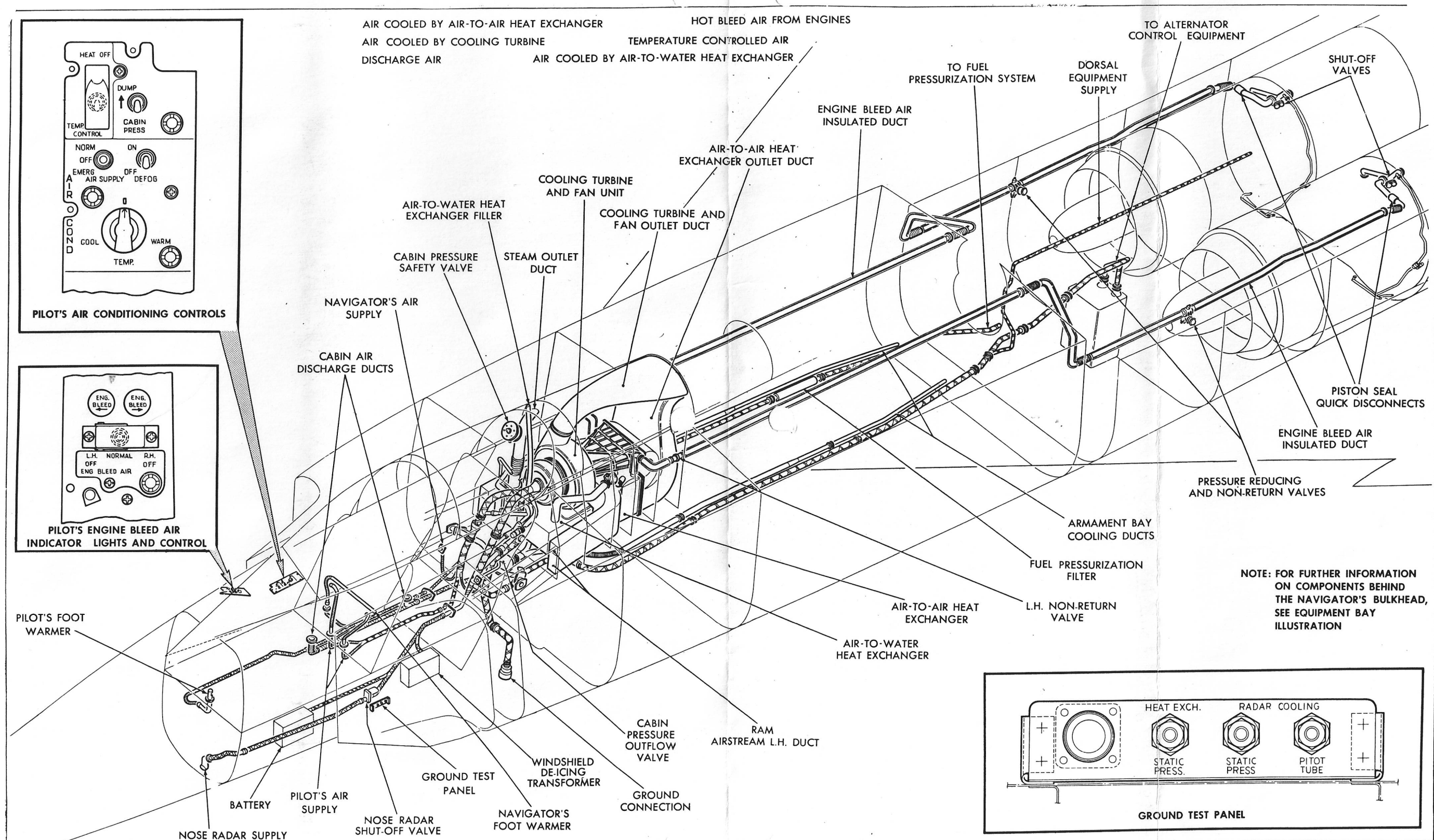
CF-105 SERVICE DATA

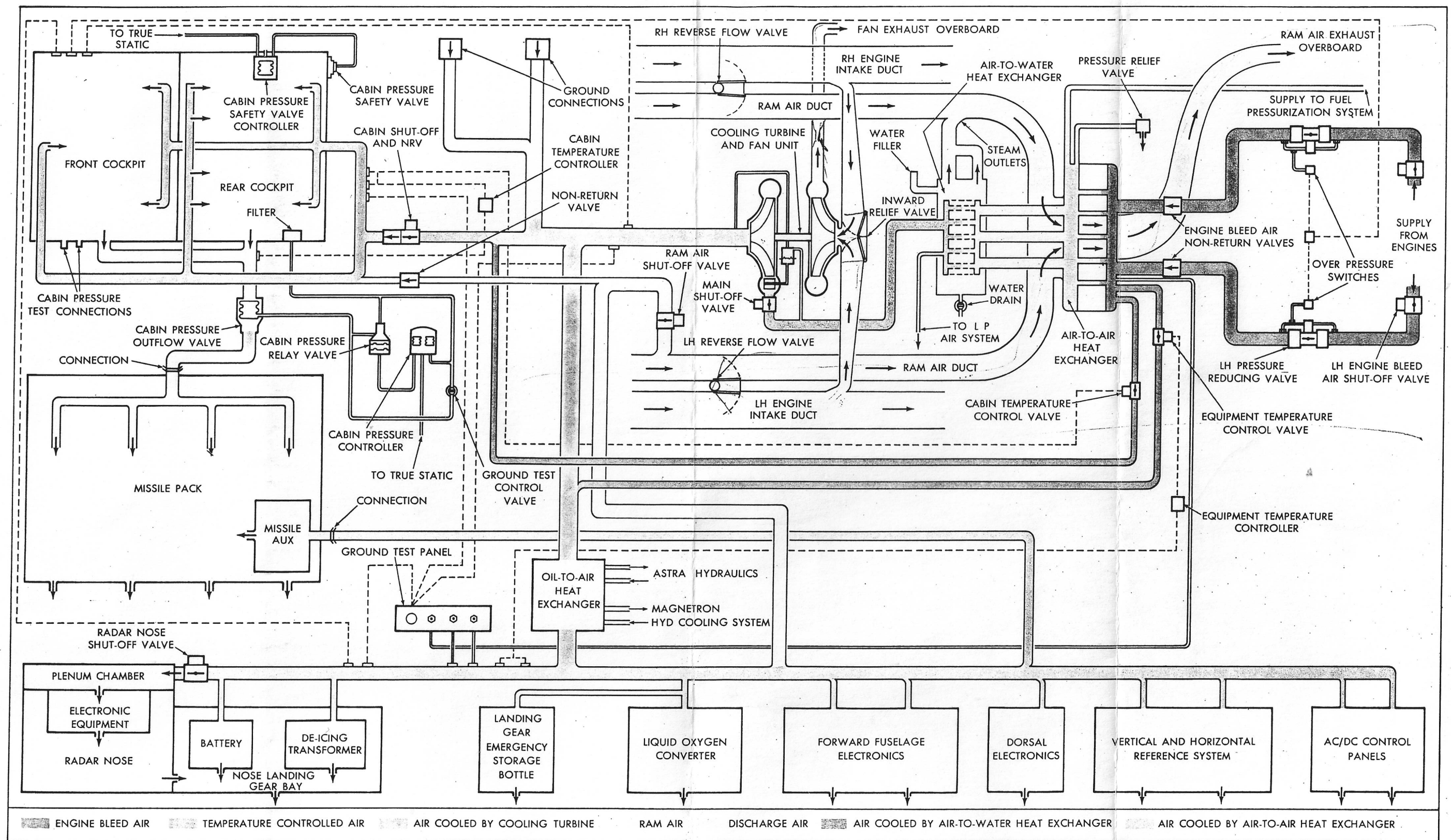
LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Air Conditioning and Pressurization - Normal Operation ..	3
2	Air Conditioning and Pressurization - Emergency Operation.	4
3	Pressurization Graph	12
4	Component Layout	13



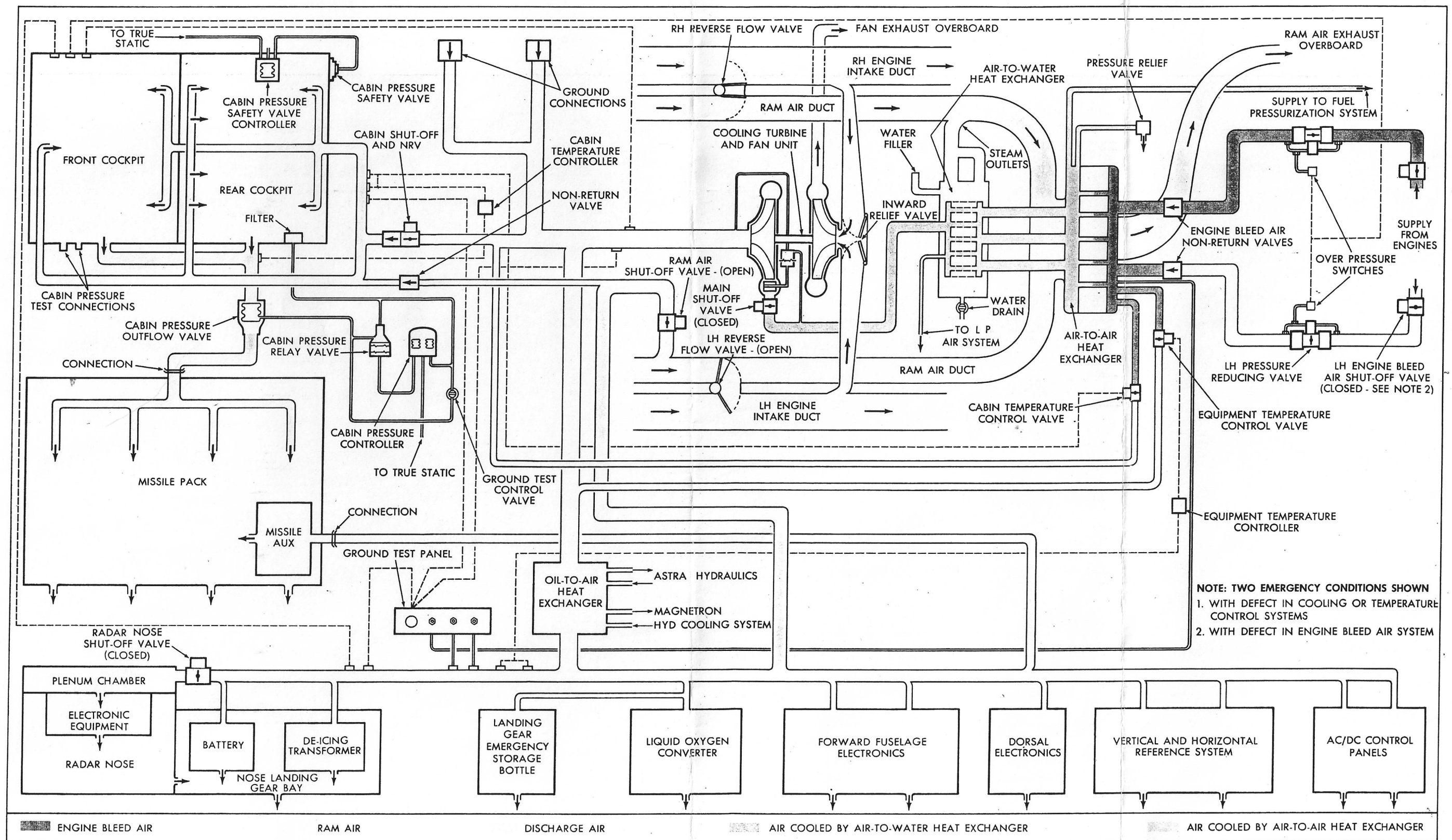
AIR CONDITIONING SYSTEM - EQUIPMENT BAY

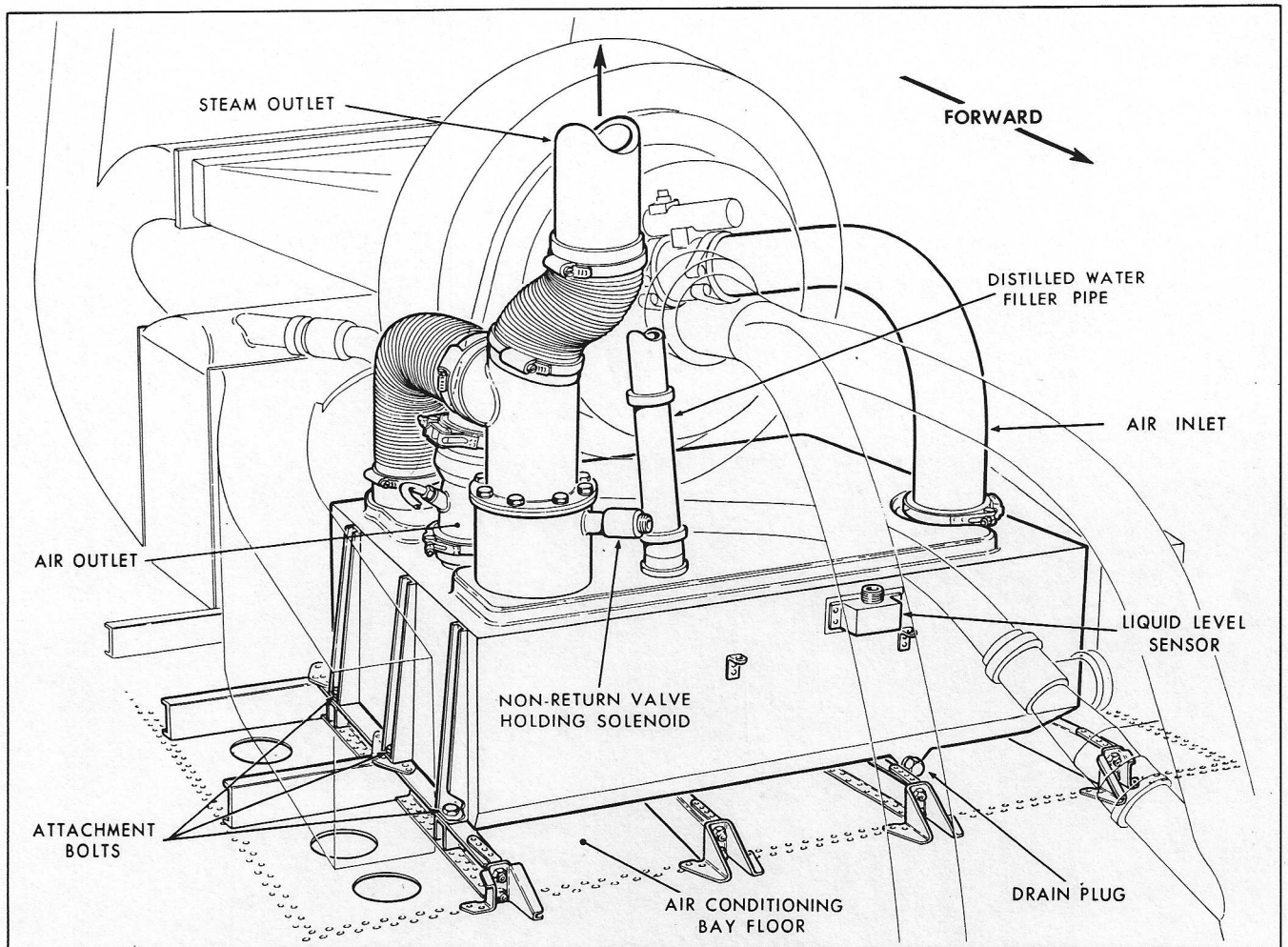




7M2-3101-1

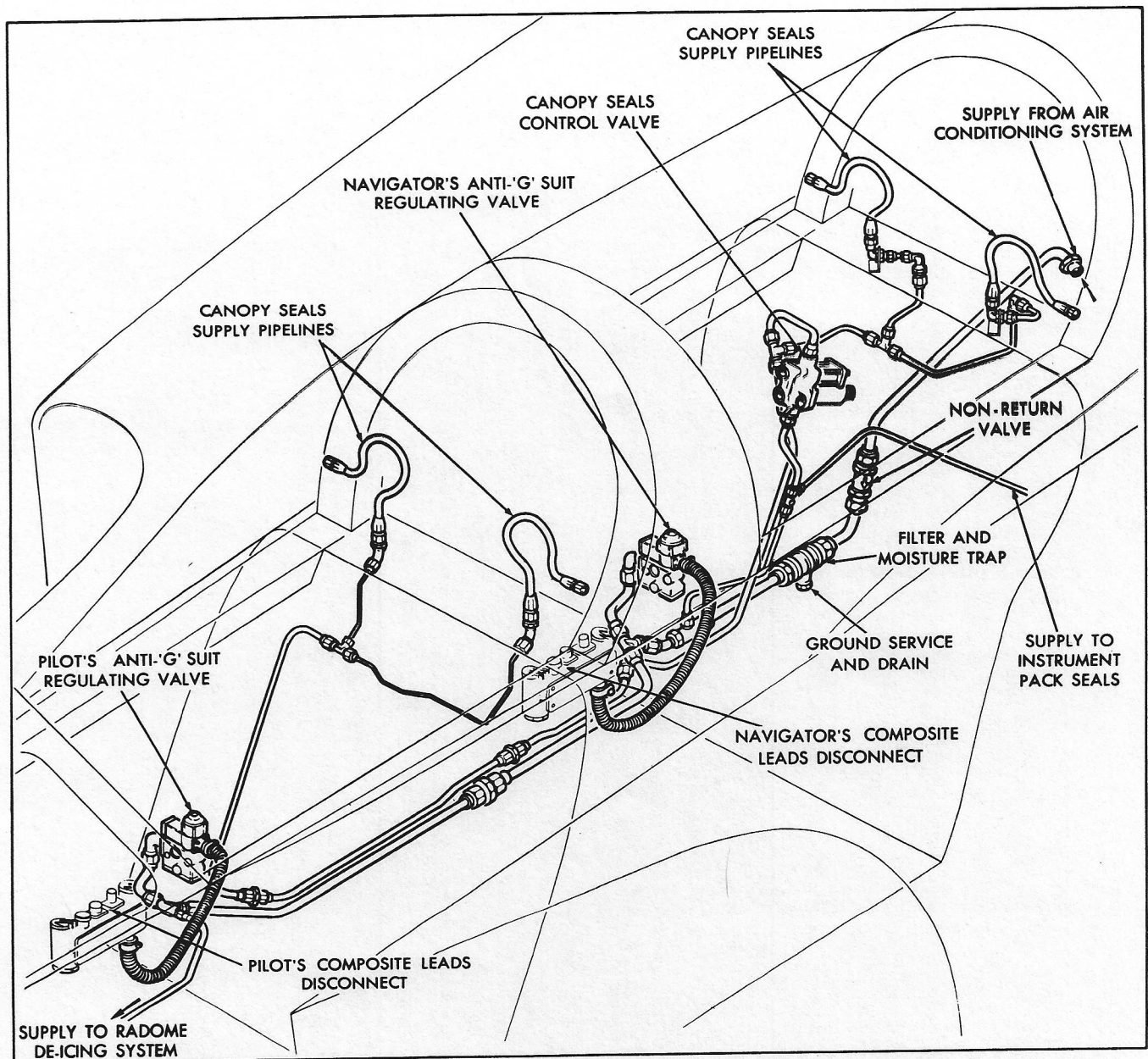
AIR CONDITIONING SYSTEM NORMAL OPERATION - SCHEMATIC





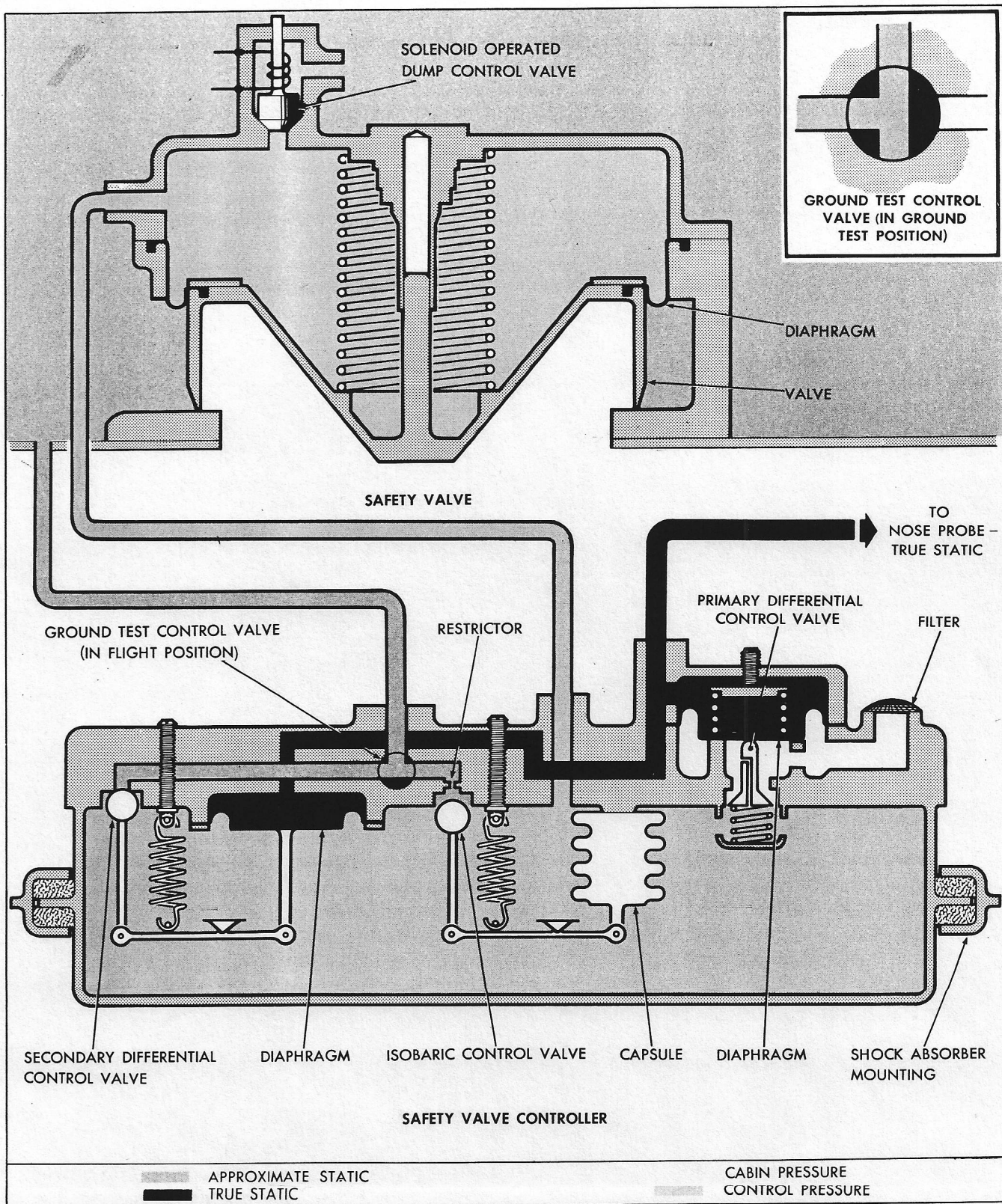
7MI-2718-1

AIR-TO-WATER HEAT EXCHANGER



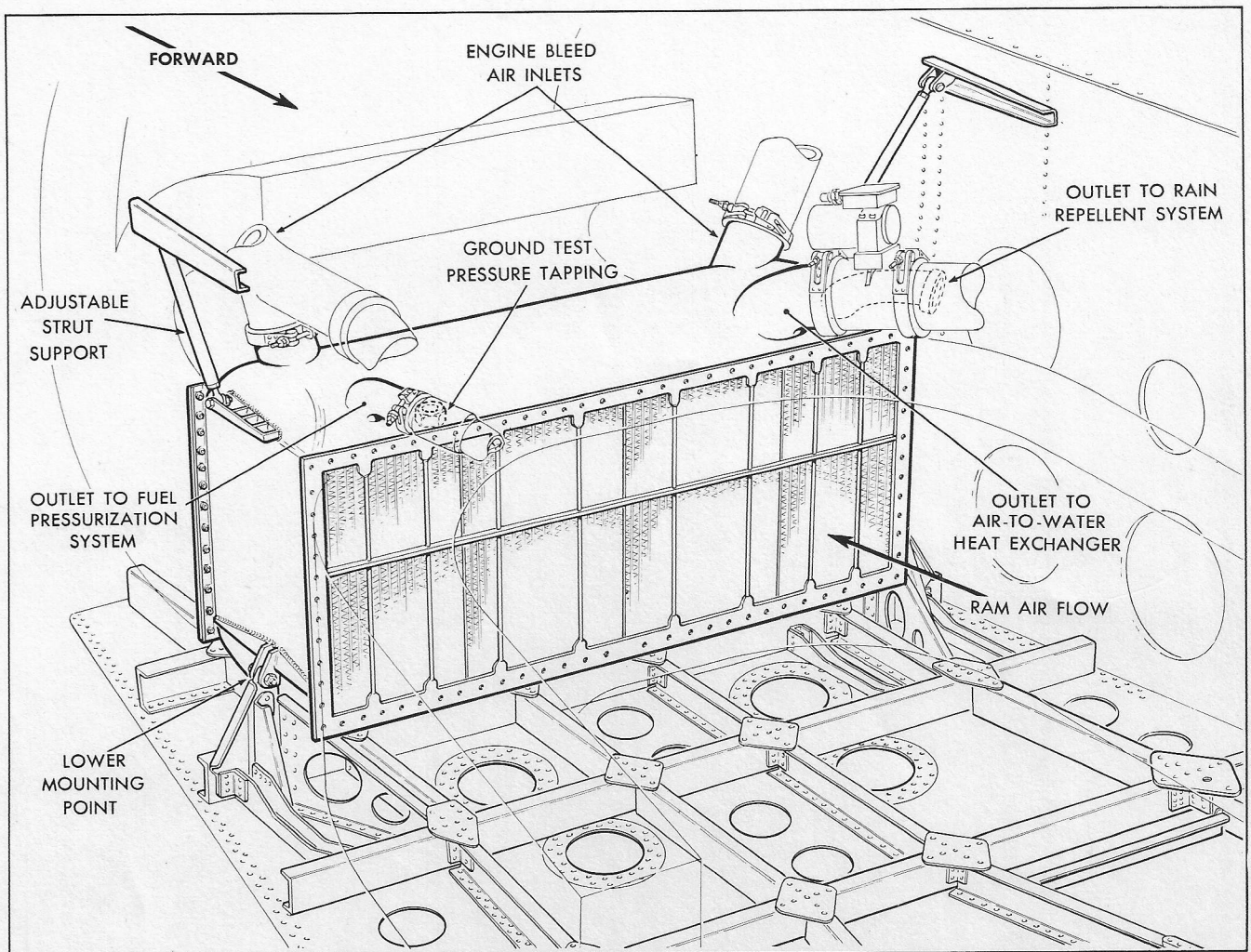
7MI-2803-1

LOW PRESSURE AIR SYSTEM



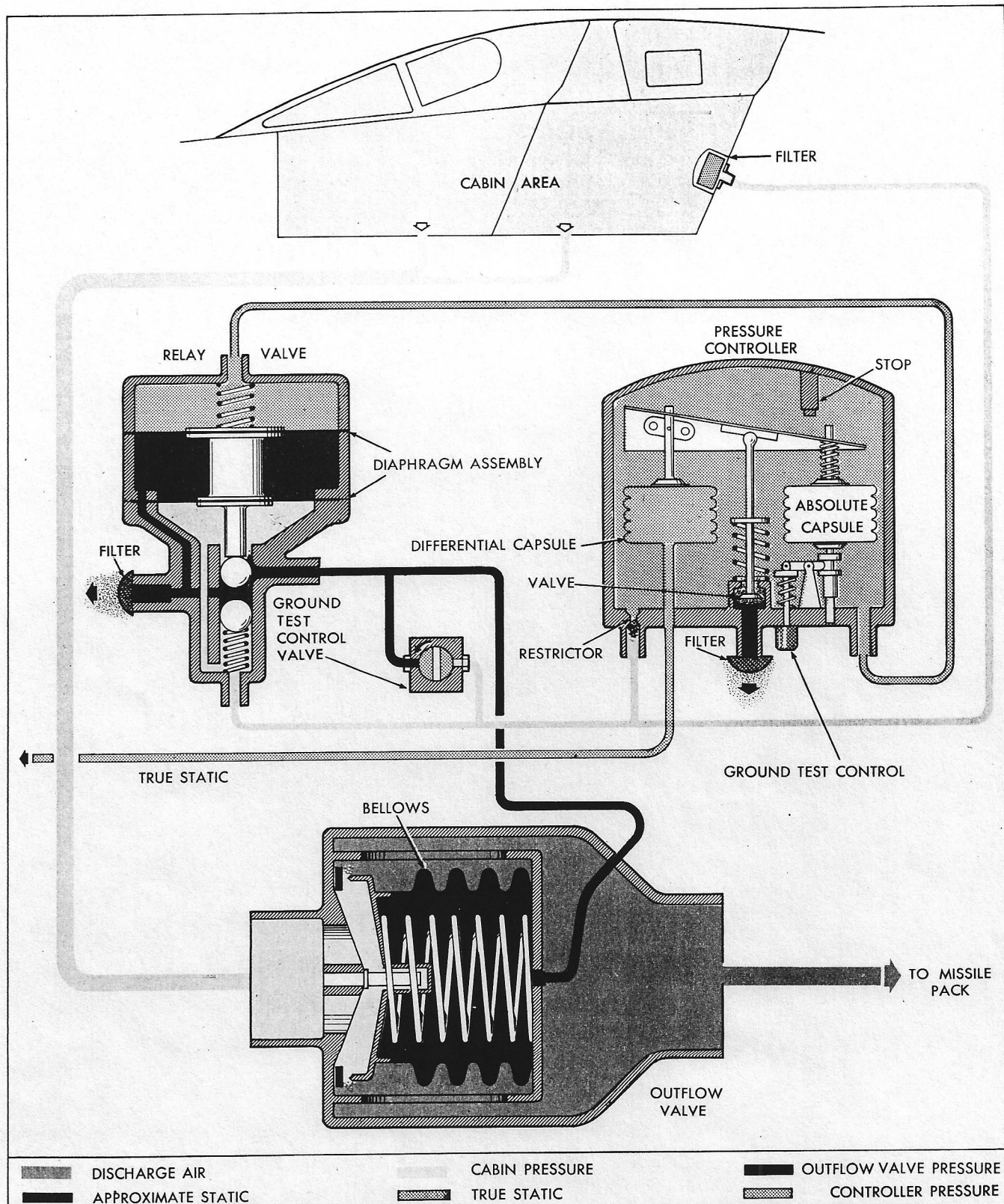
7M1-2715-1

CABIN PRESSURE SAFETY VALVE - SCHEMATIC



7M1-2719-1

AIR-TO-AIR HEAT EXCHANGER



CABIN PRESSURIZATION CONTROLS - SCHEMATIC

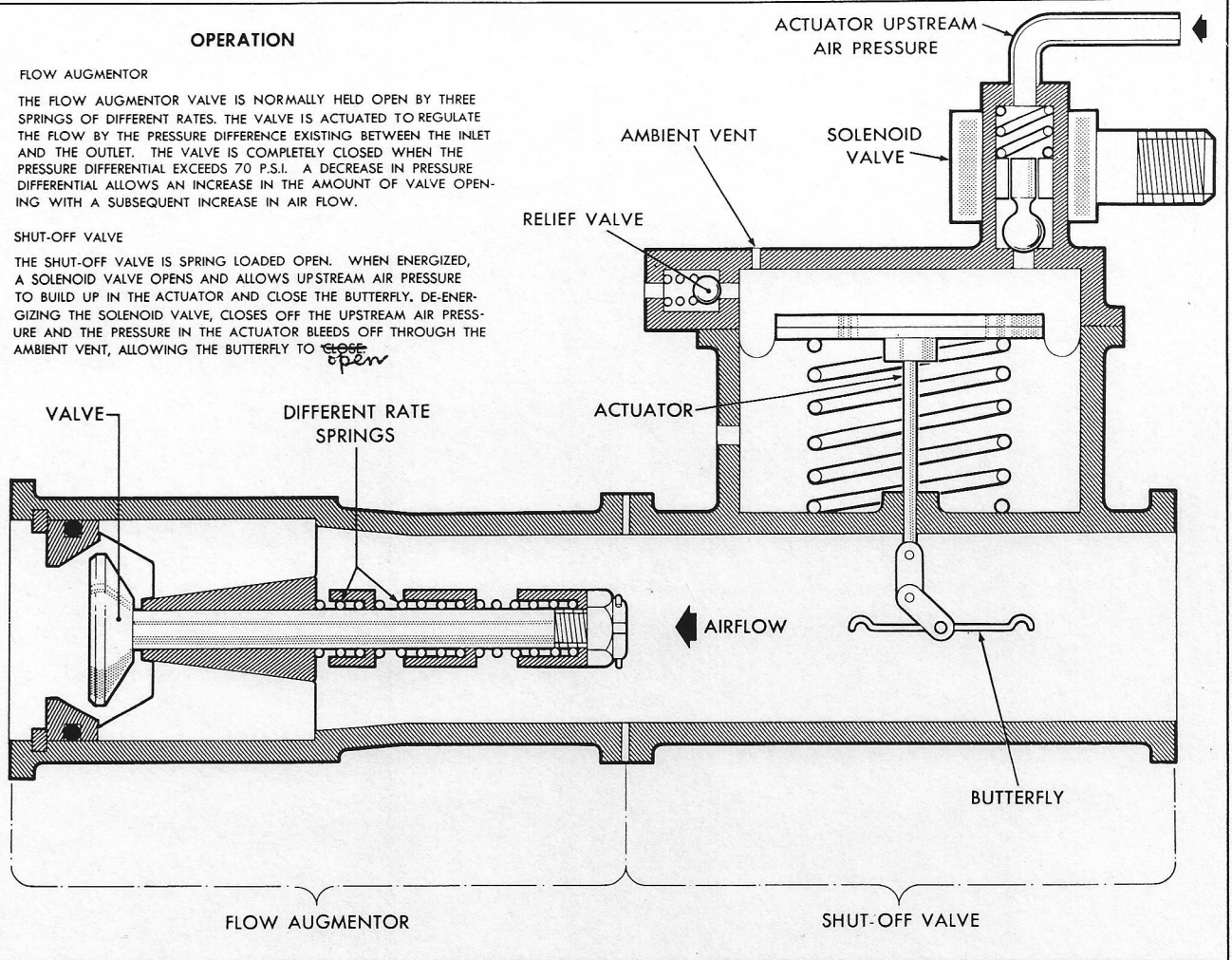
OPERATION

FLOW AUGMENTOR

THE FLOW AUGMENTOR VALVE IS NORMALLY HELD OPEN BY THREE SPRINGS OF DIFFERENT RATES. THE VALVE IS ACTUATED TO REGULATE THE FLOW BY THE PRESSURE DIFFERENCE EXISTING BETWEEN THE INLET AND THE OUTLET. THE VALVE IS COMPLETELY CLOSED WHEN THE PRESSURE DIFFERENTIAL EXCEEDS 70 P.S.I. A DECREASE IN PRESSURE DIFFERENTIAL ALLOWS AN INCREASE IN THE AMOUNT OF VALVE OPENING WITH A SUBSEQUENT INCREASE IN AIR FLOW.

SHUT-OFF VALVE

THE SHUT-OFF VALVE IS SPRING LOADED OPEN. WHEN ENERGIZED, A SOLENOID VALVE OPENS AND ALLOWS UPSTREAM AIR PRESSURE TO BUILD UP IN THE ACTUATOR AND CLOSE THE BUTTERFLY. DE-ENERGIZING THE SOLENOID VALVE, CLOSES OFF THE UPSTREAM AIR PRESSURE AND THE PRESSURE IN THE ACTUATOR BLEEDS OFF THROUGH THE AMBIENT VENT, ALLOWING THE BUTTERFLY TO ~~close~~ *open*.



7M1-2710-1

FLOW AUGMENTOR AND SHUT-OFF VALVE SCHEMATIC

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFF'TY	REF. NO.
AIR CONDITIONING AND PRESSURIZATION		25201	91
DESCRIPTION AND OPERATION General 1. The air conditioning system uses air bled from the second compressor unit of each engine. The system provides conditioned air for the cabin, fuel tank pressurization, low pressure pneumatic system, liquid oxygen system, and the rain repellent windshield ducting. The cabin is pressurized to a maximum differential of 4.5 - 5 psi and the temperature is controlled to 60° - 80°F. Conditioned air is also provided for maintaining the pressurized and non-pressurized electrical and electronic equipment at a constant temperature of 80°F - 90°F. An emergency system is provided to maintain a supply of cooling air to the essential electrical equipment under emergency conditions. Air discharged from the cabin is used to cool and ventilate the missile bay. 2. The air conditioning system has three major components, an air-to-air heat exchanger which uses the ram airstream to cool the air bled from the engine, an air-to-water heat exchanger which further cools the air by heat transfer to distilled water, and a cooling turbine and fan unit. Incorporated in the system are various types of air valves and controllers served by thermostats and sensors, which maintain the selected conditions at varying aircraft airspeeds and altitudes. The system cannot be operated normally while the aircraft is on the ground, as the cooling efficiency of the air-to-air heat exchanger and the cooling turbine and fan unit is dependent on the forward motion of the aircraft supplying ram air. 3. For ground testing and to maintain the electronic equipment in an operational condition at a safe temperature while the aircraft is on the ground, provision is made for a supply of cool air at low pressure through an external ground connection which is attached to the aircraft by a lanyard type quick-disconnect. 4. Manual controls are fitted in the front cockpit for the pilot to select the rain repellent system ON or OFF, cabin air supply to NORM-OFF-EMERGENCY, cabin air dump valve ON or OFF and to disperse cabin fog by operating the DEFOG switch from OFF to ON. A temperature control rheostat is also provided to enable the pilot to adjust the cabin temperature from COOL to WARM. Engine Bleed Air 5. The bleeds from the LH and RH engines to the air-to-air heat exchanger are identical in operation and commence at the engine bleed air take-off manifold which takes air from two positions at the compressor casing. The temperature of the air delivered to the manifold varies from 140°F to 920°F and pressure varies from 30 psi to 300 psi, according to flight conditions.			
ISSUE	1		
DATE	16 Jan 57		

TM1-3413-2-3

6. Engine bleed air from a quick-disconnect is ducted through an electrically actuated shut-off valve to a pressure reducing and non-return valve. A pressure switch in the duct down stream of the pressure reducing and non-return valve closes the shut-off valve if the pressure rises above 85 psi. The system is wired to prevent both shut-off valves being closed at the same time. An annunciator box in the nose wheel well indicates to the ground crew if a shut-off valve has been closed.

7. The pressure-reducing and non-return valve is pneumatically sensitive to upstream and downstream pressures and maintains the system pressure at 85 psi. From the pressure reducing and non-return valve the bleed air is passed through an additional non-return valve to the air-to-air heat exchanger for cooling. A duct from the RH engine is led off from this point to control the temperature of the cabin and equipment air. The ducting from the engine bleed air connection to the air-to-air heat exchanger is of stainless steel construction and is insulated to prevent damage to the aircraft structure and surrounding equipment. The insulation consists of four layers of Fibreglas 0.5 inch thick, each layer being separated by aluminum foil and the whole covered by a steel foil covering. The ducting is attached to the aircraft by individual tracks and rollers, allowing movement of the ducting to compensate for heat expansion.

Air-to-air Heat Exchanger

8. The air-to-air heat exchanger which is cooled by ram air consists of a series of communicating wide area hollow fins forming a sealed heat transfer unit through which the engine bleed air passes. The fins are enclosed within a casing which forms the ducting for the cooling airstreams. The engine bleed air from each engine enters the hollow fins through separate inlets and is discharged from the heat exchanger through three outlet ducts. One of the outlets supplies cooled air to the fuel pressurization system, (See Fuel System), the second outlet supplies the rain repellent ducts and the third delivers air to the air-to-water heat exchanger for further cooling.

9. The rain repellent air is selected by a switch in the front cockpit which opens the rain repellent shut-off valve. A sensor is fitted to prevent damage to the windshield by preventing the cockpit switch from opening the valve if the temperature of the air supplied is above 250°F. If the air becomes too hot while the valve is open, the sensor will cause the valve to close irrespective of the position of the switch.

Air-to-water Heat Exchanger

10. An electrically actuated shut-off valve is fitted between the air-to-air heat exchanger and the air-to-water heat exchanger. This valve is the air conditioning system main shut-off valve and is selected by a switch in the cockpit marked NORM-OFF-EMERGENCY. When the switch is selected to NORM the valve opens and allows air to pass to the air-to-water heat exchanger. The valve is also controlled by a controller and ductstats which limit the valve opening and regulate the mass air flow to the system, see para 13. Air from the system main shut-off valve is ducted to the air-to-water heat exchanger where it is further cooled by heat transfer to distilled water.

ISSUE	1							
DATE	16 Jan 57							

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFFTY	REF. NO.
AIR CONDITIONING AND PRESSURIZATION		25201	91
11. The air-to-water heat exchanger consists of a sealed aluminum water tank, having a total capacity of 120 pounds of distilled water, in which is immersed a series of stainless steel hollow fins mounted around an air inlet and an air outlet pipe. Steam is allowed to escape from the tank to atmosphere by vents positioned at the front and rear upper surface. When the aircraft assumes an acute angle of climb, loss of water is prevented by a disc type non-return valve fitted to the front vent and the rear vent has a tube insert to prevent water losses during inverted flying. Each vent is led to an inter-connecting duct and steam is directed to the dorsal fin outlet. Hot distilled water is used during cold weather to ensure that the non-return valve is not frozen and that the correct water level is reached. To enable the water level to be checked after each flight, a dipstick is fitted in the water replenishing pipe. 12. The air-to-water heat exchanger outlet is ducted to a three way transition duct and delivers cooled air to a low pressure pneumatic system, a flow augmentor and to a cooling turbine and fan unit for further cooling. Cooling Turbine and Fan 13. The cooling turbine and fan, each of which has a separate housing, are mounted on a common shaft to form a single unit. Conditioned air is forced through the turbine, driving the turbine and fan at a high speed. The fan assists the cooling airstream through the heat exchanger, and the energy in the form of heat expended by this operation further lowers the temperature of the cooled air. Maximum output conditions from the engine air bleed will increase the mass air flow to the turbine and fan unit, increasing the speed of the unit, with subsequent increase in cooling efficiency. To prevent the temperature dropping below -30°F under extreme conditions, a sensor fitted in the turbine outlet positions the main shut-off valve to modulate the air delivery from the air-to-air heat exchanger. 14. To maintain an air supply at a specific and constant temperature to the cabin and to the electrical and electronic gear an insulated air duct takes air from the RH engine bleed before it reaches the air-to-air heat exchanger. This uncooled air is led to a cabin temperature control valve which meters the air into the cabin cold air supply from the cooling turbine. Uncooled air from the same source is also led to an equipment temperature control valve which meters the air into the electrical equipment cold air supply from the cooling turbine. The temperature control valves are controlled automatically by electrical temperature control units, which are operated by ductstats to maintain the cabin air supply at a nominal temperature of 60°F and the equipment air at approximately 80°F. Cabin Air Supply 15. The electrical temperature control units can be adjusted by means of a temperature control rheostat fitted in the front cockpit to give a temperature range of COOL (40°F) to WARM (80°F). A DEFOG switch is also fitted in the front			
ISSUE	1		
DATE	16 Jan 57		

cockpit and when this is selected ON the controller is overridden and the temperature control valve opens, allowing the cabin temperature to rise to approximately 90°F and disperse cabin fog.

16. As a safety precaution, a sensor is fitted in the cabin air supply. Should the temperature of cabin air supply exceed 120°F, the sensor causes the temperature control valve to close by operating a relay and switching off the power supply to the controller. When the temperature drops, the system returns to normal.

17. Conditioned air is led from the mixing duct to a shut-off and non-return valve. The shut-off and non-return valve is controlled by the main landing gear scissors micro-switch. When the landing gear is lowered the micro-switch is operated and the valve is closed.

NOTE

When selected to OFF or EMERGENCY the cockpit air supply switch closes the main shut-off valve between the air-to-air and the air-to-water heat exchangers. The conditions of flight are severely restricted with the switch selected to these positions. Further information is given under the heading of Ramp and Ram Cooling Air Supply.

Equipment Air Supply

18. The supply of air to the equipment area is ducted from the hot and cold air 'mixing' duct to a 'Y'-duct to which a flow augmentor valve is fitted. The flow augmentor valve is electrically actuated and supplements the air flow to the equipment areas should the system pressure fall below 70 psi due to operation at high altitude or low engine RPM. The supplementary air is taken from the air-to-water heat exchanger outlet. While the aircraft is taxiing, air from the air-to-water heat exchanger is too hot and a micro-switch fitted on the main landing gear up-lock operates an electrical actuator and closes the flow augmentor valve.

19. Conditioned air is ducted to the radar nose during normal operation of the air conditioning system. When the cabin air supply switch is selected to OFF or EMERGENCY a gate valve fitted in the radar nose supply duct is closed.

Conditioned air is also supplied from the same duct to:

- (a) Liquid oxygen converter, discharging to the equipment section.
- (b) Battery, discharging to the nose wheel well.
- (c) Windscreen de-icing transformer, discharging to the nose wheel well.

ISSUE	1							
DATE	16 Jan 57							

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFFTY	REF. NO.
AIR CONDITIONING AND PRESSURIZATION		25201	91

- (d) Forward fuselage radar discharging to the equipment section.
- (e) Dorsal radar discharging to atmosphere.
- (f) Alternator control discharging to the rear fuselage.

Cabin Pressurization and Discharge Air

20. The cabin is unpressurized up to 10,000 ft. Pressure increases linearly with altitude from 10,000 ft. until a differential of cabin to atmospheric pressure of 4.5 - 5 psi is reached at 60,000 ft. giving a cabin altitude of 23,500 ft.

21. The cabin pressurization is regulated by a cabin pressure regulator valve, a pneumatically actuated cabin pressure regulation controller and a cabin pressure relay valve, with true ambient static pressure taken from a nose probe.

22. The cabin pressurization system can be tested on the ground by selecting a cock on the cabin pressure regulator controller to GROUND TEST.

23. A cabin pressure safety valve and controller is mounted on the rear cockpit bulkhead to protect the occupants of the cabin from excessive cabin pressures. The valve has two operations:

- (a) Relieves cabin pressure over 5.25 - 5.75 psi.
- (b) Operates as a cabin air pressure dump valve which opens when the front cockpit dump control switch is selected from CABIN PRESSURE to DUMP.

24. The normal pressure relieving function of the safety valve is actuated by the cabin pressure safety valve controller which is sensitive to cabin pressure and ambient true static pressure. The cabin pressure safety valve controller has a pre-set switch provided which can be selected OFF during ground testing of the cabin pressure and leak rate.

25. An inward relief valve is fitted to relieve negative cabin pressure.

Ramp and Ram Cooling Air Supply

26. The forward motion of the aircraft provides ram air and ramp air cooling airstreams for the air-to-air heat exchanger.

27. The ram air is taken from a duct formed by the front fuselage outer skin and the aerodynamic boundary layer ramps at each side of the aircraft adjacent to the engine intake ducts. The ram airstream provides approximately two thirds of the air-to-air heat exchanger cooling air. After passing through the heat exchanger the ram air is ducted overboard at the dorsal fin outlet.

28. The ramp air is taken from the aerodynamic boundary layer ramp bleed holes at the engine air intake and ducted to the heat exchanger. After passing through the

ISSUE	1							
DATE	16 Jan 57							

heat exchanger the ramp airstream is ducted to the fan of the cooling turbine and fan unit. The fan, driven by the turbine, assists the airstream through the air-to-air heat exchanger, and passes the airstream overboard at the dorsal fin outlet.

29. When the landing gear is lowered, it operates a micro-switch which closes a circuit to an actuator mounted in each ram air duct. Hinged flaps then open to allow ram air to supplement the ramp airstream. This is a precaution to prevent fluctuations in the speed of the cooling turbine/fan unit due to the reduced airflow at approach and landing speeds.

30. Selection of the cabin air supply switch in the front cockpit to EMERGENCY opens two gate valves which allow ram air to pass through ducting to provide cooling air for the equipment areas. As the radar nose cooling and pressurizing requirements are in excess of the ram air supply, the EMERGENCY selection of the cabin air supply switch also shuts off the radar nose equipment electrical supply. High airspeeds have the effect of heating the air to temperatures too high for equipment cooling, subsequently airspeed must be lowered prior to selecting the cabin air supply switch to EMERGENCY.

31. A light in the front cockpit gives the pilot warning of overheating in the equipment areas.

ISSUE	1							
DATE	16 Jan 57							

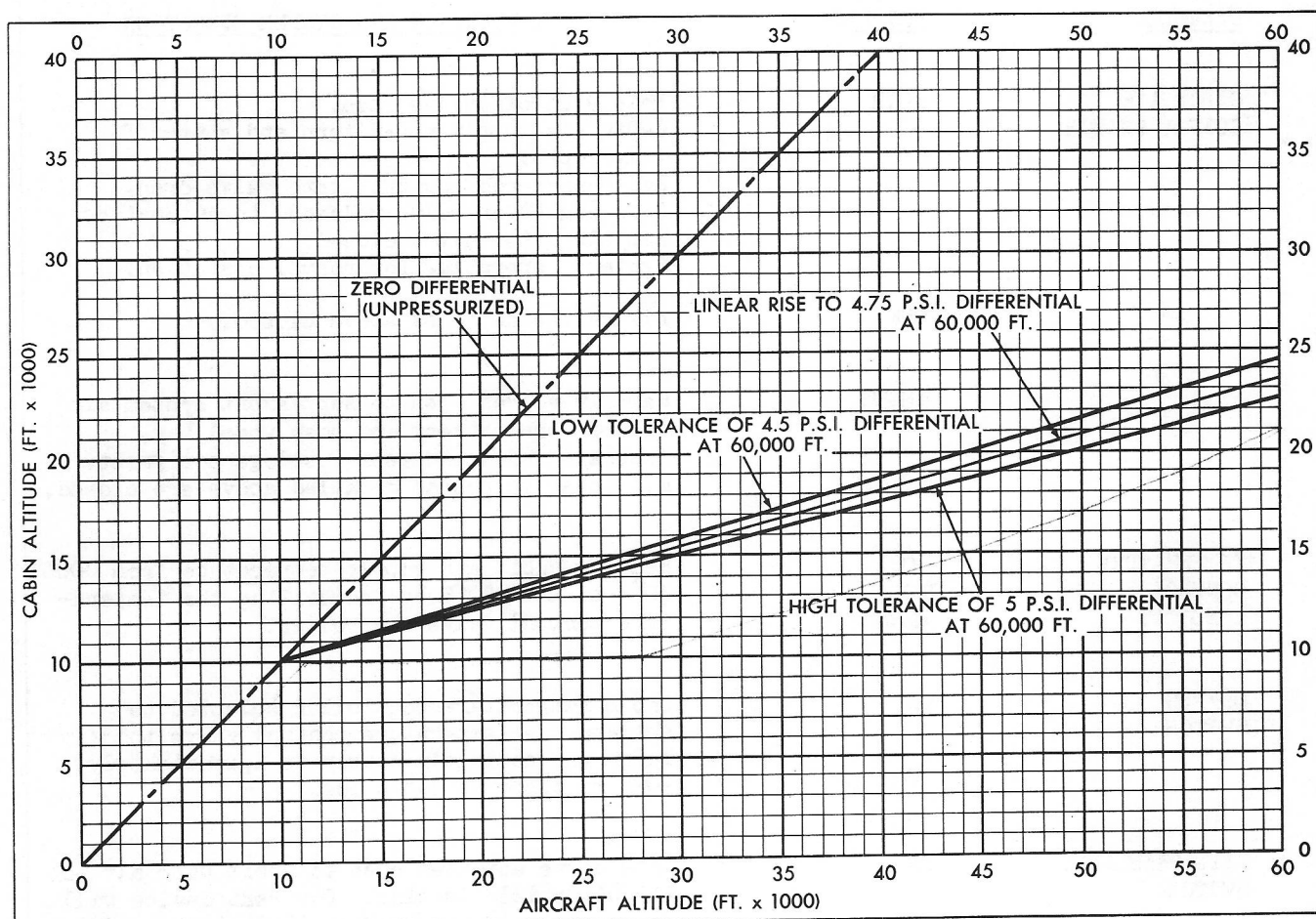
CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM	AIRCRAFT EFFTY 25201	REF. NO. 91
COCKPIT CONTROLS AND OPERATION				
<u>CONTROL</u>	<u>POSITION</u>	<u>FUNCTION AND SYSTEM OPERATION</u>		
CABIN AIR SUPPLY SWITCH	NORM	Main shut-off valve open. Cabin air supply non-return and shut-off valve open. Radar nose cooling duct gate valve open. Flow augmentor valve released to automatic. Ram air gate valves closed. System: operating for normal operation.		
"	OFF	All valves detailed above closed.		
"	EMERG	Ram air valves open to supplement system air to cool the battery and nose wheel bay, fuselage radar and rear fuselage equipment. All other valves as detailed above are closed.		
TEMPERATURE CONTROL RHEOSTAT	COOL TO WARM	Selects cabin air supply temperature from COOL 40°F to WARM 80°F by pre-setting the temperature control valve controller.		
DE-FOG SWITCH	ON	Cabin temperature controller selected to actuate the temperature control valve to raise the cabin air supply to approximately 90°F to disperse cabin fog.		
RAIN REPELLENT SWITCH	ON	Gate valve actuated open to admit warm air to the windshield ducting. Overheat device will close the valve or prevent the valve opening.		
DUMP VALVE SWITCH	ON	Cabin pressure safety valve solenoid operates the valve allowing cabin pressure air to spill overboard at the dorsal fin.		
LANDING GEAR	LOWERED	Ram air duct hinged flaps opened allowing ram air to supplement ramp air. Cabin air supply non-return and shut-off valve closed. Flow augmentor valve closed.		
ISSUE	1			
DATE	16 Jan 57			

TM1-3413-2-3

CF-105 SERVICE DATA



7MI-2706-2

FIG. 3 PRESSURIZATION GRAPH

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Flow Augmentor and Shut-off Valve	REF. NO. 22-2
AVRO PART NO. 7-2254-3	MANUFACTURER Airesearch (c/o Garrett Mfg. Co.)	MAN'FR'S PART NO. E-106482		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION To allow air from the air-to-water heat exchanger to by-pass the turbine when the system pressure drops below 70 psi.					
LOCATION Rear of navigators bulkhead at Sta. 224-255.					
ACCESS Remove 76 - 3/16 inch screws from an access panel positioned on the undersurface of the fuselage to the rear of the navigators bulkhead. Disconnect the antenna attached to the panel and remove the access panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Connect one pipe line. Place augmentor in position and connect two holding clamps to augmentor. Connect one electrical connector. Replace cabin air discharge pipe.					MEN X MINUTES

INSPECTION Check for security, damage and corrosion.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT Electrical ground power unit. B4 access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Main Shut-off Valve (Turbine Pressure Control)		REF. NO. 22-3	
AVRO PART NO. 7-2252-2		MANUFACTURER Barber-Colman		MAN'FR'S PART NO. DYLZ 5314		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION Used in conjunction with temperature sensing element and temperature controller to control turbine inlet pressure. Used as a shut-off valve in an emergency.							
LOCATION Part of ducting between air-to-water heat exchanger and turbine positioned to the rear of the navigators bulkhead.							
ACCESS Remove the dorsal fairing rear of navigators cockpit by releasing six latches. Remove fan outlet duct. Remove 57 - 3/16 inch screws from an access panel in the air conditioning bay roof and remove the access panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the valve. Connect two holding clamps. Connect one electrical connection.						MEN X MINUTES	

7M1-3413-2-5

INSPECTION		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Electrical ground power unit. Temperature control ground test equipment. Cockpit access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Shut-off Valve - Rain Repellant	REF. NO. 22-4
AVRO PART NO. 7-2252-22	MANUFACTURER Barber-Colman	MAN'FR'S PART NO. DYLZ 5330	AIRCRAFT EFFECTIVITY 25201		
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To control the flow of air for the windshield rain repellant. Valve is controlled manually by a switch in the pilots cockpit. Temperature sensor closes the valve if air temperature rises above 250°F.					
LOCATION In the air conditioning equipment bay at the air-to-air heat exchanger outlet.					
ACCESS					MEN X MINUTES
Remove dorsal fairing rear of navigators cockpit by releasing six latches. Remove fan outlet duct. Remove 57 - 3/16 inch screws from the access panel positioned in the equipment bay roof and remove the access panel.					
REPLACEMENT PROCEDURE					MEN X MINUTES
Place valve in position. Connect two holding clamps. Connect one electrical connection.					

TM1-3813-2-5

INSPECTION							MEN X MINUTES		
Check for security, damage and corrosion.									
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Electrical ground power unit. Cockpit access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Regulator Valve - Cabin Pressure		REF. NO. 22-5	
AVRO PART NO. 7-2252-1		MANUFACTURER Normalair Canada Ltd.		MAN'FR'S PART NO. 511710		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Controls the cabin air discharge flow rate to maintain the cabin pressure to a given schedule. Controlled by a controller unit.							
LOCATION Fitted in the cabin air discharge duct in the air conditioning equipment bay on the forward face of bulkhead at station 255.							
ACCESS Remove 76 screws from the access panel at the undersurface of the fuselage positioned to the rear of navigators cockpit. Remove access panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place regulator in position. Fit six attachment bolts. Connect duct to the outlet side of regulator valve. Replace the cabin air discharge duct between the navigators bulkhead and valve, and connect duct to the inlet side of the regulator valve.						MEN X MINUTES	

INSPECTION Check for security, damage and corrosion.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cabin pressurization unit. Stop watch, pressure and temperature gauges. Electrical ground power unit.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Air-to-water Heat Exchanger (Evaporator and Water Tank)	REF. NO. 22-6
AVRO PART NO. 7-2254-12	MANUFACTURER Surface Combustion Corp.	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION Operates, as a part of the refrigeration system and reduces the temperature of engine bleed air for cabin and radar equipment cooling.					
LOCATION Air conditioning equipment bay at station 268.					
ACCESS Remove the dorsal fairing to the rear of the navigator's cockpit by releasing six latches. Remove 57 - 3/16 inch screws from the access panel on the air conditioning equipment bay roof and remove the access panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Place heat exchanger in position. Fit six 3/16 inch bolts to the heat exchanger and mounting. Connect the steam outlet duct to the heat exchanger. Place the turbine/fan unit in position. Connect two holding struts and bracket to the turbine/fan unit. Position the duct from the heat exchanger to the turbine into position and connect up. Connect the turbine outlet duct. Replace and connect the air-to-water heat exchanger inlet duct. Replace and connect the air-to-air heat exchanger to fan duct.					MEN X MINUTES

INSPECTION		Fill air-to-water heat exchanger with distilled water using the dipstick for checking the correct level. (For filling in cold weather use hot distilled water). Check for security, damage and corrosion.		MEN X MINUTES	
FUNCTIONAL CHECKS				MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT					
Distilled water and container. Electrical ground power unit.					
SPECIAL TOOLS TO REMOVE OR SERVICE					
REMARKS					
ISSUE	1				
DATE	16 Jan 57				

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Shut-off Valve - Radar Nose	REF. NO. 22-7
AVRO PART NO. 7-2252-201	MANUFACTURER Transco Products Inc.		MAN'FR'S PART NO. 2520-23	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To seal off the flow of cooling air to the radar nose, in order to conserve air for more vital equipment when the pilot operates the conditioned air supply switch to emergency.					
LOCATION In the nose wheel well at station 193 LH side.					
ACCESS In nose wheel well at station 193 LH side.					MEN X MINUTES
REPLACEMENT PROCEDURE Place valve in position. Fit four bolts to the valve and mounting. Connect an electrical connector.					MEN X MINUTES

INSPECTION Check valve for security, damage and corrosion. Check the electrical connector for security.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT Electrical ground power unit. Cockpit and B4 access stands.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Pressure Reducing and Non-return Valve	REF. NO. 22-8
AVRO PART NO. 7-2256-5	MANUFACTURER Airesearch (c/o Garrett Mfg. Co.)		MAN'FR'S PART NO. 108298	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 500 hours	
FUNCTION To reduce pressure of engine bleed air to 80-90 psig and to act as a non-return valve as a precaution against an engine failure.					
LOCATION On each engine, outboard at station 524.					
ACCESS Disconnect the main landing gear door jack concerned and secure door in the closed position. Remove 36 - 3/16 inch screws from an access panel positioned on the outer skin of the aircraft and remove the access panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Place valve in position. Connect two holding clamps. Reposition two small pipe lines and connect up.					MEN X MINUTES

INSPECTION Check for security and damage.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT Pressure gauge. External power supply. B4 access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Non-return Valve - Engine Bleed		REF. NO. 22-9	
AVRO PART NO. 7-2254-579		MANUFACTURER Normalair Canada Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To prevent return flow of engine bleed air.							
LOCATION Right and left hand of fuselage at station 489.							
ACCESS						MEN X MINUTES	
REPLACEMENT PROCEDURE Place the valve in position. Connect two holding clamps.						MEN X MINUTES	

INSPECTION		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Cockpit access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Ram Air Valve	REF. NO. 22-11
AVRO PART NO. 7-2252-3	MANUFACTURER Transco	MAN'FR'S PART NO. 3020-6	AIRCRAFT EFFECTIVITY 25201		
OVERHAUL LIFE: KNOWN-		ESTIMATED- 1500 hours			
FUNCTION Allows cooling air from the ram air duct to flow to the essential equipment when the valve is opened by operating the cockpit air conditioning switch to EMERG.					
LOCATION In the air conditioning equipment bay at each side of the fuselage at station 235.					
ACCESS Remove 76 - 3/16 inch screws from the access panel positioned on the undersurface of the fuselage to the rear of the navigator's bulkhead, disconnect the antenna and remove the access panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Place the valve in position. Fit four bolts to the valve and mounting. Connect the electrical connection.					MEN X MINUTES

INSPECTION							MEN X MINUTES		
Check for security, damage and corrosion.									
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Electrical ground power unit. Cockpit and B4 access stands.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Cooling Turbine/Fan Unit	REF. NO. 22-13
AVRO PART NO. 7-2254-1	MANUFACTURER Airesearch (c/o Garrett Mfg. Inc.)		MAN'FR'S PART NO. 201970	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 500 hours	
FUNCTION To reduce system air temperature.					
LOCATION Upper compartment of air conditioning equipment bay at station 274.					
ACCESS Remove the dorsal fairing to the rear of the navigators cockpit by releasing six latches. Remove the fan outlet duct. Remove 57 - 3/16 inch screws from the access panel positioned on the air conditioning equipment bay roof and remove the access panel.				MEN X MINUTES	
REPLACEMENT PROCEDURE Place the turbine/fan unit into position. Connect the two holding struts and bracket to the unit. Connect the outlet duct to the turbine. Connect the duct from the air-to-water heat exchanger to the turbine. Place the fan inlet duct into position and connect the duct to the fan and to the air-to-air heat exchanger using 24 3/16 inch bolts and one hinge pin.				MEN X MINUTES	

INSPECTION		Check for security, damage and corrosion. Listen when running for smooth operation. Remove to oil at specific periods and replace. Remove for overhaul.							
		MEN X MINUTES							
FUNCTIONAL CHECKS									
		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Air conditioning ground power unit. Cockpit access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Non-return and Electric Shut-off Valve - Cabin Air Supply	REF. NO. 22-17
AVRO PART NO. 7-2254-4	MANUFACTURER Airesearch (c/o Garrett Mfg. Inc.)	MAN'FR'S PART NO. 104588		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To prevent an immediate loss of cabin pressure in the event of a system failure at high altitude. Reduces air flow to the cabin when the landing gear is down.					
LOCATION Rear of the navigators bulkhead at station 240.					
ACCESS Remove 76 - 3/16 inch screws from the access panel positioned on the undersurface of the fuselage to the rear of the navigators bulkhead and remove the access panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Place the valve in position. Connect two holding clamps to valve and ducting. Connect an electrical connection to the valve. Replace the cabin discharge air duct.					MEN X MINUTES

INSPECTION Check for security, damage and corrosion.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cabin pressurization unit. Stop watch, pressure and temperature gauges. Electrical ground power unit. Cockpit and B4 access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Safety Valve - Cabin Pressure	REF. NO. 22-18
AVRO PART NO. 7-2252-328	MANUFACTURER Airesearch (c/o Garrett Mfg. Inc.)		MAN'F'R'S PART NO. 102058-1	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION Protects the cabin from a pressure differential, exceeding 5.25 - 5.75 psi. Can be used as a cabin pressure dump valve by operating a DUMP switch to ON.					
LOCATION Rear top face of the navigator's bulkhead.					
ACCESS Remove the dorsal fairing to the rear of the navigator's cockpit by releasing six latches.					MEN X MINUTES
REPLACEMENT PROCEDURE Place valve in position. Fit six 3/16 inch bolts to the valve and mounting. Wirelock bolts. Connect one electrical connector to the valve. Connect one pipe to the valve.					MEN X MINUTES

INSPECTION							MEN X MINUTES		
Check valve and electrical connector for damage, security and corrosion.									
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Cabin pressurization unit. Stop watch, temperature and pressure gauges. Electrical ground power unit. Cockpit access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

INSPECTION		MEN X MINUTES							
Check for security, damage and corrosion. Carry out a cockpit pressurization check.									
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Cabin pressurization unit. Stop watch, pressure and temperature gauges. Electrical ground power unit. B4 and cockpit access stands.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

7M1-3913-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Filter		REF. NO. 22-20	
AVRO PART NO. 7-2252-316		MANUFACTURER Normalair Canada Ltd.		MAN'FR'S PART NO. 511831		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 200 hours							
FUNCTION To exclude foreign material from the cabin air used by the relay valve and controller.							
LOCATION Front face of the navigators bulkhead.							
ACCESS Remove 76 - 3/16 inch screws from the access panel positioned to the rear of the navigators bulkhead. Disconnect the antenna and remove the access panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place the filter in position complete with sealing washer on the cockpit side of the navigators bulkhead. Fit two holding nuts to the filter. Connect one pipe line.						MEN X MINUTES	

INSPECTION		MEN X MINUTES							
		Remove and replace with a clean filter.							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Cockpit and B4 access stands.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Air-to-air Heat Exchanger	REF. NO. 22-21
AVRO PART NO. 7-2254-6	MANUFACTURER Airesearch (c/o Garrett Mfg. Co.)		MAN'FR'S PART NO. 83940	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION To reduce temperature of engine bleed air.					
LOCATION Air conditioning equipment bay at station 292.					
ACCESS Remove dorsal fairing to the rear of the navigator's cockpit by releasing six latches. Remove 57 - 3/16 inch screws from the access panel in the equipment bay roof and remove the access panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Place the air-to-air heat exchanger in position with a hoist. Attach the holding struts. Connect the ram and ramp inlet ducts to the heat exchanger. Connect the rain repellant, fuel pressurization ducts and air-to-water heat exchanger inlet duct to the heat exchanger. Connect the engine bleed ducting. Replace the duct to the fan and heat exchanger and attach with 24 - 3/16 inch bolts, a hinge pin, and clamp. Replace and connect up the ramp air outlet duct to the heat exchanger and dorsal outlet.					MEN X MINUTES

7M1-3413-2-5

INSPECTION Check for security, cracks and corrosion.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Sling and hoist for lifting heat exchanger from the aircraft. Wing mats. Cockpit access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Ground Connection - Low Pressure		REF. NO. 22-23	
AVRO PART NO. 7-2252-18		MANUFACTURER Normalair Canada Limited		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To facilitate connection of low pressure air from the air conditioning ground test unit to the aircraft.							
LOCATION On the undersurface of the left hand engine air intake at station 242.							
ACCESS The ground test unit connection is on the undersurface of the LH engine air intake at station 242. To dismantle the unit remove 76 3/16 inch screws from the access panel positioned on the undersurface of the fuselage, to the rear of the navigator's bulkhead. Disconnect the antenna and remove the access panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place the unit into position complete with gasket. Fit six 3/16 inch bolts to the unit and mounting. Connect duct to the unit.						MEN X MINUTES	

INSPECTION		MEN X MINUTES							
Check for security, damage and corrosion.									
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
B4 access stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Temperature Control Valve - Cabin Temperature Control		REF. NO. 22-28	
AVRO PART NO. 7-2252-11		MANUFACTURER Hamilton Standard (Canadian Pratt & Whitney)		MAN'FR'S PART NO. HS. 506337		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION		The proportional solenoid of this valve converts the electrical signal from the controller to a pneumatic signal which positions the valve. The position of the valve controls the amount of engine bleed air to be mixed with the turbine air entering the cabin air supply.					
LOCATION		In the cabin air supply duct assembly, air conditioning equipment bay at station 247.					
ACCESS		Remove 76 - 3/16 inch screws from the access panel positioned on the undersurface of the fuselage, disconnect the antenna and remove the access panel.				MEN X MINUTES	
REPLACEMENT PROCEDURE		Place the valve in position. Connect two holding clamps to the valve. Connect the 1/4 inch pipe line. Connect the electrical connector. Replace and connect the cabin discharge air duct.				MEN X MINUTES	

INSPECTION		MEN X MINUTES	
Check the valve and electrical connection for damage, security and corrosion. Check system with temperature control test equipment.			
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Temperature control test equipment. Electrical ground test equipment. Cockpit and B4 access stands.			
SPECIAL TOOLS TO REMOVE OR SERVICE			
REMARKS			
ISSUE	1		
DATE	16 Jan 57		

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Temperature Control Valve - Radar Temperature Control		REF. NO. 22-30	
AVRO PART NO. 7-2252-11		MANUFACTURER Hamilton Standard (Canadian Pratt & Whitney)		MAN'FR'S PART NO. HS. 506337		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION		The proportional solenoid of this valve converts the electrical signal from the controller to a pneumatic signal which positions the valve. The position of the valve controls the amount of engine bleed air to be mixed with the turbine air entering the radar equipment air supply.					
LOCATION		In the air conditioning equipment bay and fitted in the radar equipment air supply duct assembly.					
ACCESS		Remove 76 - 3/16 inch screws from the access panel positioned on the fuselage undersurface. Disconnect the antenna and remove the access panel.				MEN X MINUTES	
REPLACEMENT PROCEDURE		Place the valve in position. Connect two holding clamps to the valve. Connect a 1/4 inch diameter pipe line. Connect the electrical connector. Replace and connect the cabin air discharge duct.				MEN X MINUTES	

INSPECTION		MEN X MINUTES	
Check for damage, security and corrosion. Check system with test equipment.			
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Temperature control test equipment. Electrical ground power unit. B4 access stand.			
SPECIAL TOOLS TO REMOVE OR SERVICE			
REMARKS			
ISSUE	1		
DATE	16 Jan 57		

CF-105 SERVICE DATA

COMPONENT DATA SHEET

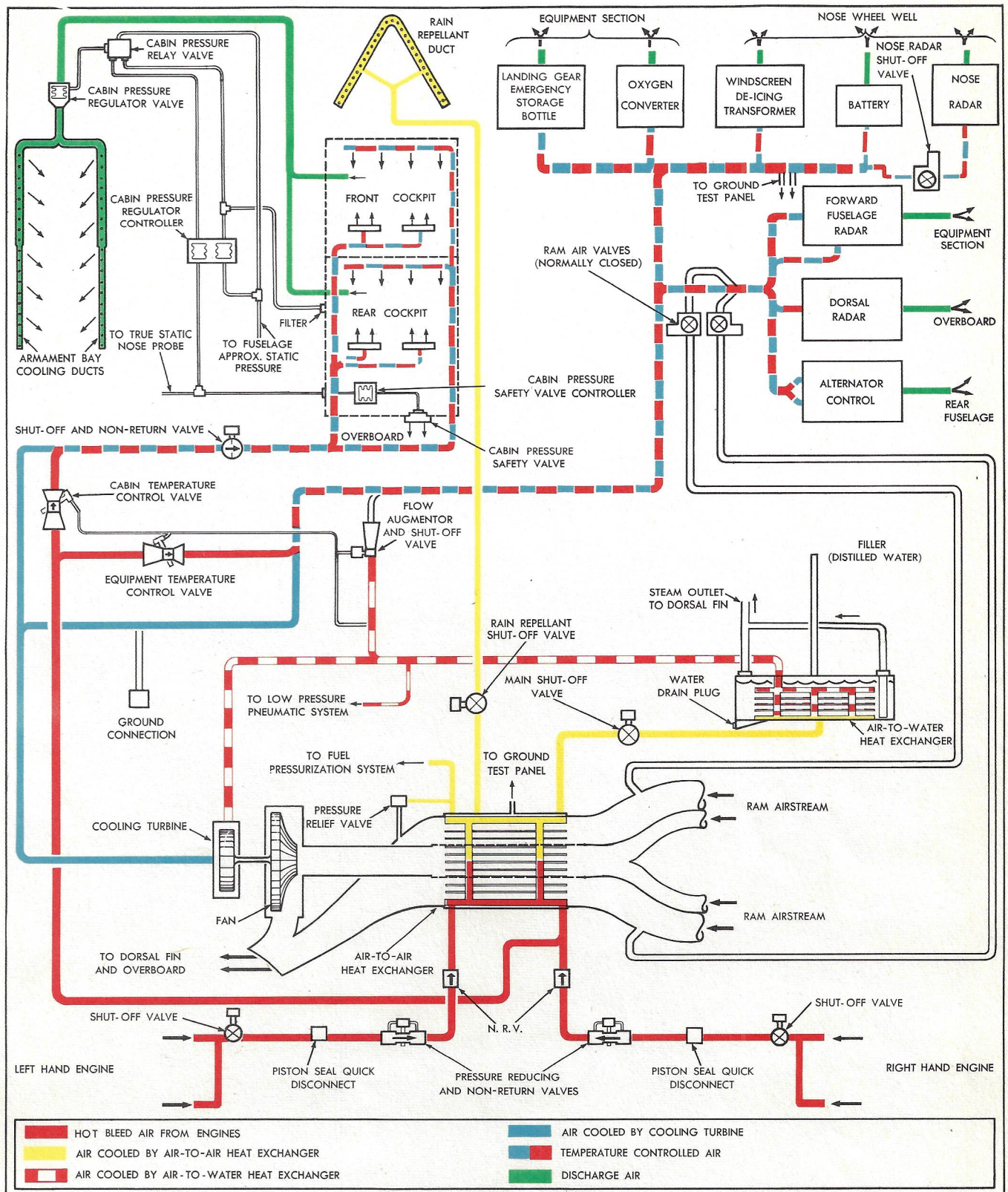
SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Shut-off Valve - Engine Air Bleed		REF. NO. 22-31	
AVRO PART NO. 7-2295-57 RH 7-2295-55 LH		MANUFACTURER Airesearch (c/o Garrett Mfg. Inc)		MAN'FR'S PART NO. 105596		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To shut-off engine bleed air to the system when an over pressure or over temperature condition is sensed in the engine bleed air line.							
LOCATION Engine bleed air manifold at the engine second compressor stage.							
ACCESS Accessible when the engine is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place valve in position. Fit eight mounting bolts. Connect the electrical connector.						MEN X MINUTES	

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM AIR CONDITIONING AND PRESSURIZATION		SUB-SYSTEM		COMPONENT Pressure Relay Valve	REF. NO. 22-33		
AVRO PART NO. 7-2252-728	MANUFACTURER Normalair Canada Ltd.	MAN'FR'S PART NO. 512610		AIRCRAFT EFFECTIVITY 25201			
OVERHAUL LIFE: KNOWN-		ESTIMATED- 1500 hours					
FUNCTION Relays cabin pressure conditions from the controller to the cabin pressure regulator valve. Corrects any surge of cabin pressure.							
LOCATION Mounted on the cabin pressure controller bracket on the navigator's seat bulkhead.							
ACCESS In the navigator's cockpit.					MEN X MINUTES <table border="1"> <tr><td></td><td></td></tr> </table>		
REPLACEMENT PROCEDURE Place the valve in position. Fit the screws to the valve and bracket. Connect three pipe lines. (Pipe lines are identified by coloured sleeves).					MEN X MINUTES <table border="1"> <tr><td></td><td></td></tr> </table>		

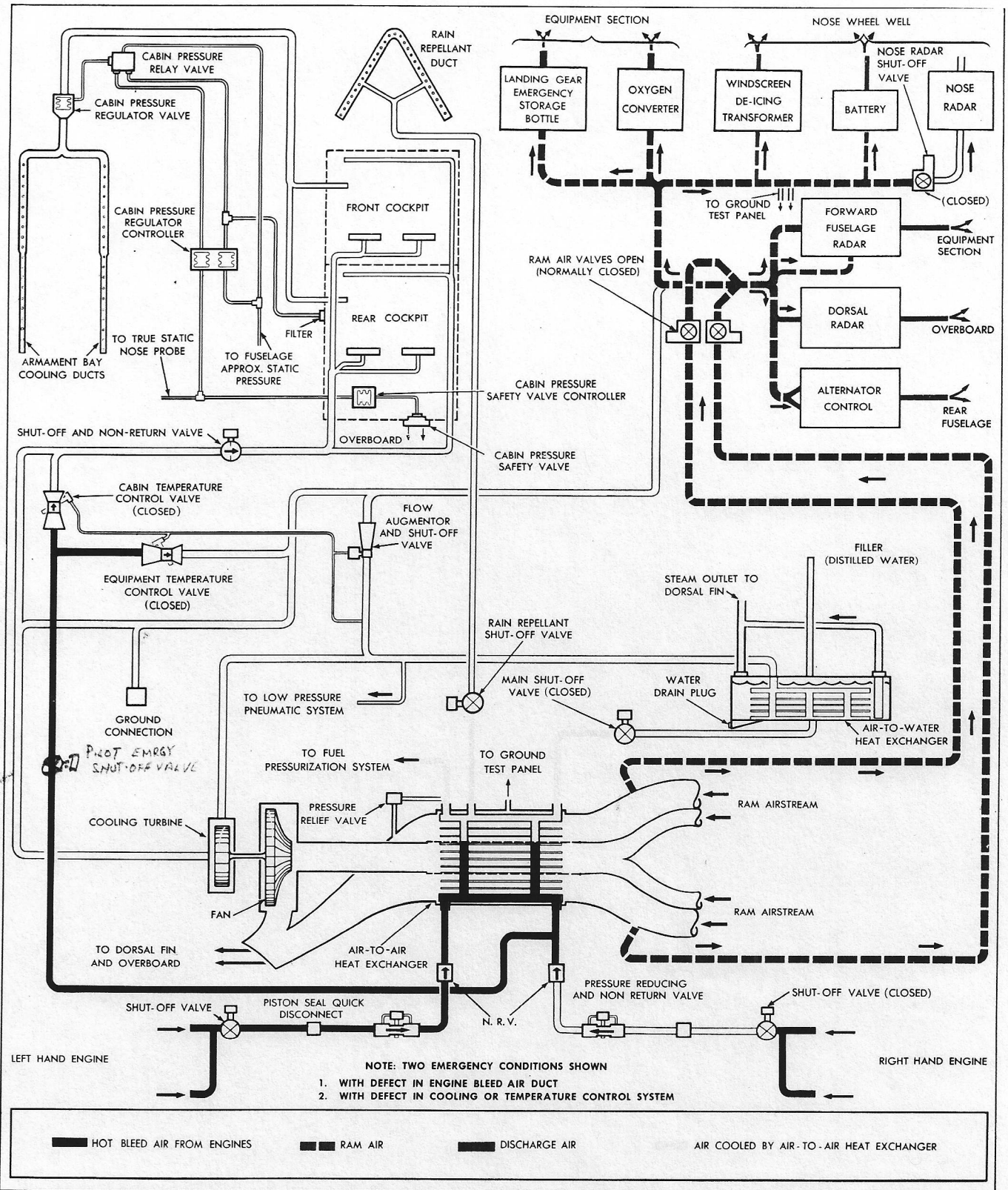
INSPECTION							MEN X MINUTES		
Check valve for security, damage and corrosion.									
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT Cabin pressurization ground test rig. Stop watch, pressure and temperature gauges. Electrical ground Power unit. B4 and cockpit access stands.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	16 Jan 57								



7M1-2701-2

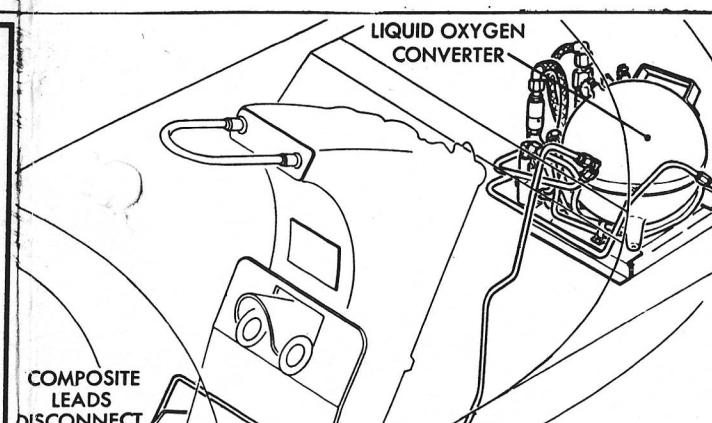
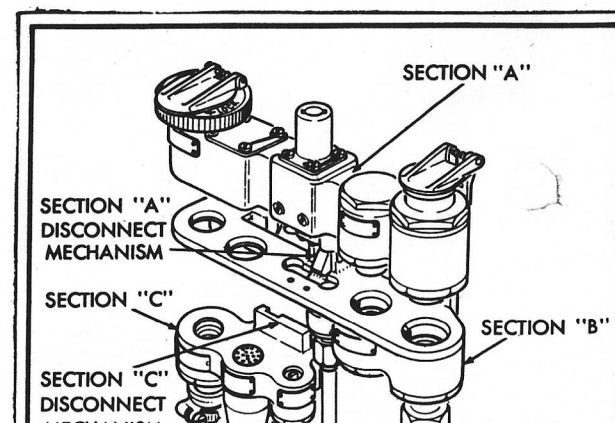
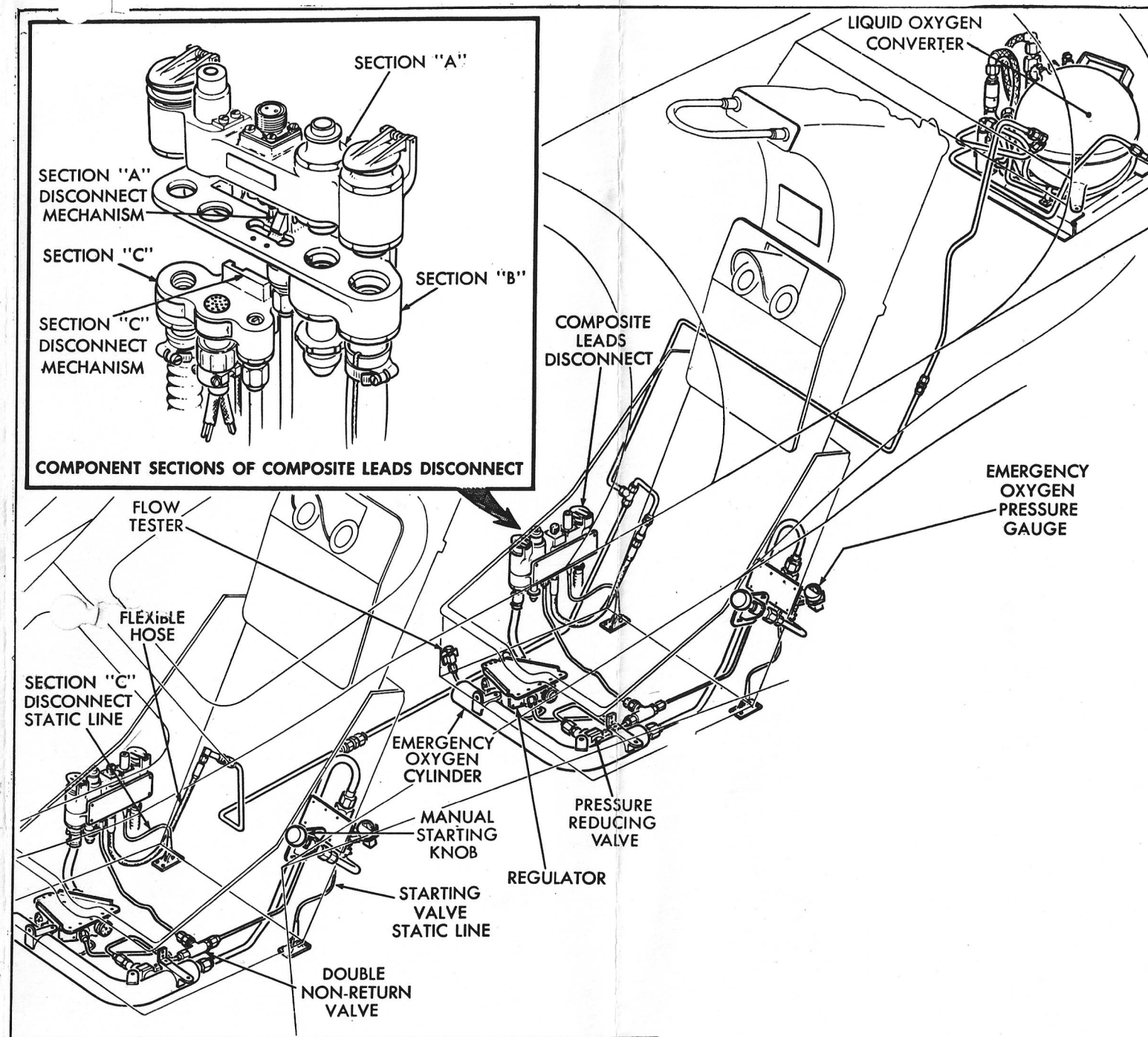
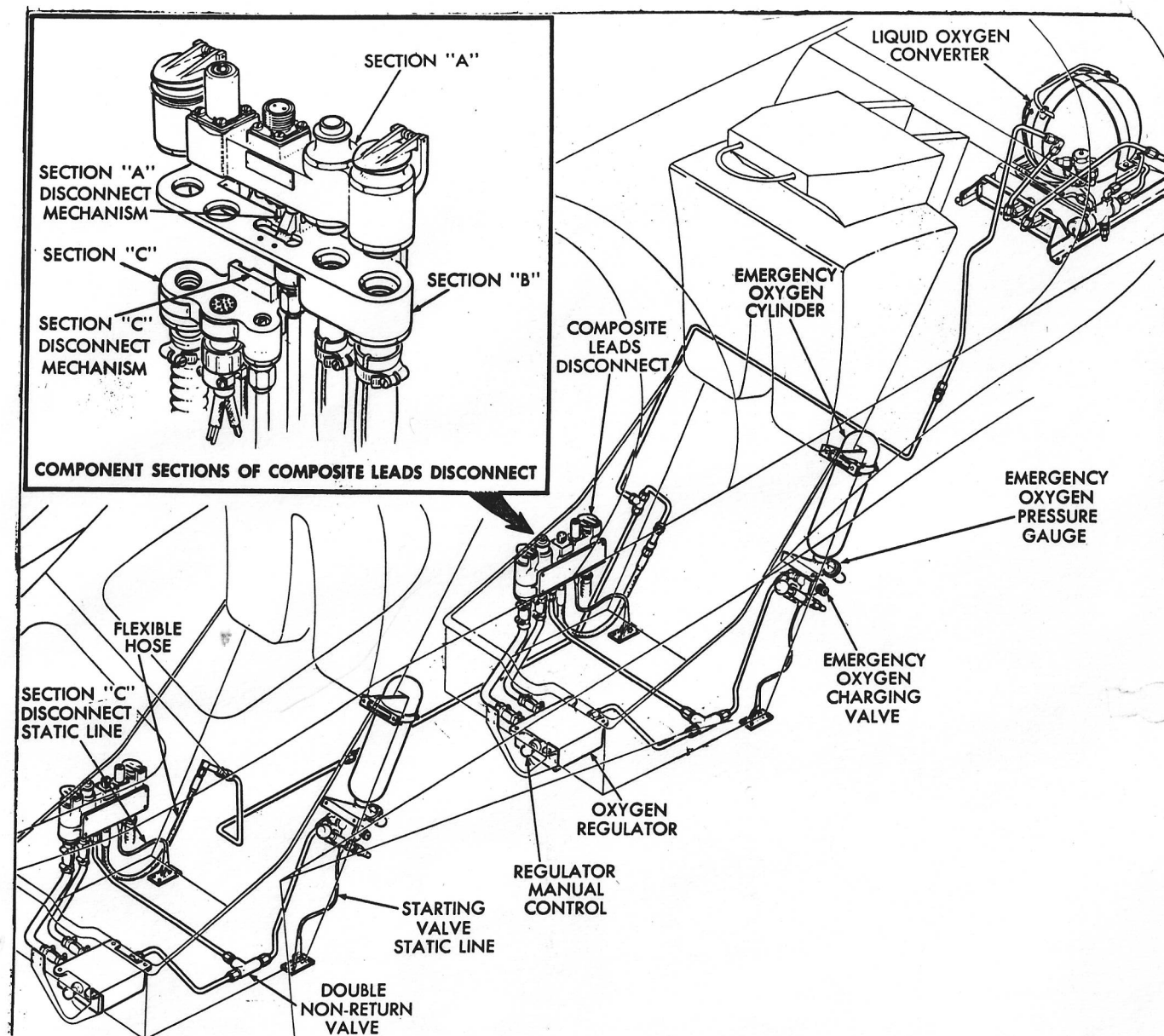
AIR CONDITIONING - NORMAL OPERATION

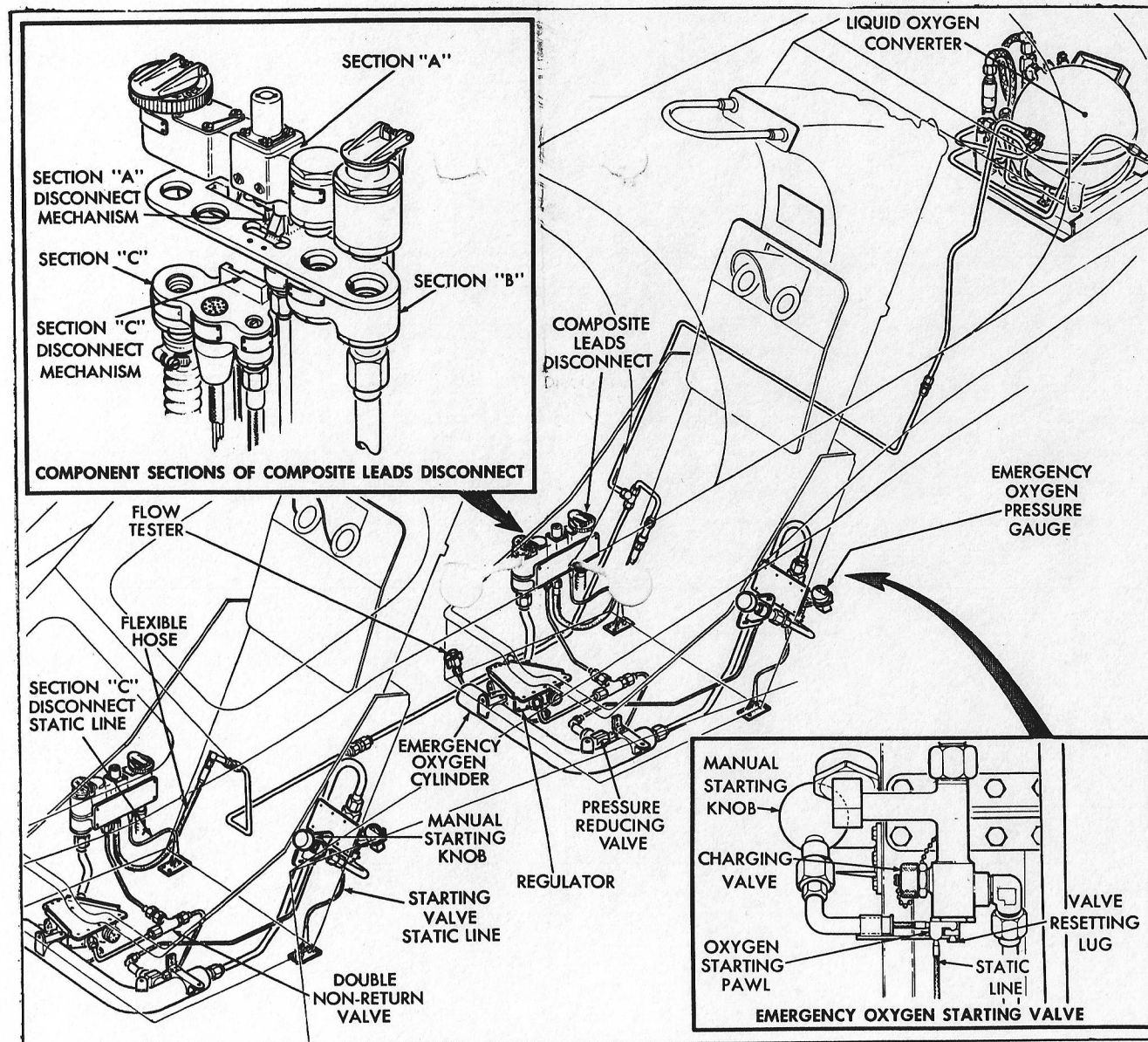
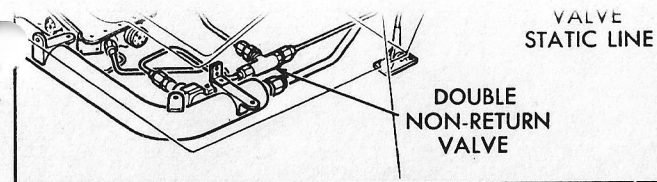
(this is an original)



7M1-2702-2

AIR CONDITIONING - EMERGENCY OPERATION





OXYGEN SYSTEM