TECHNICAL MANUAL
ORGANIZATIONAL MAINTENANCE

UNCLASSIFIED

COPY NO. 81

-2-4
VOL II

TECHNICAL MANUAL
ORGANIZATIONAL MAINTENANCE

POWERPLANT
(J75P-13)

MODELS U-2C AND U-2F AIRCRAFT

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VOL II

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iii	Original
iv	Original
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1-1 thru 1-13	Original
*1-14	22 Nov 65
1-15 thru 1-29	Original
*1-30	22 Nov 65
1-31 thru 1-78	Original
*1-79	22 Nov 65
1-80	Original
1-81	18 Oct 65
1-82 thru 1-88	Original
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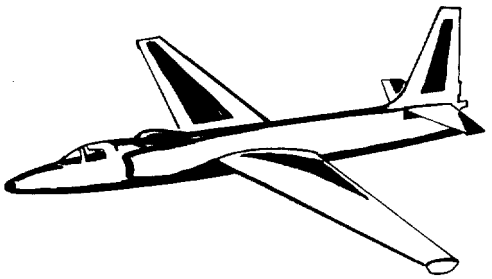


U-2

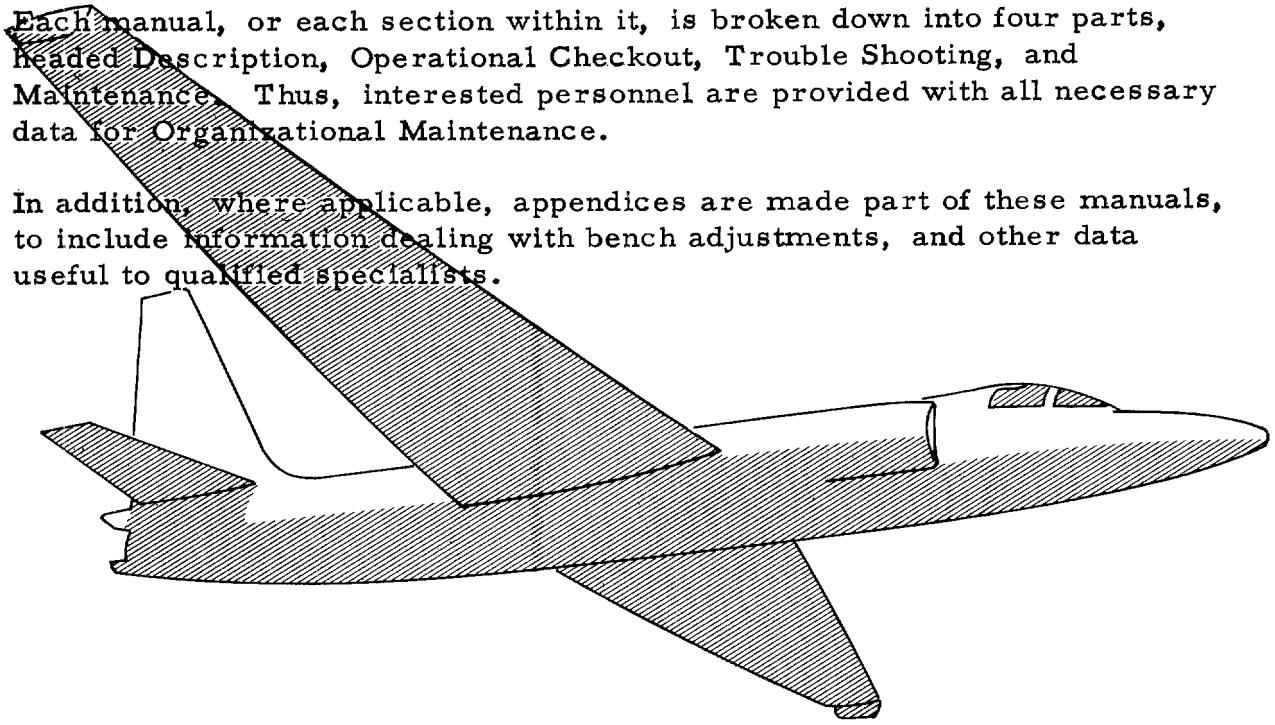
INTRODUCTION

This is one in a series of manuals which comprise the Technical Manual of Organizational Maintenance for U-2 aircraft.

Each manual in the series is a complete and separate book prepared in support of a particular system. (Some of these manuals, due to similarity or direct interrelation of system functions, contain added sections wherein the associated systems are covered.)

Each manual, or each section within it, is broken down into four parts, headed Description, Operational Checkout, Trouble Shooting, and Maintenance. Thus, interested personnel are provided with all necessary data for Organizational Maintenance.

In addition, where applicable, appendices are made part of these manuals, to include information dealing with bench adjustments, and other data useful to qualified specialists.



NOTES, CAUTIONS, AND WARNINGS

These adjuncts to the text are defined as follows:

Note - An operation, procedure, condition, et cetera, which it is essential to emphasize.

CAUTION - Operations, procedures, practices, et cetera, which if not strictly observed, will result in damage to or destruction of equipment.

WARNING - Operations, procedures, practices, et cetera, which will result in personal injury or loss of life, if not correctly followed.

LIST OF U-2 TECHNICAL MANUALS

MANUAL NO.	TITLE
-2-1	General Airplane, Airframe, Landing Gear
-2-2	Flight Controls and Instruments
-2-3	Air Conditioning and Pressurization
-2-4 VOL I	Powerplant J57
-2-4 VOL II	Powerplant J75
-2-5	Fuel System and Hydraulic System
-2-6	Oxygen System
-2-7	Electrical and Electronics
-2-8	Ground Handling
-2-9	Special Equipment
-3-1	Structural Repair Instructions
-6-1	Inspection Requirements

VOL II

TABLE OF CONTENTS

J75 POWERPLANT

CONTENTS

VOL II

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (CONT'D)

LIST OF TABLES

VOL II

LIST OF TABLES (CONT'D)

DESCRIPTION

1-1. ENGINE.

1-2. GENERAL.

1-3. The J75P-13 engine (See figures 1-1 and 1-2.) is a continuous flow, turbojet engine incorporating an axial flow compressor, an eight unit canannular combustion chamber and a split three stage reaction turbine.

1-4. The multistage axial flow split compressor consists of an eight stage low pressure unit, which is connected by a through-shaft to the second and third stage turbine wheels, and a seven stage high pressure, high speed unit, which is connected by a hollow shaft to the first stage turbine wheel.

1-5. The accessory section is located under the "wasp waist" of the compressor section.

1-6. The tailpipe assembly is attached to the turbine exhaust case and extends to the augmentor assembly.

1-7. SPLIT COMPRESSOR OPERATION.

1-8. Greater flexibility for starting and part load operation is achieved by splitting the compressor into two mechanically separated rotors. Each rotor is driven by separate turbines. The low pressure rotor being free to rotate at its best speed.

1-9. The starter drives but one section, thus reducing the size and weight of the starting system.

1-10. The high pressure rotor is geared to the starter drive because it is the smaller of the two and so requires the lesser torque for starting.

1-11. With the rear or high pressure compressor rotor turning at the governed speed, the front or low pressure compressor rotor is rotated by its turbine at the rpm ensuring optimum flow through the compressor.

1-12. JET ENGINE SYMBOLS AND THEIR MEANING.

1-13. The following list of jet engine symbols (See figure 1-3.) represents most of the more common everyday symbols that you will find used in this text as well as on the flight or maintenance line.

F_n net jet thrust, lb

N_1 low pressure compressor rotational speed, rpm

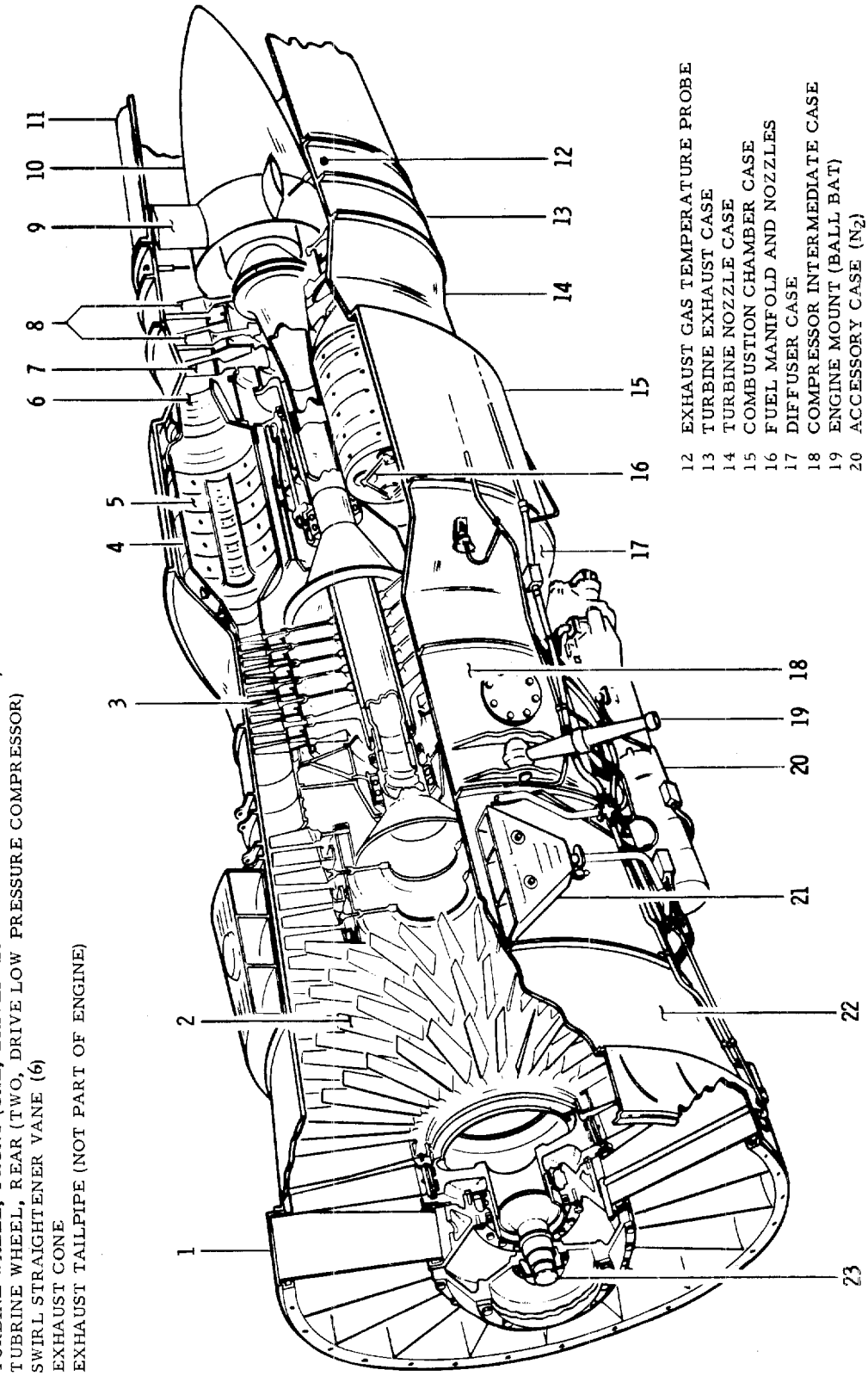


Figure 1-1. Cutaway of J75 Engine

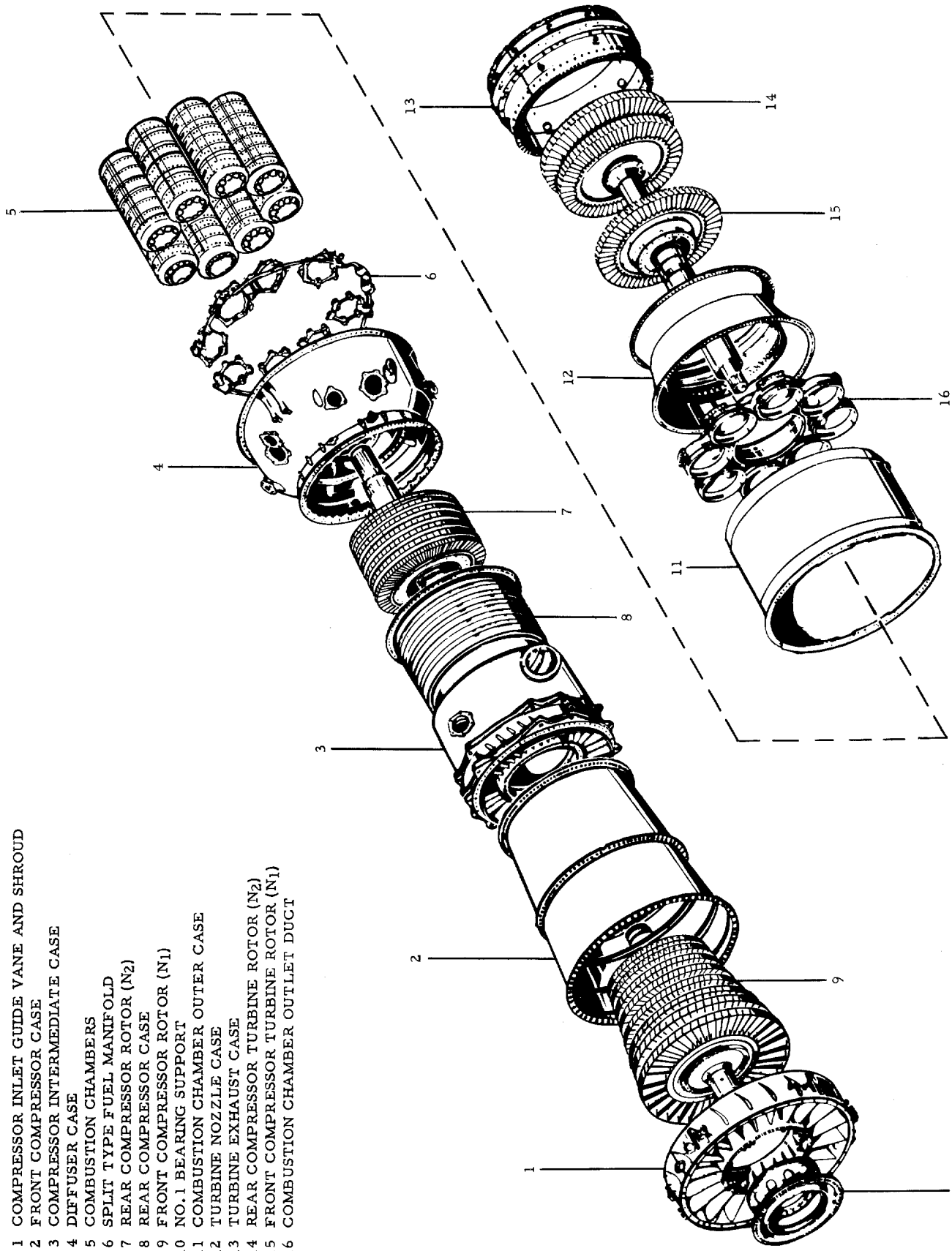


Figure 1-2. Major Engine Components (Typical)

N_2 high pressure compressor rotational speed, rpm

P_{am} ambient absolute pressure

P_{t1} total pressure at entrance to inlet duct

P_{t2} total pressure at low pressure inlet

P_{t3} total pressure at low pressure discharge

P_{t4} total pressure at high compressor discharge

P_{t7} total pressure at low pressure turbine outlet

t_{am} ambient temperature, ^{o}F

t_{t2} temperature at low compressor inlet, ^{o}F

T_{t2} total temperature at low compressor inlet

T_{t7} total temperature at low pressure turbine inlet

tsfc thrust specific fuel consumption, pound of fuel hour per pound of thrust

W_f engine fuel flow, lb/hr

1-14. SYMBOL SUBSCRIPTS.

Example - P_{t4}:

P Means pressure, but what pressure and where?

t Means total pressure as differentiated from static pressure

4 Means engine reference station No. 4 (See figure 1-3.)

Thus P_{t4} means total pressure existing at the discharge of the high compressor. The engine reference station numbers will be among the most common subscripts used. Some more of the common ones are as follows:

1-15. SUBSCRIPTS.

am ambient (t_{am})

b burner, combustion chamber (P_b)

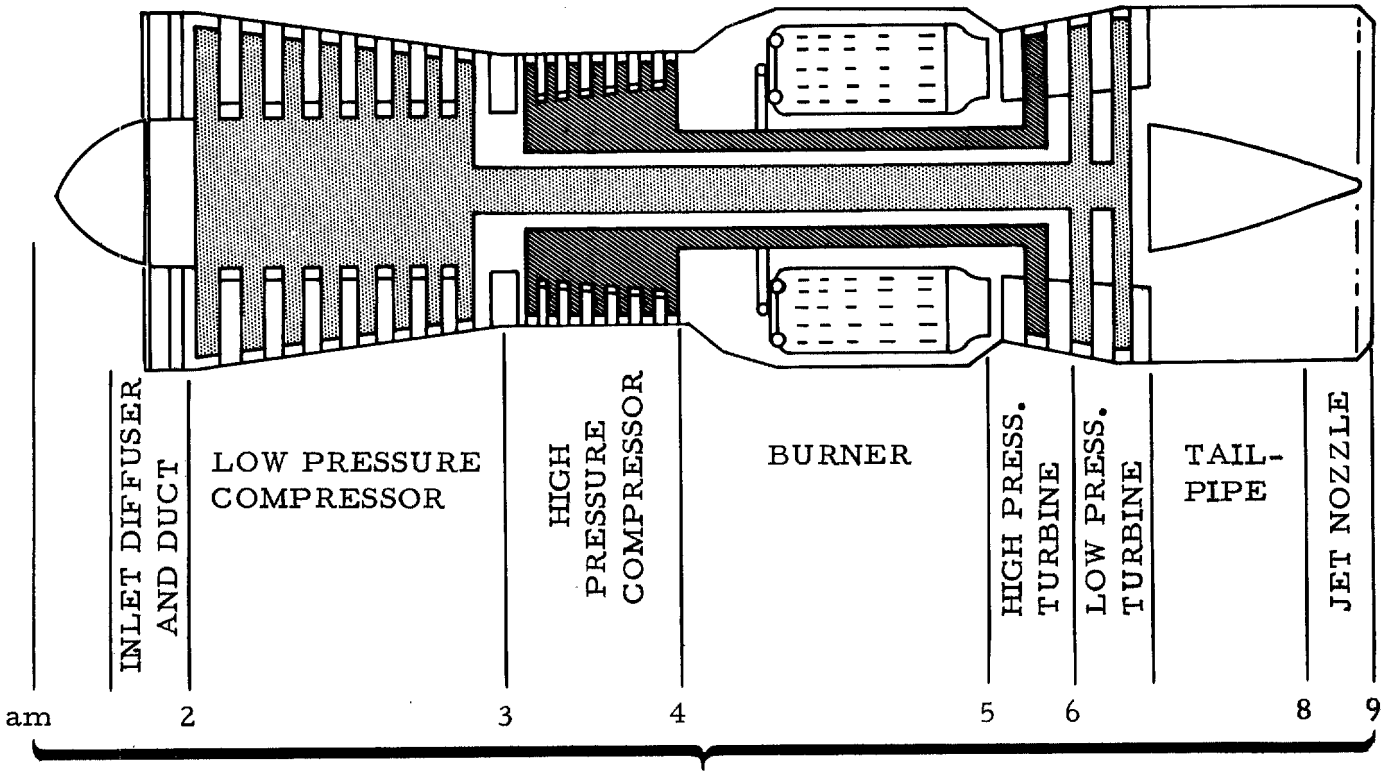
c compressor (η c)

e exhaust, exit

f fuel (W_f)

s static (P_s)

t total (pt); turbine (η t)



It is customary in the jet engine field to utilize engine reference stations when wishing to indicate the characteristics of the many aerodynamic or thermodynamic variables at a specific point in the air's progress through the engine. The standard location of these reference stations, for dual rotor type axial flow compressor jet engines, are shown above.

Figure 1-3. Dual Rotor Type Engine Reference Stations

VOL II

1-16. ENGINE AIRFLOW.

1-17. Air enters the engine (See figure 1-4.) through the compressor inlet guide vane and shroud assembly (1). Air from this source enters the front compressor (2), which consists of eight rotor stages and seven vane stages. The gas path of this compressor has an increasing inside diameter and a decreasing outside diameter. The front compressor provides initial compression of air.

1-18. The compressor intermediate case (4) separates the front compressor (2) from the rear compressor (3). Inlet vanes (8th stage) direct compressed air from the front compressor (2) to the rear compressor(3).

1-19. The rear compressor (3) has seven rotor stages and six vane stages. The gas path of this compressor has an increasing inside diameter, and a constant outside diameter. As the air passes through, it increases from low velocity to high velocity.

1-20. The diffuser case (5) serves to diffuse the air flow discharged by the rear compressor and adapt it for entry into the combustion chambers. The exit guide vanes, mounted in the air stream in the forward part of the case, accomplish diffusion and widening of the air passage formed by the inner inlet duct. The inner diameter of the case diverts the air to the combustion chambers for burning.

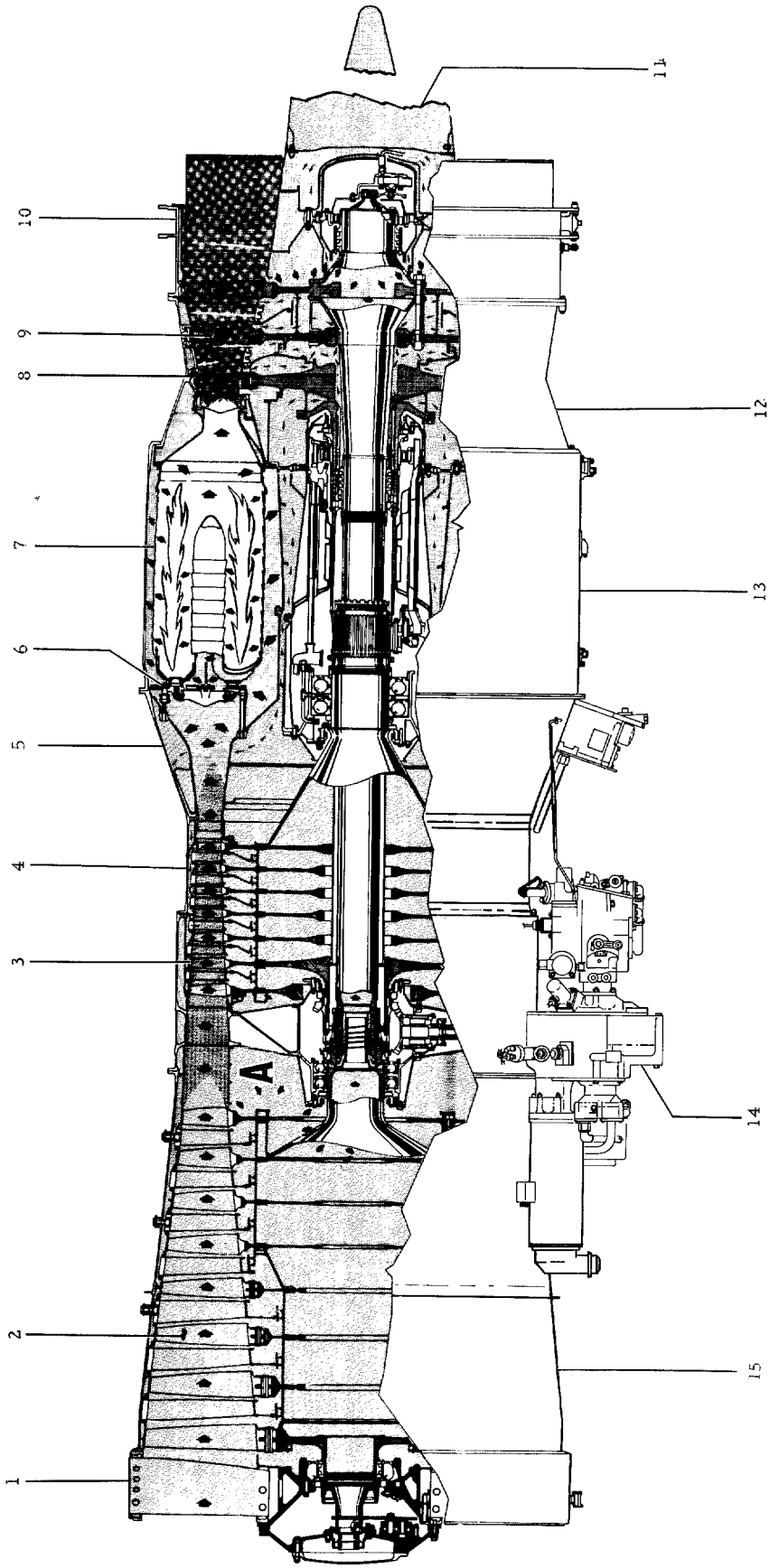
1-21. Most of the highly compressed air discharged from the front and rear compressors passes into the combustion section, there it combines with fuel from the nozzles to form a combustible fuel-air mixture. When the fuel-air mixture is ignited, the exhaust-gases are heated and accelerated, then discharged into the turbine section. As the gases leave the turbine, their pressure forces them at very high speeds through the jet nozzles at the rear of the engine producing reactive thrust.

1-22. From the combustion chambers (7), the gases enter the turbines, producing power to drive the front and rear compressors, and fuel pump and accessories. After the gases leave the turbines, their pressure forces them at very high speeds through the jet nozzle at the rear of the engine. The engines thrust comes from taking a large mass of air in at the front end and pushing it out the jet nozzle at a much higher speed than it had when it entered the front compressor.

1-23. ENGINE BLEED AIR SYSTEM.

1-24. GENERAL.

1-25. Air is bled from the engine primarily for cabin pressurization. Two high pressure bleed ports on the engine are used for this purpose. A high pressure line for hydraulic tank pressurization and fuel tank pressurization is taken off the cabin pressurization line. The maximum pressure available at the high pressure port is 160 psig.



A 8TH STAGE COOLING AIR

1 COMPRESSOR INLET GUIDE VANE AND SHROUD
2 FRONT COMPRESSOR ROTOR
3 REAR COMPRESSOR ROTOR
4 COMPRESSOR INTERMEDIATE CASE
5 DIFFUSER CASE
6 FUEL MANIFOLD AND NOZZLES
7 COMBUSTION CHAMBERS
8 REAR COMPRESSOR TURBINE ROTOR
9 FRONT COMPRESSOR TURBINE ROTOR
10 TURBINE EXHAUST CASE
11 EXHAUST CONE
12 TURBINE NOZZLE CASE
13 COMBUSTION CHAMBER OUTER CASE
14 ACCESSORY SECTION (N_2)
15 FRONT COMPRESSOR CASE

Figure 1-4. Engine Airflow (Typical)

1-26. ENGINE BLEED AIR MANIFOLD. An engine bleed air manifold, constructed of corrosion resistant steel tubing is bolted to the engine. The manifold connects to two high pressure bleed air ports on the top right-hand side of the engine diffuser case. These ports come equipped with Pratt and Whitney short bolts, covers, and gaskets.

Note

To install the bleed air manifold longer bolts must be used. (Refer to Engine Buildup.)

1-27. HYDRAULIC TANK PRESSURIZATION. The high pressure bleed air system of the engine is used to pressurize the hydraulic tank. A quarter inch tee is plumbed into the high pressure line taken off the cabin pressurization line. From the tee a corrosion resistant steel tube is plumbed to a pressure regulator in the fuselage. For additional information, refer to -2-5 Maintenance Manual.

1-28. FUEL TANK PRESSURIZATION. The fuel tanks are pressurized by engine bleed air through the pressure regulator for level flight and descent conditions, and by air expansion during a climb. The tank pressurization air is taken off the engine compressor bleed line above and aft of the sump tank by a one-half inch steel line. For additional information, refer to -2-5 Maintenance Manual.

1-29. ENGINE COOLING AIR SYSTEM.

1-30. COMPRESSOR AIR. (See figure 1-4.)

1-31. FRONT COMPRESSOR AIR. Cooling air for the rear face of the third stage turbine disc is furnished by the front compressor. Leakage at the rear of the eighth stage compressor blade platform enters the front compressor rotor assembly through holes in the front compressor rear hub. The air then enters the front end of the front compressor drive turbine shaft and passes rearward through the hollow shaft. Cooling air leaves the shaft through holes in the front compressor drive turbine hub. Some of the air is directed past the double air seal on the hub, along the rear face of the third stage turbine disc and mixes with the exhaust gases. The remaining air passes rearward through holes in the No. 6 bearing seal housing flange, the bearing support, and the No. 6 bearing oil suction pump cover flange to the annulus formed by the cover and the No. 6 bearing rear heatshield. Air leaving the rear of the heatshield passes outward to enter holes at the inner end of the No. 6 bearing oil pressure, oil scavenge and breather inner tubes and flows outward along the tubes, leaving by means of holes in the tube heatshields to mix with the exhaust gases.

1-32. REAR COMPRESSOR AIR. Rear compressor cooling air passes through drilled holes in the twelfth stage compressor stator outer shroud and enters the passage formed by the inner diameter of the necked down portion of the diffuser case and the rear compressor stator outer shrouds. The air then enters holes in the outer ends of the diffuser case struts and flows inward to leave by means of holes at the inner ends of the struts. The cooling air then passes rearward between the combustion chamber inner case and the turbine shafts heatshield. From there it passes through holes in the rear flange of the combustion chamber inner case to the air space between the turbine front bearing seal housing and the turbine seal support. Cooling air for the front face of the first stage turbine disc leaks past the double air seal of the seal support and flows outward along the disc face to mix with the exhaust gases.

1-33. Cooling air for the rear face of the first stage turbine disc and the front and rear face of the second stage disc and the front face of the third stage disc passes between the low compressor shaft and the inner diameter of the first and second stage turbine disc. After the air passes the first stage disc it flows outward past the single air seal of the second stage turbine nozzle to cool the rear face of the first stage disc and past the double air seal on the front face of the second stage disc to cool the front face of the second stage disc. After the air passes the second stage turbine disc, the air flows through the holes in the inner seal between the second and third stage disc. After serving to cool the rear face of the second stage turbine disc and the front face of the third stage turbine disc the air passes outward to mix with the exhaust gases.

1-34. EXTERNAL COOLING AIR.

1-35. ENGINE COMPARTMENT AND AFT SECTION COOLING. The engine compartment and aft fuselage section are cooled by means of flush scoops.

a. On U-2C airplanes the flush scoops are located as follows: top engine hoist cover, and left and right-hand engine mount access covers.

b. On U-2F airplanes the flush scoops are located as follows: upper left and right fairing covers (F.S. 420) and left and right engine mount access covers.

1-36. Additional cooling for the portion aft of the engine burner section is obtained from the oil cooler air scoop on the left-hand side and the hydraulic and oil cooler air scoop on the right-hand side.

1-37. All cooling air is exhausted at the aft end of the airplane, between the augmentor and the tailpipe.

1-38. Heat shields in the upper half of the airplane in the area of the hot section of the engine protect the structure from radiated heat.

VOL II

1-39. AUGMENTOR ASSEMBLY. The augmentor assembly, Part No. 75P1, is located in the aft section of the airplane.

1-40. It is fabricated from corrosion resistant steel and is supported on a bulkhead at the forward end and eight spring clips at the aft end.

1-41. The augmentor is designed to provide pumping of cooling air for aft section as well as cooling for the air-oil cooler during ground running of the engine.

1-42. ENGINE MOUNTED ACCESSORIES.

1-43. GENERAL.

1-44. Engine mounted accessories (see figure 1-5.) are located on the N_1 and N_2 accessory sections.

1-45. AC GENERATOR. The ac generator is a 208 volts, 400 cps, at 6000 rpm, 3 phase, 30 kva unit, Bendix type 28B54-14A. It is a class C, high temperature, salient pole, brushless generator.

1-46. The ac generator is mounted on an adapter on the centerline of the front accessory section. It is directly coupled to the N_1 rotor and is driven at N_1 rotor speed. This engine pad gear ratio is 1:1 (N_1).

Note

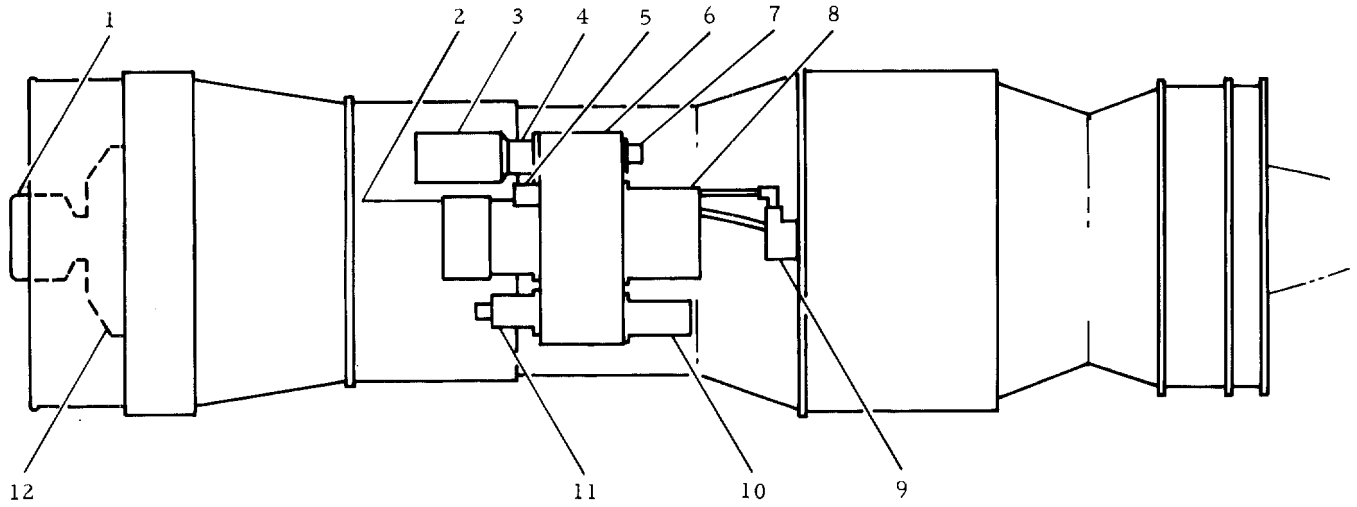
When installing the generator, no gasket is used between the generator adapter flange and engine pad.

1-47. The ac generator is air-cooled and receives the air through the left-hand boundary layer scoop. A two inch diameter aluminum tube ducts the air aft to the blast cap of the generator. Refer to -2-7 Maintenance Manual for details.

1-48. STARTER. The engine starter is an air turbine type, Model ATS140-29-1, Airesearch Part No. 350520 or Model ATS140-16-1, Airesearch Part No. 210250.

1-49. The starter is mounted on six studs provided on the center pad of the oil pump and accessory drive gearbox. The engine pad gear ratio is 0.823:1 (N_2).

1-50. DC GENERATOR. The dc generator installed in J75 equipped airplanes is a Bendix 30B26-21A. It is a 400 ampere generator and is derated at altitude to a maximum of 225 amperes.



BOTTOM VIEW

1. AC GENERATOR
2. STARTER
3. DC GENERATOR
4. GENERATOR ADAPTER
5. ENGINE OIL PUMP ASSEMBLY
6. OIL PUMP AND ACCESSORY DRIVES GEARBOX (N_2)
7. TACHOMETER GENERATOR
8. FUEL CONTROL
9. FUEL PRESSURIZING AND DUMP VALVE
10. FUEL PUMP
11. HYDRAULIC PUMP
12. FRONT ACCESSORY SECTION (N_1)

Figure 1-5. Accessory Location

1-51. The generator is mounted on a gearbox which is mounted on the left-hand (forward) side of the oil pump and accessory drive gearbox. The mounted gearbox, Part No. 75P29, is used to change the engine pad ratio of 0.433:1 (N_2) to 0.866:1 (N_2). This provides the necessary step-up in rpm to run the generator.

1-52. There are three Allen head plugs in the engine accessory pad, one in the mounting face, which is the oil supply hole and mates with a hole in the gearbox. The other two are located in the accessory pad recess and are oil return holes which drain into the accessory gear case of the engine.

Note

Be sure the Allen plugs in the accessory pad oil holes have been removed before installing the gearbox.

1-53. As noted on the nameplate of the gearbox, use only the designated pad gasket between the gearbox and engine accessory pad. This is to ensure that oil will pass from the engine oil system into the gearbox.

1-54. The dc generator is air-cooled and receives the air through a scoop on the bottom just forward of the generator. A two inch diameter aluminum tube ducts the air aft to a flame proof flexible duct which connects to a special blast cap bolted to the generator.

1-55. The generator speed versus the engine speed is given in table 1-1.

Table 1-1. Generator Speed versus Engine Speed

GENERATOR RPM	ENGINE RPM (N_2)	% RPM (APPROX)
3500	4265	49
4500	5485	63
6200	7560	87

1-56. FUEL CONTROL. The fuel control is a hydromechanical unit manufactured by Hamilton Standard, Model No. JFC-25-15.

1-57. The fuel control is mounted on six studs on the left-hand (aft side) pad of the oil pump and accessory drive gearbox. The engine pad gear ratio is 0.433:1 (N_2). Refer to Engine Fuel System for details.

1-58. FUEL PRESSURIZING AND DUMP VALVE. The fuel pressurizing and dump valve is a pressure operated check valve, manufactured by Pratt and Whitney Aircraft.

1-59. It is mounted with two bolts on the outside of the engine diffuser case at its rear bottom center. Three lines connect to the fuel pressurizing and dump valve and must be disconnected at the time that the valve is being removed.

1-60. ENGINE FUEL PUMP. The fuel pump is a single gear type unit with booster manufactured by Pesco Products, Inc.

1-61. The fuel pump is mounted on six studs on the right-hand (aft) side of the oil pump and accessory drive gearbox. The engine pad gear ratio is 0.433:1 (N_2).

1-62. HYDRAULIC PUMP. The hydraulic pump is a variable delivery type with integral flow regulation, controlled by system pressure.

1-63. The hydraulic pump is mounted on six studs on the right-hand forward side of the oil pump and accessory drive gearbox. The engine pad gear ratio is 0.433:1 (N_2). The pressure, suction, and bypass connections are made through flexible hoses and disconnect at the pump for engine removal.

1-64. TACHOMETER GENERATOR. The tachometer generator is a two pole alternating current generator, Part No. AN5544-3.

1-65. The tachometer generator is mounted on the left-hand aft side of the oil pump and accessory drive gearbox. The engine pad gear ratio is 0.481:1 (N_2) and indicates only the speed of the high pressure compressor rotor.

1-66. INTAKE AIR SYSTEM.

1-67. GENERAL.

1-68. The engine intake air system consists of two branches of air ducting extending from intakes at the sides of the airplane from fuselage station 267 to fuselage station 365 where they converge to form a cylindrical inlet to the engine.

1-69. The interior of the intake ducts is zinc chromated from the aft end of the leading edge to the aft end of the duct.

1-70. COMPONENTS.

1-71. The intake air system is composed of the scoop nose, fuselage station 267 to fuselage station 319, and the duct from fuselage station 319 to fuselage station 365.

1-72. The essential differences between the scoop and the duct is one of location; the scoop is outside the airplane and the duct is inside.

1-73. Fuselage station 319 bulkhead is the member which effects the scoop to duct transition. The scoop, being external, has an outside skin which provides fairing over the structural rings in addition to an inside skin which forms an air duct wall. The duct is a simple sheet metal part encircled by rings at a six inch spacing.

1-74. ENGINE INSTRUMENTS.

1-75. GENERAL.

1-76. The engine instruments consist of the tachometer, exhaust gas temperature, engine oil pressure, engine oil temperature, and engine pressure ratio indicating systems.

1-77. TACHOMETER INDICATING SYSTEM.

1-78. The tachometer system (See figure 1-6.) provides a visual indication in the cockpit of the high pressure compressor rotor (N_2) rpm in percent of cruise.

1-79. The tachometer generator is engine-driven and supplies the indicator with a continuous signal during engine operation. The strength of the signal varies with rpm, enabling the tachometer indicator to indicate rpm to the pilot.

1-80. Refer to -2-7 Maintenance Manual for electrical circuit wiring diagram.

1-81. TACHOMETER INDICATOR. This indicator is located on the upper right-hand corner of the center instrument panel. It receives a signal from the tachometer generator. The signal strength varies as a function of rpm. Indicator calibration is based on the tachometer generator turning at 4200 rpm at 100 percent. One hundred (100) percent on the indicator is equivalent to 8730 rpm of (N_2).

1-82. The indicator is composed of a mechanism which gives percentage indications of high pressure compressor rotor speed. The mechanism is enclosed in a hermetically sealed case.

1-83. The instrument has a range of 0 to 110 percent and is driven by a three phase permanent magnet rotor. Electrical connections to the indicator are made at a single mating plug on the unit.

1-84. TACHOMETER GENERATOR. The tachometer generator, AN5544-3 (MIL-G-6027), is a two pole alternating current generator driven by the engine at a maximum speed of 4200 rpm during military operation. The generator supplies a signal to the indicator, enabling the indicator to indicate rpm. It is mounted on the accessory case pad located on the left-hand aft side of the engine.

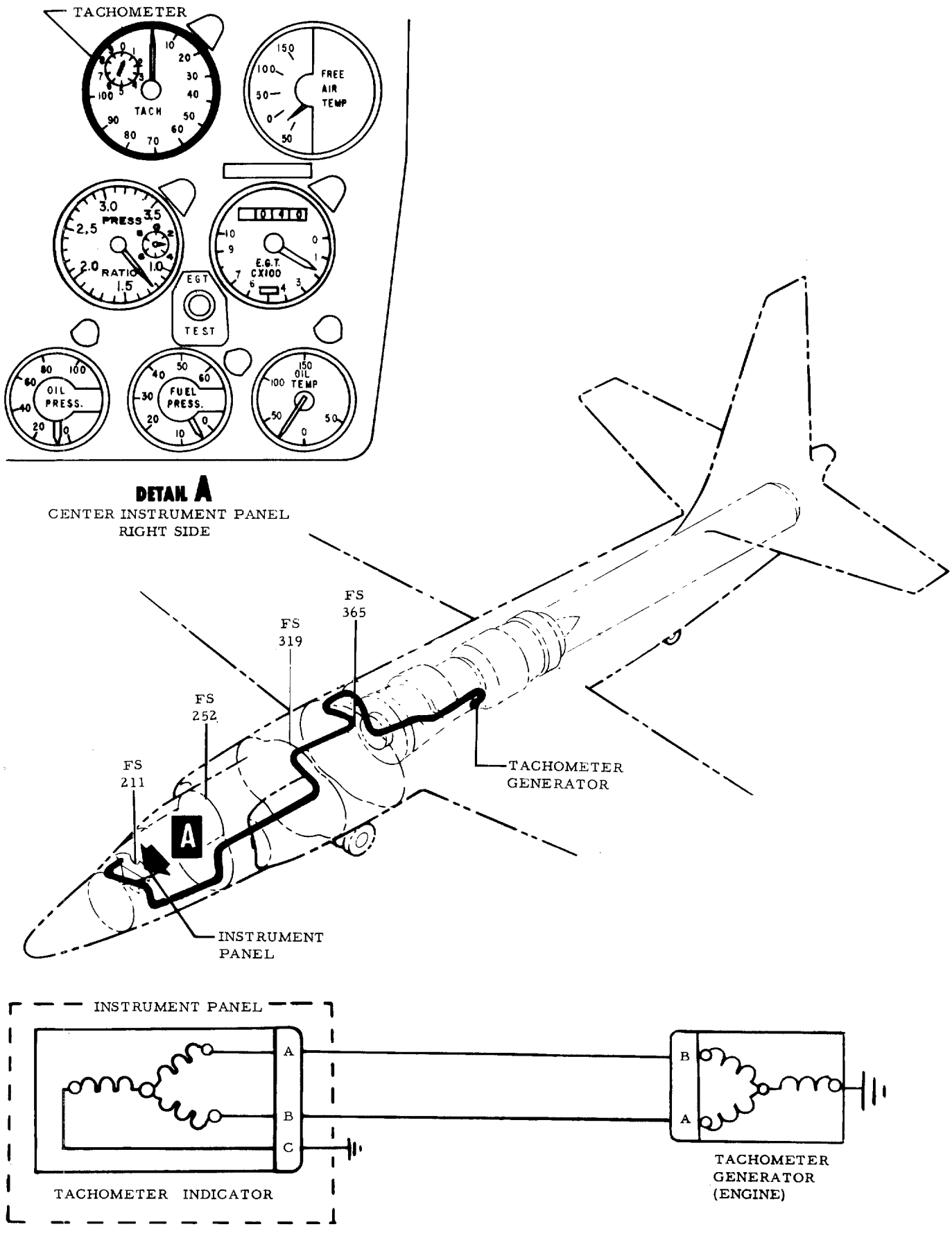


Figure 1-6. Engine Tachometer System

1-85. The pad gear ratio is 0.481:1 (N_2) high pressure compressor rotor.

1-86. EXHAUST GAS TEMPERATURE INDICATING SYSTEM.

1-87. The thermocouples used in the exhaust gas temperature system (See figure 1-7.) supply a signal to a temperature indicator on the center instrument panel.

1-88. THERMOCOUPLE PROBES. Thermocouple probes (6) are located in the turbine frame just aft of the turbine wheel and are supplied on the engine. A reading is obtained of the average temperature of all the thermocouples. The basic system is chromel-alumel and leads are supplied on the engine to a disconnect point at the lower right-hand side of the main engine access panel, fuselage station 405. From fuselage station 405 disconnect the chromel-alumel leads go forward to fuselage station 252 disconnect and then to the indicator amplifier in the cockpit.

1-89. Refer to -2-7 Maintenance Manual for electrical circuit wiring diagram.

1-90. EXHAUST GAS TEMPERATURE INDICATOR/AMPLIFIER. The indicator/amplifier is located in the lower right-hand corner of the center instrument panel. The unit provides a means of reading exhaust gas temperature and is calibrated in degrees centigrade times 100 with a range from 0 to 10 . It is a transistorized, servo driven, hermetically sealed unit. A cannon plug on the back of the instrument provides connections for chromel and alumel leads. It is a Howell indicator, Part No. BH185R-11B.

1-91. ENGINE OIL PRESSURE INDICATING SYSTEM.

1-92. The engine oil pressure system (See figure 1-8.) consists of a pressure transmitter, Edison Part No. 318-100, and an indicator, Edison Part No. 290-100K.

1-93. OIL PRESSURE TRANSMITTER. The transmitter is mounted on the left side of the engine at approximately fuselage station 419. A flexible line connects the transmitter with the vent port on the N_2 case.

1-94. Identification of the vent port is shown on the engine accessory case.

1-95. Refer to -2-7 Maintenance Manual for electrical circuit wiring diagram.

1-96. OIL PRESSURE INDICATOR. The oil pressure indicator, Edison Part No. 290-100K, is located on the right-hand side of the center instrument panel. The range of the indicator is from 0 psi to 100 psi.

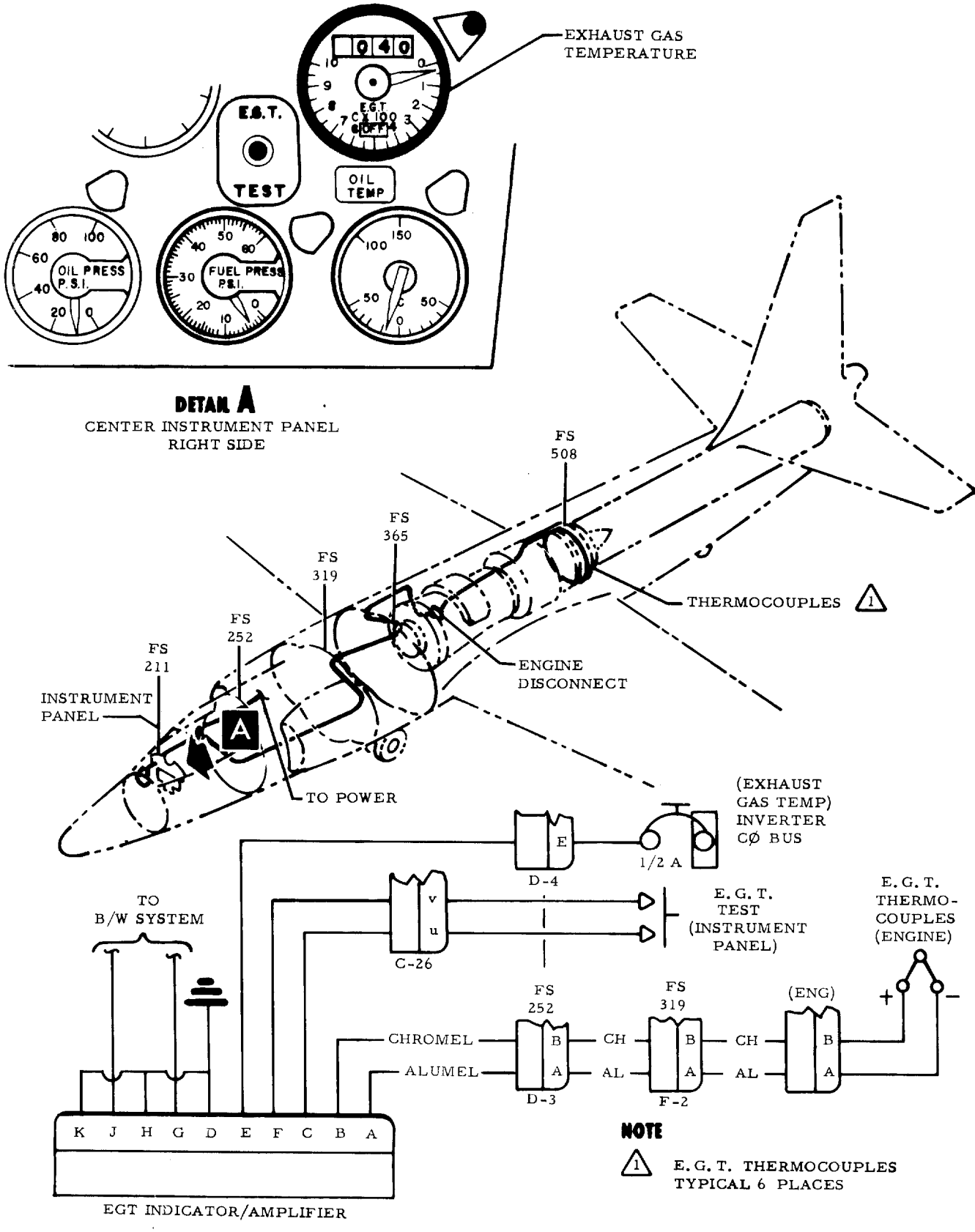


Figure 1-7. Exhaust Gas Temperature Indicating System

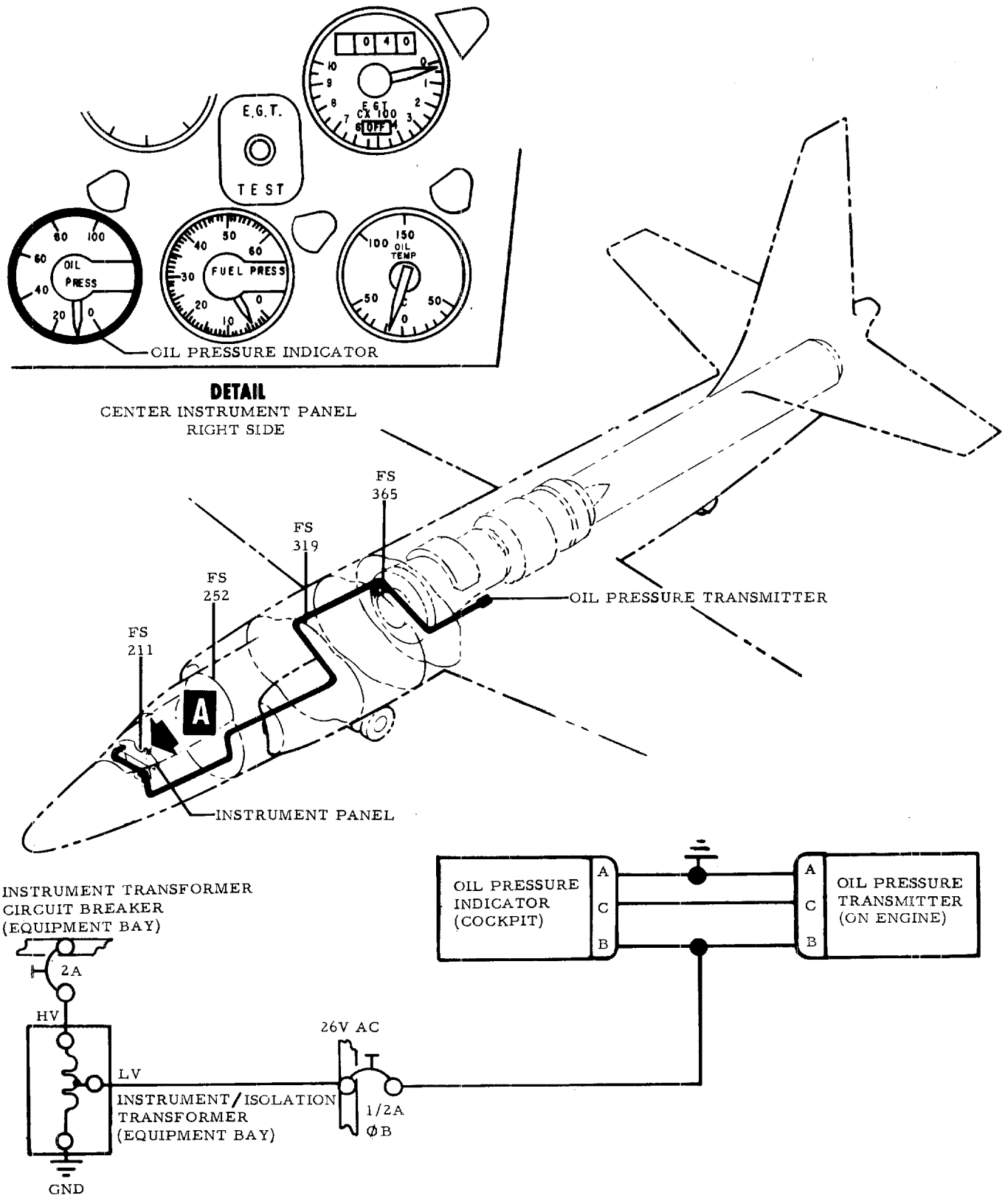


Figure 1-8. Engine Oil Pressure Indicating System

1-97. The normal operating pressure range (green arc) is 40 to 55 psi and indicates oil pressure pump discharge pressure. The indicator has red marks at the 35 psi and 60 psi limits.

1-98. ENGINE OIL TEMPERATURE INDICATING SYSTEM.

1-99. The engine oil temperature system (See figure 1-9.) includes an electrical resistance temperature bulb, MS28034-1, (MIL-B-7990) and an indicator, Lewis Engineering Part No. 163B2 (MIL-I-7749).

1-100. OIL TEMPERATURE BULB. The oil temperature bulb is installed in an adapter, Part No. 75P69, which is installed on the right-hand (forward) side of the oil pump and accessory drive gearbox adjacent to the starter.

1-101. Refer to -2-7 Maintenance Manual for electrical circuit wiring diagram.

1-102. OIL TEMPERATURE INDICATOR. The oil temperature indicator, Lewis Engineering Part No. 163B2, is located on the right-hand side of the center instrument panel.

1-103. The range of the indicator is from $-70^{\circ}C$ to $+150^{\circ}C$ and registers the temperature of the oil entering the engine. The maximum oil temperature (red mark) is $125^{\circ}C$.

1-104. ENGINE PRESSURE RATIO INDICATING SYSTEM.

1-105. The engine pressure ratio system (See figure 1-10.) is designed to give the pilot an indication of power or thrust for all the throttle settings. The system consists of a transmitter and an indicator. The transmitter senses a pressure ratio between engine inlet pressure (P_{t2}) and exhaust pressure (P_{t7}) and transmits the ratio of these pressures to an indicator on the center instrument panel.

1-106. ENGINE INLET PRESSURE SENSING (P_{t2}). A pressure sensing probe (P_{t2}), Pratt & Whitney Part No. 533039, is installed in the right side of the compressor inlet case at the 7 o'clock position. A quarter inch steel line is routed aft to the forward side of the N_2 accessory case where it crosses over to the left side. At this point a short length of hose (1/4") connects to the airplane portion of the Engine Pressure Ratio System taking it forward to the pressure ratio transmitter located on the upper right side of the main wheel well.

1-107. ENGINE EXHAUST PRESSURE SENSING (P_{t7}). An exhaust pressure sensing manifold containing four probes is located on the outer perimeter of the exhaust case. A five-eighth inch steel line connects to the manifold at the 9 o'clock position and goes forward to the left trunnion (ball bat) position. At this point a short length of hose (3/8") connects to the airplane portion of the Engine Pressure Ratio System taking it forward to the pressure ratio transmitter located in the main wheel well.

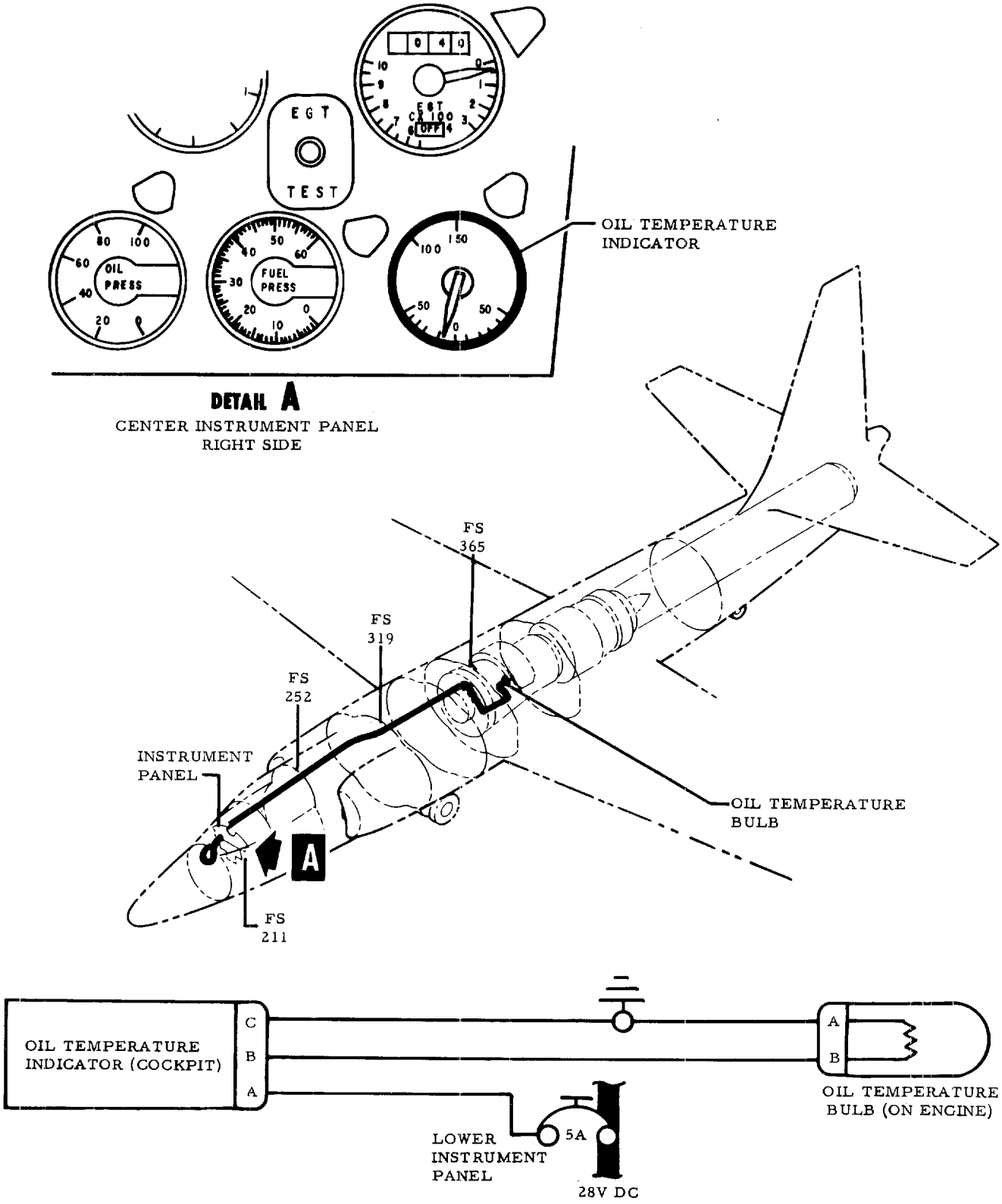


Figure 1-9. Engine Oil Temperature Indicating System

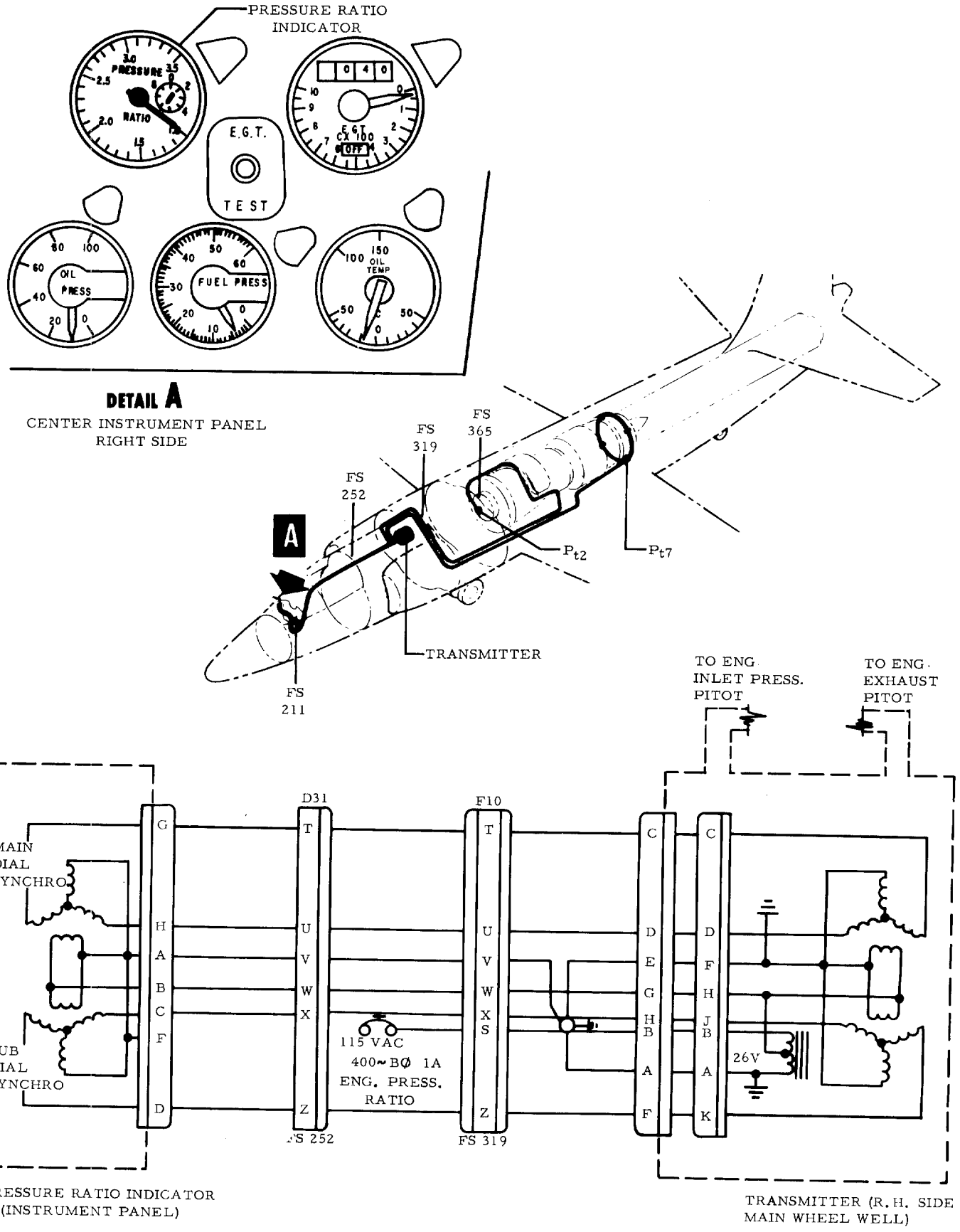


Figure 1-10. Engine Pressure Ratio Indicating System

1-108. ENGINE PRESSURE RATIO TRANSMITTER. The pressure ratio transmitter, Honeywell Part No. DLG80D1 or FLG80D1, is installed in an insulated container and is mounted on the upper right-hand side of the main wheel well. The transmitter consists of a bellows actuated servoed-ratio-computer, a cam and gear train, an amplifier, a two-phase motor, and a transmitting synchro. The mounting rack has vibration isolators and pressure and electrical connections.

1-109. ENGINE PRESSURE RATIO INDICATOR. The indicator, Honeywell Part No. JG151A6, is mounted on the right-hand side of the center instrument panel. It contains two synchro receivers, a main dial pointer and a subdial pointer. The subdial increases the readability and accuracy capability of the indicator.

1-110. ENGINE MOUNTING SYSTEM.

1-111. GENERAL.

1-112. The engine has mounting provisions (see figure 1-11.) on the compressor intermediate case, turbine case, and the exhaust tailpipe, which consist of side mounts, aft top mount, and tailpipe side mounts.

1-113. COMPONENTS DESCRIPTION.

1-114. SIDE MOUNTS. These are the main load carrying mounts and utilize the socket-type fittings at the left and right sides of the compressor intermediate case. A trunnion (ball bat) is inserted in each socket-type fitting when the engine is mounted in the airplane. The trunnions attach to the airplane at fittings at fuselage station 425. The attachment of each fitting is by means of two clamp-type caps which are held closed by eyebolts.

1-115. These side mounts take inertial and side loads. Provisions for engine expansion (axial load) is also provided in the right side trunnion.

1-116. AFT TOP MOUNT. The aft support consists of a yoke suspended from a fitting fastened to the fuselage ring at fuselage station 509 (top centerline of fuselage). The yoke, in turn, is attached by truss type links to the engine.

1-117. This type mount facilitates engine removal and installation. Vertical adjustment of engine position is made by loosening a locknut and adjusting the position of a rod end fitting in the yoke. The truss type links are attached to this rod end fitting.

1-118. The top mount is capable of taking only side and vertical loads and also allows for engine expansion rearward.

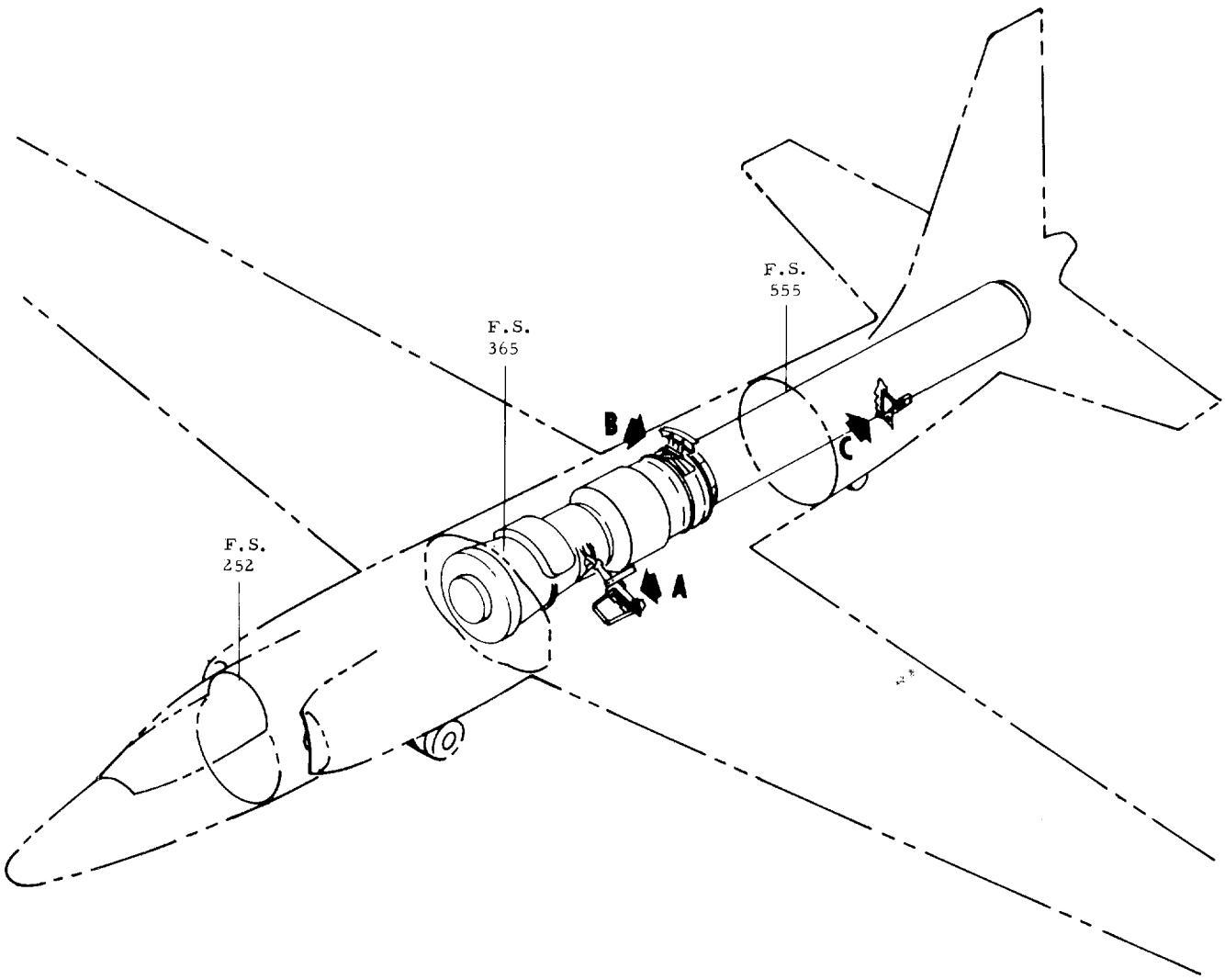
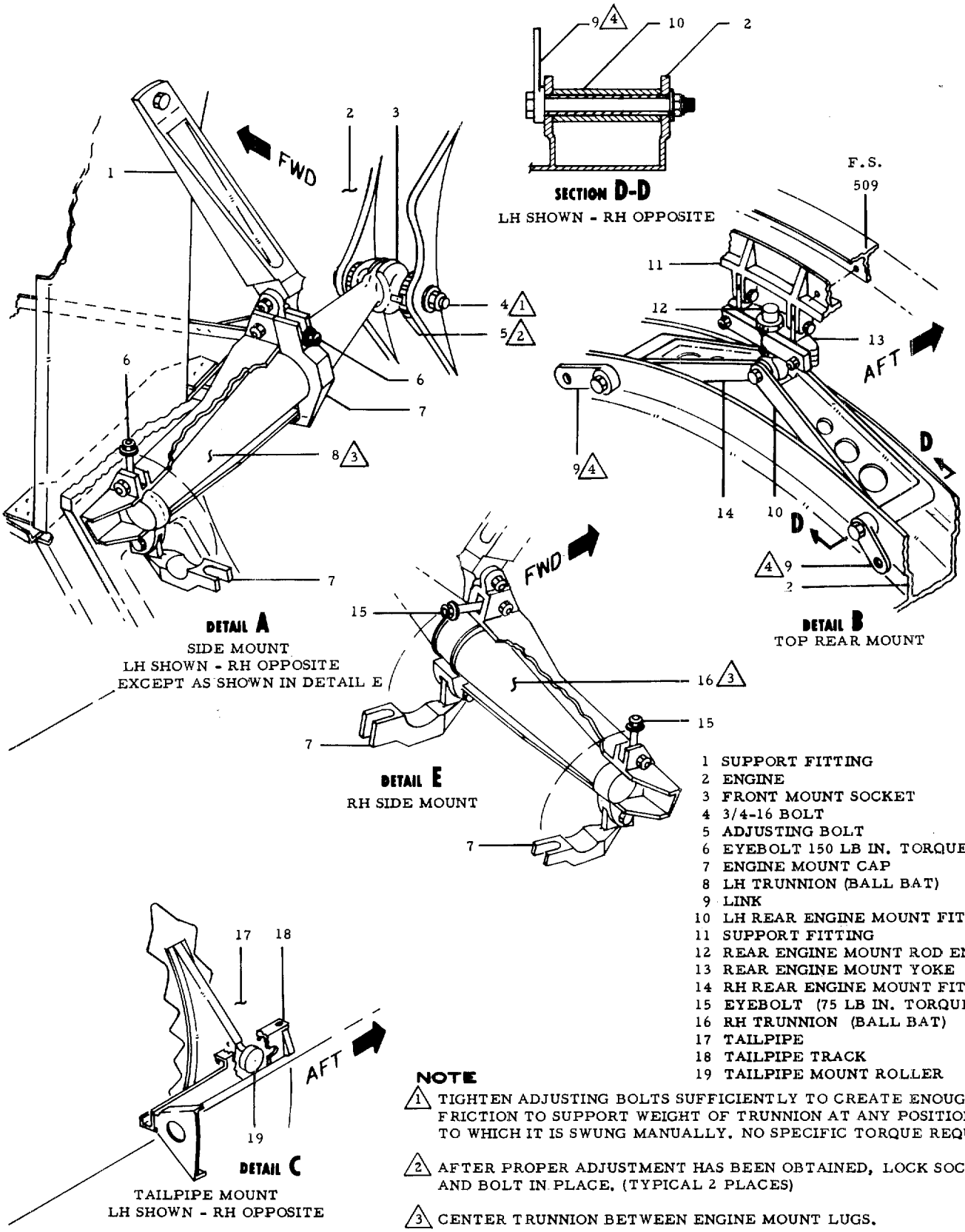


Figure 1-11. Engine Mount Installation (Sheet 1)



1 SUPPORT FITTING
2 ENGINE
3 FRONT MOUNT SOCKET
4 3/4-16 BOLT
5 ADJUSTING BOLT
6 EYEBOLT 150 LB IN. TORQUE
7 ENGINE MOUNT CAP
8 LH TRUNNION (BALL BAT)
9 LINK
10 LH REAR ENGINE MOUNT FITTING
11 SUPPORT FITTING
12 REAR ENGINE MOUNT ROD END
13 REAR ENGINE MOUNT YOKE
14 RH REAR ENGINE MOUNT FITTING
15 EYEBOLT (75 LB IN. TORQUE)
16 RH TRUNNION (BALL BAT)
17 TAILPIPE
18 TAILPIPE TRACK
19 TAILPIPE MOUNT ROLLER

NOTE

(1) TIGHTEN ADJUSTING BOLTS SUFFICIENTLY TO CREATE ENOUGH FRICTION TO SUPPORT WEIGHT OF TRUNNION AT ANY POSITION TO WHICH IT IS SWUNG MANUALLY. NO SPECIFIC TORQUE REQUIRED.

(2) AFTER PROPER ADJUSTMENT HAS BEEN OBTAINED, LOCK SOCKET AND BOLT IN PLACE. (TYPICAL 2 PLACES)

(3) CENTER TRUNNION BETWEEN ENGINE MOUNT LUGS.

(4) AFTER ENGINE IS INSTALLED, ROTATE LINKS OUTBOARD AND DOWN TO CLEAR CONTROL CABLES.

Figure 1-11. Engine Mount Installation (Sheet 2)

1-119. TAILPIPE SIDE MOUNTS. The tailpipe is supported by the engine and by two rollers at approximately fuselage station 636.

1-120. Due to the long overhang of the tailpipe, a flexible joint is built into it to prevent load pickup from fuselage deflection. As the engine expands due to temperature rise, the rollers move aft in the aft fuselage section support tracks.

1-121. ENGINE STARTING SYSTEM.

1-122. GENERAL.

1-123. The engine starting system (see figure 1-12.) is manually controlled and pneumatically operated. The pneumatic starter is installed on the center accessory pad on the N_2 case. An air adapter is attached to the starter inlet port for connection of the ground starting equipment. The air from the ground starting equipment passes through the nozzle causing the turbine wheel assembly to rotate. An exducer which is a part of the turbine wheel assembly helps exhaust expended air through the outlet port on the forward side of the starter.

1-124. There is an access to the starter area at the underside of the airplane.

1-125. STARTER.

1-126. The pneumatic starter operates on compressed air from a ground source.

1-127. It is mounted on six studs provided on the center accessory pad on the N_2 case. The engine pad gear ratio is 0.823:1 (N_2).

1-128. Air is introduced at the bottom of the starter and is directed against the turbine wheel which drives a reduction gear assembly. The starter incorporates an internal - engaging mechanism. This mechanism is composed of a ratchet driven by the reduction gear assembly and a set of spring-loaded pawls attached to the splined starter output shaft. This shaft engages a mating input drive shaft on the engine and rotates when the engine is turning.

1-129. Leading particulars of Airesearch penumatic starter, Part No. 350520, Model No. ATS140-29-1, are as follows:

Turbine Type	Inward - radial - flow
Reduction Gearing	Helical and spur mesh
Output Shaft Assembly Speed	3300 rpm (min) to 3550 rpm (max) at cutoff speed
Supply Air Requirements	
Air Inlet Total Pressure	45 psi abs (nominal)
Air Inlet Total Temperature	288°C (550°F) (nominal)
Air Outlet Static Pressure	14.7 psi abs

VOL II

Rated Performance of 2840 rpm	
Output Torque (min)	182.5 lb ft.
Air Flow (max)	110.0 lb per min.
Operating Limitations	
Air Inlet Total Pressure	60 psi abs (max)
Air Inlet Temperature	371°C (700°F) (max)
System Lubrication	
Oil	Specification MIL-L-23699A or MIL-L-7808
Capacity	600 cc (Max - approximately)
Operating Level	300 cc (min)
Operating Temperature	177°C (350°F) (max)
Weight	27.5 lb (max)

Note

Airesearch starter, Part No. 210250, Model No. ATS140-16-1, is interchangeable with Airesearch starter, Part No. 350520.

1 STARTER NAMEPLATE
2 AIR OUTLET PORT
3 BALANCE LINE PORT
4 ELECTRICAL RECEPTACLE (NOT USED ON THIS AIRPLANE)
5 OUTPUT SHAFT ASSY
6 OIL FILLER PLUG
7 OIL DRAIN PLUG (NOT ILLUSTRATED)
8 AIR INLET PORT

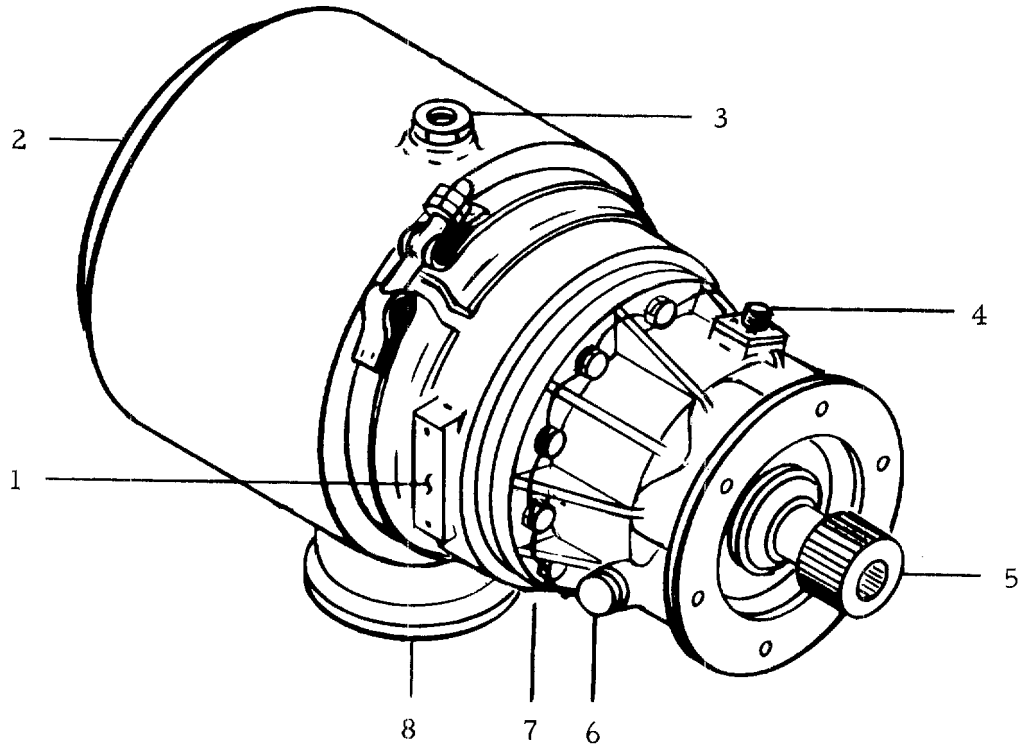


Figure 1-12. Engine Pneumatic Starter

1-130. OPERATION.

1-131. At the beginning of the starting cycle, the ratchet commences rotation, engaging the pawls and transmitting torque to the engine. While the starter is exerting torque on the engine the pawl and ratchet mechanism will remain in the engaged position. After the engine reaches ignition speed, the starter continues to assist the engine to accelerate until the cutoff speed of the starter is reached. At this speed, the engine overruns the starter and the engaging mechanism ratchets without transmission of torque. When the output shaft reaches pawl throwout speed, the engaging mechanism is completely disengaged, the pawls being thrown outward by centrifugal force so as to clear the ratchet without contact.

Note

Refer to Operational Checkout Section for starter operational limits.

1-132. THROTTLE CONTROL SYSTEM.

1-133. GENERAL.

1-134. The throttle control system (see figure 1-13.) provides the mechanical motion necessary to operate the throttle arm on the fuel control. It is cable operated by means of a drive pulley below the throttle in the left console in the cockpit. A torque shaft connected to the throttle lever moves the drive pulley. The cables are routed aft along the left side of the fuselage to the power control lever. A short adjustable pushrod connects between the cable system termination and the power control lever. The power control lever operates the throttle arm on the fuel control.

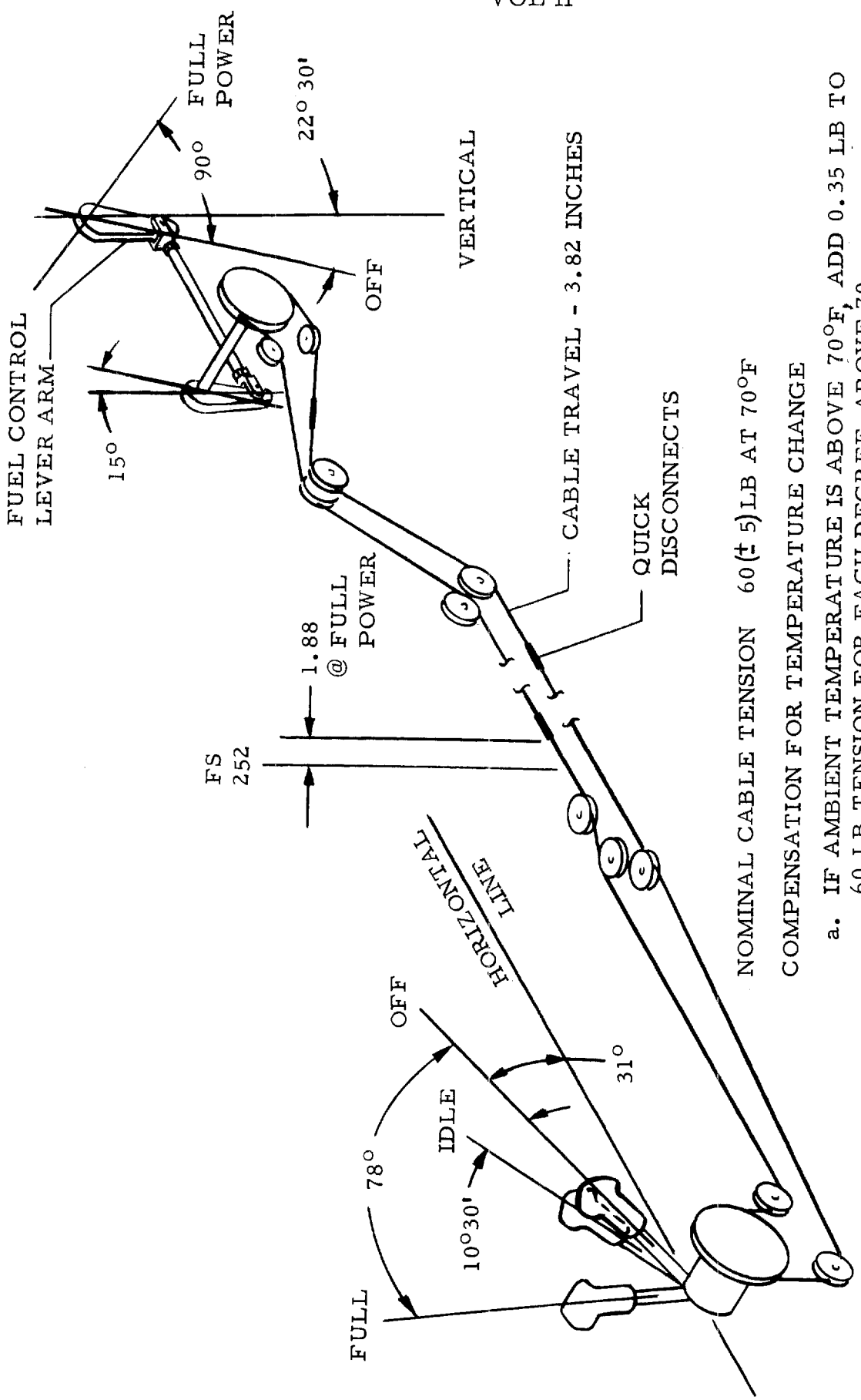
1-135. COMPONENTS.

1-136. THROTTLE LEVER QUADRANT. The throttle lever quadrant is mounted at the forward end of the left console. It is attached to the console and airplane structure by screws and nuts and may be removed and replaced.

1-137. The flap control is also mounted in the quadrant.

1-138. The throttle lever is spring-loaded in the inboard direction so that the forward motion, from OFF will cause it to drop into IDLE without forcing. Throttle lever travel from IDLE to FULL is accomplished by straight forward movement.

1-139. A gate type throttle stop is provided to serve as a limit on takeoff power. This stop will be adjusted to give approximately 93 to 94 percent rpm. In order to go past this stop, the throttle lever must be moved outboard. The device will automatically reset when the throttle is retarded.



NOMINAL CABLE TENSION 60(± 5)LB AT 70°F

COMPENSATION FOR TEMPERATURE CHANGE

a. IF AMBIENT TEMPERATURE IS ABOVE 70°F, ADD 0.35 LB TO 60 LB TENSION FOR EACH DEGREE ABOVE 70.

b. IF AMBIENT TEMPERATURE IS BELOW 70°F, SUBTRACT 0.35 LB FROM 60 LB TENSION FOR EACH DEGREE BELOW 70.

EXAMPLE: AMBIENT TEMPERATURE = 50°F (20°F LESS THAN 70°F)
20 x 0.35 = 7 LB. CABLE TENSION AT 50°F = 53 LB

Figure 1-13. Throttle Control System

1-140. THROTTLE LEVER. The throttle lever is mounted in the quadrant on the left side of the cockpit. It actuates the throttle cable system by moving the quadrant torque shaft that, in turn, moves a drive pulley.

1-141. A vernier wheel is installed just inboard of the throttle lever and provides for very small movements of the lever for power adjustment at high altitude.

1-142. Throttle friction may be regulated by a knob located in the center of the vernier wheel on the left side console.

1-143. A toggle switch installed on top of the grip is used to operate the speed brakes.

1-144. A pushbutton switch for the microphone is also installed on the grip.

1-145. The wiring for the grip extends out the bottom, joins with other wiring from the quadrant and connects to a terminal strip at fuselage station 221.

1-146. POWER CONTROL LEVER. The power control lever is installed on the fuel control and rotates through an arc of 90 degrees. Power lever OFF position is set 22 degrees 30 minutes forward of vertical .

1-147. FUEL SYSTEM.

1-148. GENERAL.

1-149. The fuel system (see figure 1-14.) consists of a fuel-oil cooler, main fuel strainer, engine fuel pump, hydromechanical fuel control, fuel flow totalizing transmitter, fuel pressurizing and dump valve, and the fuel manifolds.

1-150. SYSTEM OPERATION.

1-151. Fuel from the aircrafts boost system is delivered to the fuel-oil cooler where it passes through cooling coils to reduce the temperature of the oil. From the fuel-oil cooler the fuel passes through a 60-mesh strainer and into the engine-driven fuel pump. The two-stage pump delivers fuel at predetermined pressures and quantities to the hydromechanical control.

1-152. Due to the characteristics of the engine it is necessary that fuel flow be maintained within certain limits which vary depending upon operating conditions. The variables sensed by the control are those of burner pressure, engine rpm, and compressor inlet pressure. Subject to these variables, the control is capable of accurately maintaining the desired engine rpm during steady state operation by a governor droop system.

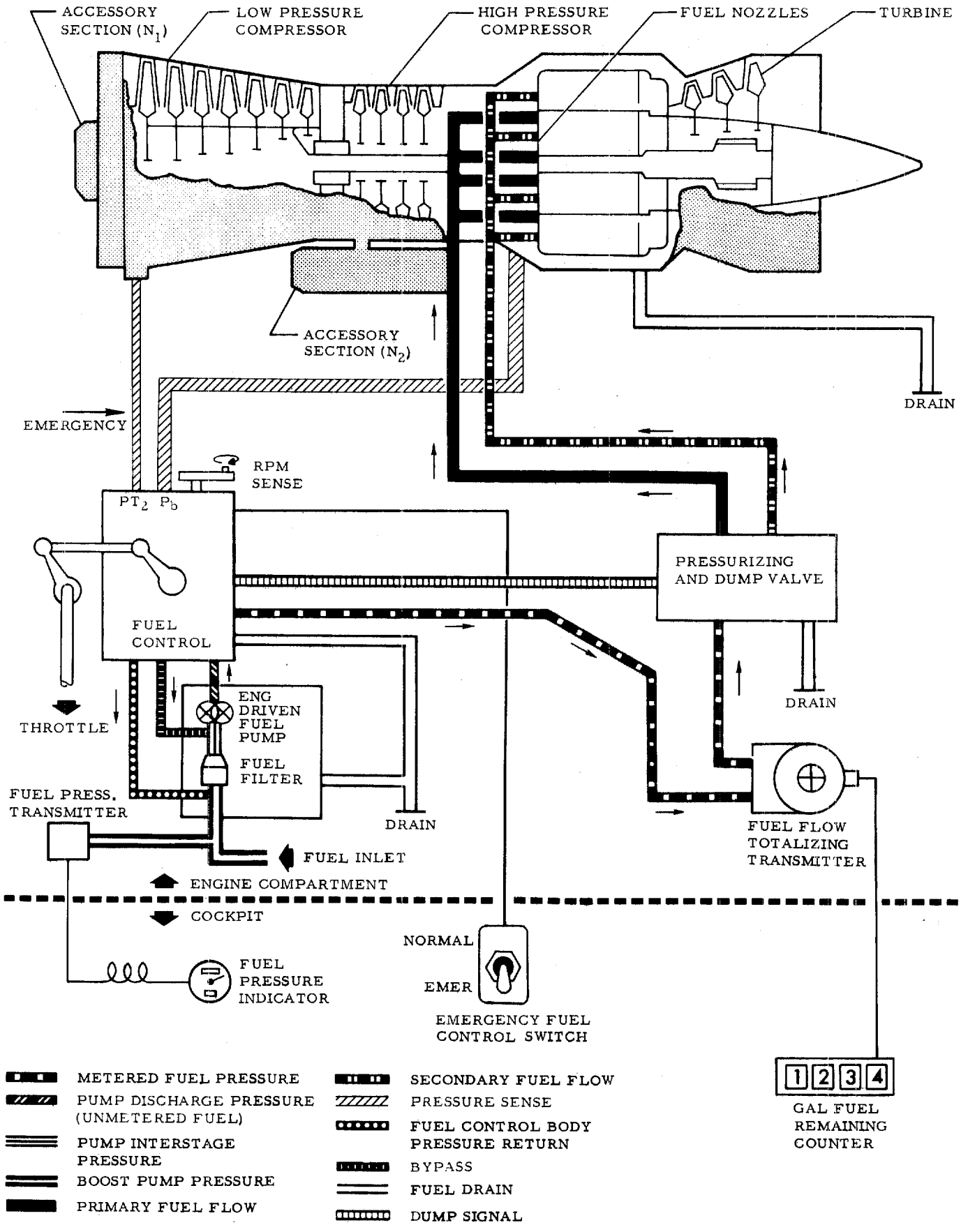


Figure 1-14. Engine Fuel System

1-153. During acceleration and starting, the control senses burner pressure, and engine rpm, and as a result, schedules fuel flow to permit the maximum rate of acceleration allowable within the engine temperature limits without compressor surge while discouraging "rich blow-out".

1-154. During deceleration the fuel control schedules fuel flow as a function of burner pressure to ensure the maintenance of sufficient fuel flow at the minimum flow level to support combustion, thus preventing the condition called "lean die-out".

1-155. Metered fuel from the control passes through a fuel flow totalizing transmitter, then into the fuel pressurizing and dump valve. The purpose of this valve is to provide the division of flow between the primary and secondary nozzle orifices to ensure proper fuel atomization. Also incorporated in the fuel pressurizing and dump valve body is a dump valve which drains the fuel manifold at shutdown. Fuel from the pressurizing and dump valve enters the engine fuel manifolds, which provide separate paths for primary and secondary fuel flow, and finally into the 48 duel-orifice nozzles where it is atomized for burning in the combustion chambers.

1-156. Fuel System components are listed in table 1-2.

Table 1-2. Fuel System Components

NAME	PART NO.	VENDOR
Fuel-Oil Cooler	87880-3	Airesearch
Main Fuel Strainers		
Strainer Assy (200 Mesh)	301385 or 748-1	Airline Welding Prod.
Strainer Assy (60 Mesh)	300720	Airline Welding Prod.
Engine Fuel Pump	023341-030-038P1	Pesco
Fuel Control	597797	Hamilton Standard
Fuel Flow Totalizing Transmitter	H222	Contractor
Fuel Pressurizing and Dump Valve	476828	Pratt & Whitney

1-157. COMPONENTS DESCRIPTION.

1-158. FUEL-OIL COOLER. The fuel-oil cooler, by transferring heat from the engine oil, heats abnormally cool fuel, prevents ice formation in the fuel strainer and fuel control, and provides additional oil cooling at high altitude. For further details refer to the Lubrication, Scavenge, and Breather System.

1-159. MAIN FUEL STRAINERS. One fuel strainer (200-mesh) is located near the outlet of the left-hand sump tank half at approximately fuselage station 389; the other fuel strainer (60-mesh) is located on the right side of the fuselage structure slightly above the fuel-oil cooler. For further details refer to -2-5 Maintenance Manual.

1-160. ENGINE FUEL PUMP (See figure 1-15.) The function of the engine fuel pump is to supply fuel under pressure to the engine fuel system.

1-161. The fuel pump is a high-pressure engine-driven pump consisting of one gear-type pump element and one centrifugal-type booster element combined as a single unit.

1-162. The booster element is located opposite the drive end of the pump and is driven through a step-up gear train. A shear section is incorporated in the centrifugal element drive.

1-163. A No. 40-mesh removable filter is located in the pump body between the discharge side of the booster stage and the inlet side of the gear stage. The filter is designed to bypass fuel in the event of clogging.

1-164. A fuel pressure relief valve is contained in the pump body on the discharge side of the gear pump. The pressure relief is adjusted to limit the pressure rise of the pump to a maximum pressure of 835 to 845 psi.

1-165. Operation. Fuel enters the booster stage through the pump inlet on the end of the impeller casting where the fuel is boosted approximately 20 psi. The fuel passes through the filter to the inlet side of the main pump and is discharged through the outlet port to the fuel control. Excess fuel from the fuel control is returned to the main pump through the return port and is recirculated within the pump.

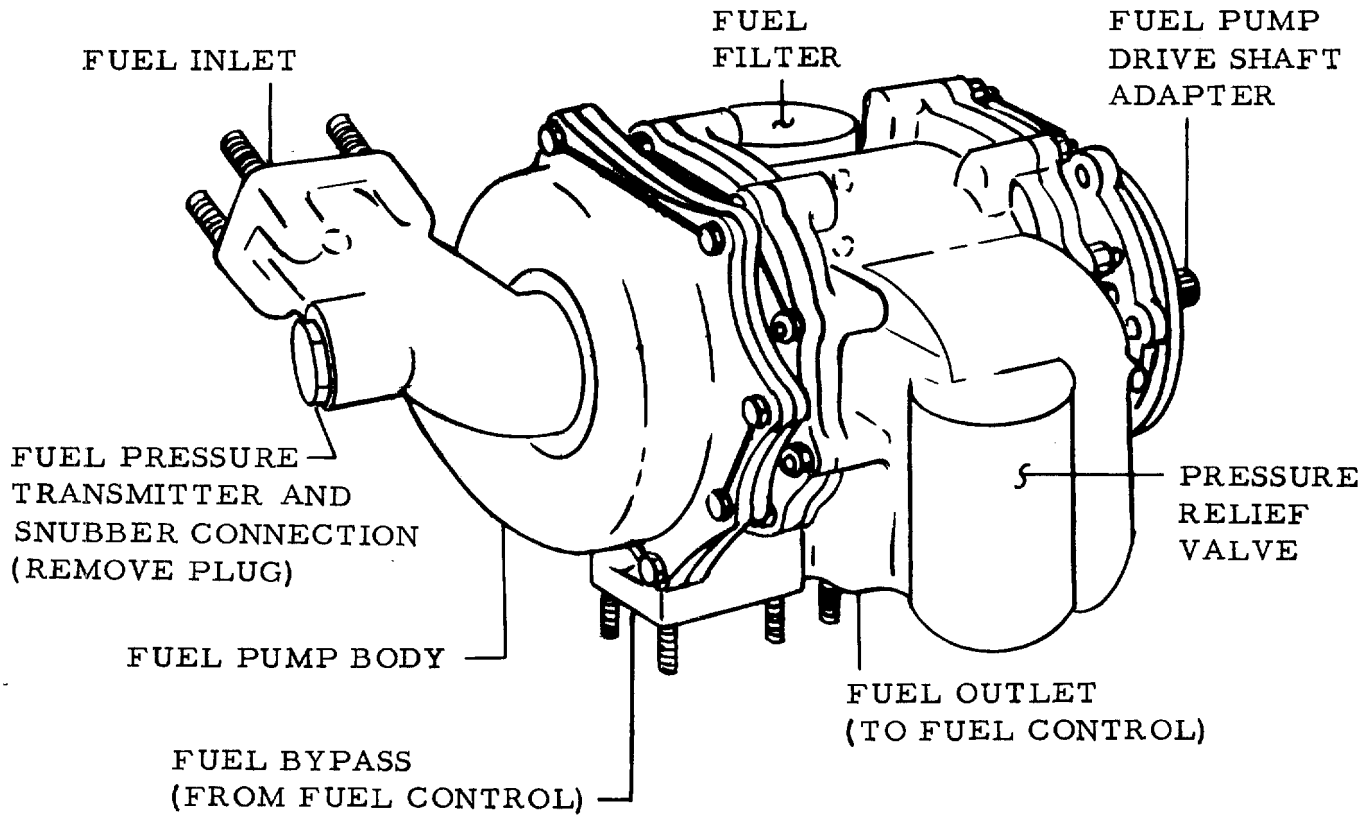


Figure 1-15. Engine Fuel Pump

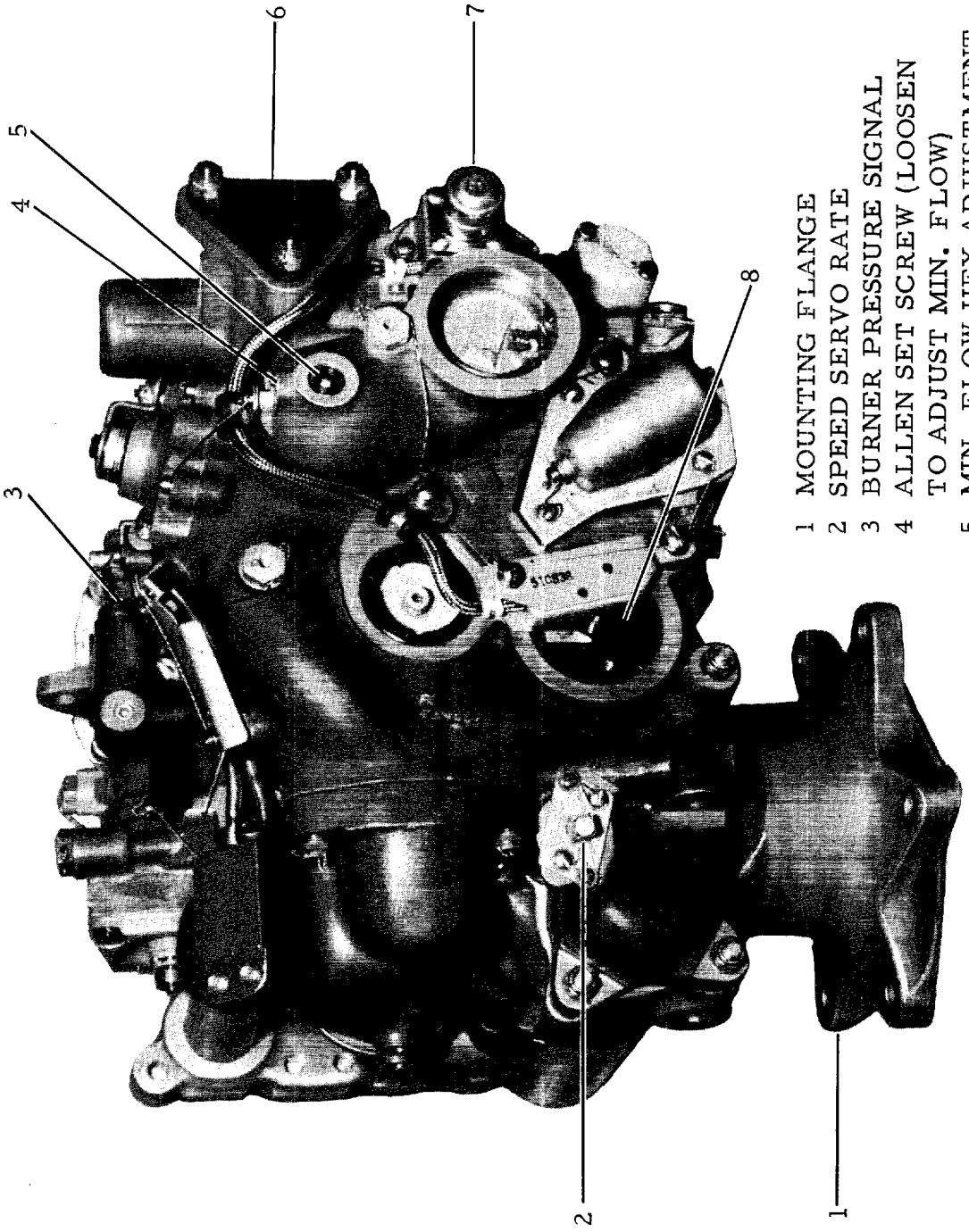
1-166. FUEL CONTROL. (JFC-25-15)

1-167. The fuel control (see figure 1-16.) is a hydromechanical unit designed to meter fuel to the engine. Fuel is metered in the normal system according to a predetermined flow schedule, which varies as a function of the pilot's throttle lever position, burner pressure, and engine rpm.

1-168. The hydromechanical control is made up of hydraulic and mechanical components. The operating forces required within the control are delivered by servos which operate on approximately a 2:1 pressure ratio.

1-169. The fuel control also incorporates a standby emergency control system designed to provide emergency control operation with minimum performance. This system is manually selected by the pilot by means of a toggle switch. When the system is in operation an amber light on the center instrument panel comes on.

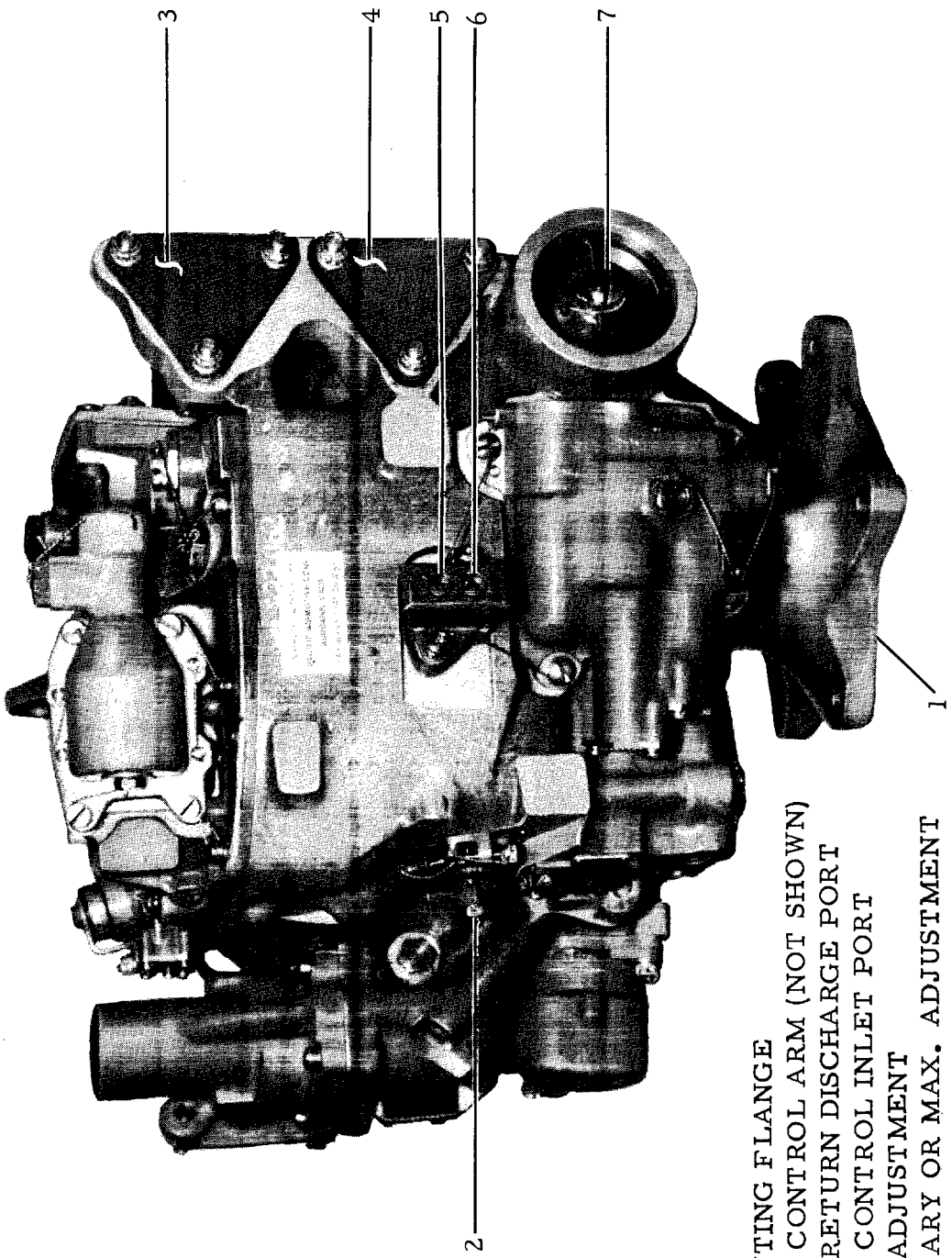
1-170. NORMAL SYSTEM OPERATION. (See figure 1-17.) The normal operating system of the fuel control consists of a metering system and a computing system. The metering system alters the fuel supplied to the fuel control by the engine-driven fuel pump to provide the engine thrust output required, but subject to engine operating limitations which are sensed and scheduled by the control computing section.



1 MOUNTING FLANGE
2 SPEED SERVO RATE
3 BURNER PRESSURE SIGNAL
4 ALLEN SET SCREW (LOOSEN TO ADJUST MIN. FLOW)
5 MIN. FLOW HEX ADJUSTMENT
6 FUEL OUTLET - TO FUEL FLOW RATE TRANSMITTER
7 EMERGENCY SOLENOID POWER CONNECTOR
8 EMERGENCY TRANSFER VALVE

TOP VIEW

Figure 1-16. Fuel Control (Sheet 1)



1 MOUNTING FLANGE
2 FUEL CONTROL ARM (NOT SHOWN)
3 HIGH RETURN DISCHARGE PORT
4 FUEL CONTROL INLET PORT
5 IDLE ADJUSTMENT
6 MILITARY OR MAX. ADJUSTMENT
7 FINE AND COURSE FILTERS

BOTTOM VIEW

Figure 1-16. Fuel Control (Sheet 2)

1-171. The Metering System. (See figure 1-17.) Fuel from the engine-driven pump enters the fuel control inlet port, then passes through the coarse and fine filters. The coarse filter protects the metering section against large particles of fuel contaminants. Clogging of the coarse filter will cause a bypass valve to open and permit continued operation, but with unfiltered fuel. The fine filter protects the computing section against solid contaminants. This filter is fuel cleaned by washing action of the fuel flow to the metering section.

1-172. The fuel then enters the pressure regulating valve. The pressure regulating valve performs its function of maintaining a constant pressure differential across the throttle valve. All high pressure fuel in excess of that required to maintain this pressure differential is bypassed to pump interstage pressure by the pressure regulating valve. This valve is servo controlled, whereby the actual pressure drop across the throttle valve orifice is applied to a diaphragm opposing a spring. Any error is hydraulically relayed to the pressure regulating valve by action of the flapper valve. The relayed error positions the pressure regulating valve spring, altering the force balance on this valve so that sufficient high pressure fuel is bypassed to maintain the desired pressure drop.

1-173. The high pressure fuel then passes through the metering valve. The valve consists of a contoured plunger within a sharp-edged orifice and is positioned by the computing section of the control. By virtue of the constant pressure drop maintained across the valve, the fuel flow is proportional to the position of the plunger. An adjustable stop is provided to limit the motion of this plunger in the decrease fuel direction to permit selection of the proper minimum fuel flow.

1-174. The Computing System. The computing system of the JFC25-15 control positions the throttle valve to control fuel flow during steady state operation, acceleration, and deceleration. The positioning of the throttle valve is accomplished through a multiplying system whereby the signal for acceleration, deceleration or steady state speed control is multiplied by a signal proportional to burner pressure to provide the required fuel flow.

1-175. Burner pressure is sensed as follows: A metallic bellows is internally exposed to burner pressure and the resulting force is opposed by an evacuated bellows of equal size. The net force, which is proportional to absolute burner pressure, is transmitted through a lever system to a set of rollers, whose position is proportional to the required ratio of metered fuel flow to burner pressure. These rollers ride between the bellows-actuated lever and a multiplying lever. A force proportional to burner pressure is transmitted through the rollers to the multiplying force. A spring transmits a force proportional to throttle valve opening to the multiplying lever. When the throttle valve is in this required position a force of equilibrium exists. Any change in roller position or burner pressure signals causes an upsetting of the equilibrium of the multiplying lever, which results in opening or closing of a variable metering orifice which is supplied with

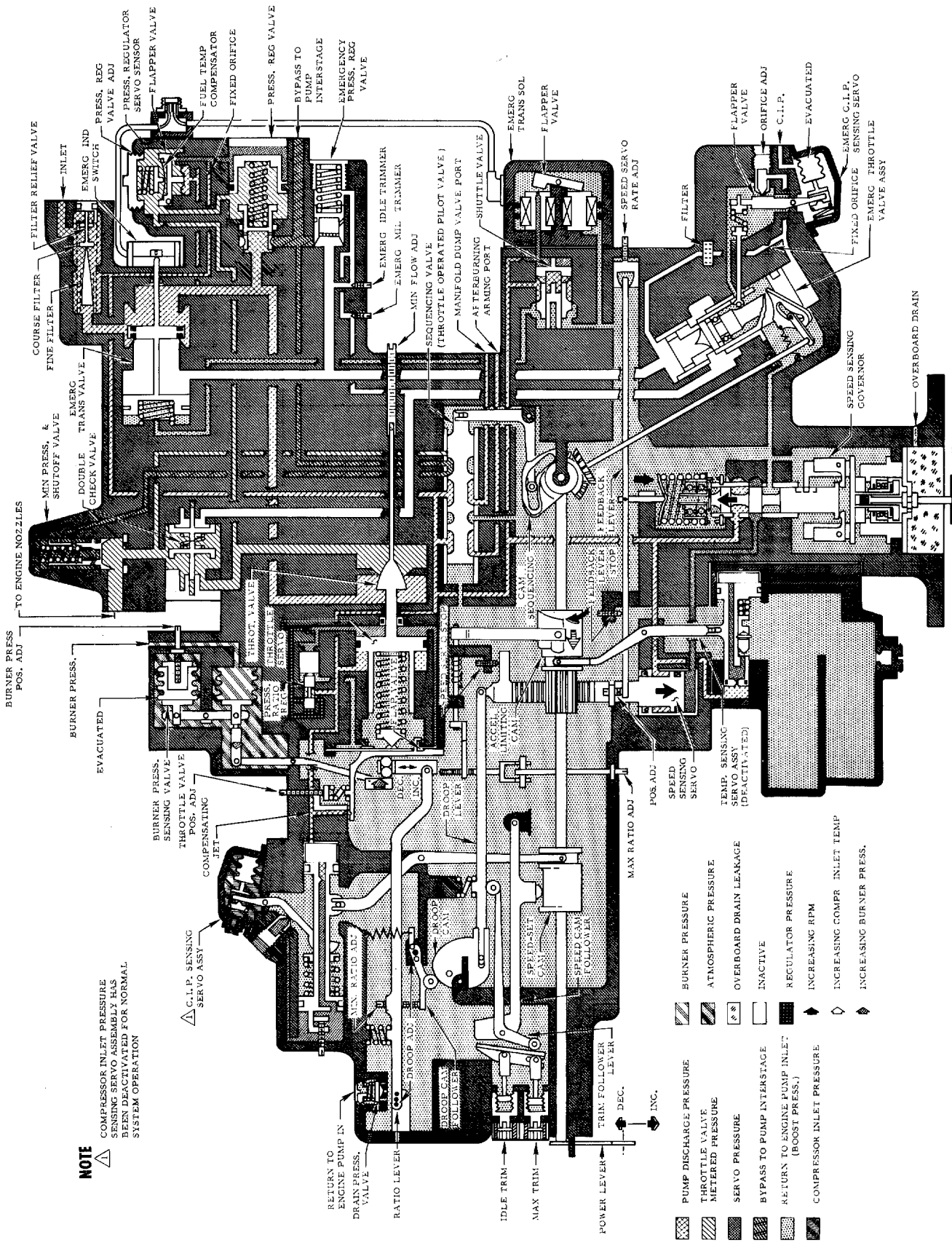


Figure 1-17. Fuel Control Schematic (Normal System Operation)

high pressure fuel through a fixed orifice. The opening or closing of the metering orifice modulates fuel pressure between the two orifices and this pressure is used to control the position of a piston attached to the throttle valve plunger. The motion of this piston compresses or relaxes a spring which will return the multiplying lever to its equilibrium position when the throttle valve reaches the required position.

1-176. Deceleration control is accomplished by placing a minimum ratio stop on the roller-positioning linkage. This provides a linear relationship between fuel flow and burner pressure conforming with engine operating characteristics.

1-177. Acceleration control is accomplished by placing a maximum ratio stop on the roller position. This stop is positioned by the acceleration limiting cam. This is a two dimensional cam, rotated by a signal proportional to engine speed. The acceleration cam is contoured to define a schedule of the fuel flow to burner pressure ratio versus engine speed. This combination will avoid the over-temperature and surge limits of the engine without compromising engine acceleration time.

1-178. The speed sensing governor controls movement of the speed servo piston through a pilot valve. The governor is of the flyweight type and is engine driven. When speed changes, the flyweight force varies and the pilot valve is positioned to meter either low or high pressure fuel to the speed servo piston. The motion of this piston resets the compression of the governor speeder spring to reposition the pilot valve until the speed sensing system returns to equilibrium. The position of the servo piston is indicative of actual engine speed. The piston incorporates a rack which meshes with a gear segment on the acceleration two-dimensional cam to provide the speed signal for acceleration limiting. The piston position is also utilized to hold selected engine speed within safe limits by repositioning the droop cam.

1-179. The final component of the fuel control to act on metered fuel is the minimum pressure and shutoff valve. The primary function of this valve is to instantly shut off the flow of metered fuel to the engine when the power lever is at a five-to seven-degree angle from the OFF position. The sequencing valve ports high pressure fuel to the spring side of the shutoff valve forcing it down against a seat, thus shutting off the flow of metered fuel to the engine. When the shut-off lever is moved into the ON position, the high pressure signal is replaced by pump interstage pressure, allowing metered fuel pressure to overcome the spring force, and open the valve. This valve will provide a minimum operating pressure within the fuel control, ensuring that adequate pressure is available for operation of the servos and valves at low fuel flow conditions.

1-180. The sequencing valve provides the shutoff signal to the minimum pressure and shutoff valve and the pressure signal to the manifold drain valve. The manifold drain valve signal is normally set two to three degrees from the zero degree

power lever angle. As the power lever enters the five-to seven-degree angle in being moved to the shutdown position, high pressure fuel is directed to the spring side of the shutoff valve, which added to spring pressure provides immediate shutdown of fuel to the engine. The sequencing valve is positioned by a power lever operated cam so that the signals are generated at the desired lever positions. The sequencing valve also provides a windmill bypass feature, when the shutoff valve is closed. The feature bleeds throttle valve downstream pressure to provide fuel flow through the throttle valve. This allows the pressure regulating valve to continue to operate normally, thereby preventing damage to fuel pumps from excessive fuel pressure and heat during engine windmilling. The sequencing valve functions in both the normal operating and emergency system.

1-181. EMERGENCY CONTROL SYSTEM COMPONENTS DESCRIPTION. (See figure 1-18.) In addition to the preceding subassemblies and parts groups the following emergency system major subassemblies and parts groups are also included: emergency transfer valve, emergency pressure regulating valve, emergency transfer solenoid and shuttle valve, emergency throttle valve, emergency altitude compensating sensor assembly and emergency wiring assembly.

1-182. Emergency Transfer Valve. The emergency transfer valve includes a housing, a piston, an inner and outer piston ring, a plunger and a cap. The transfer valve is spring loaded to the emergency position when the fuel control is shut down. Pump discharge pressure acting directly on the valve during normal operation will keep it in normal operating position. For emergency operation pump discharge pressure is directed by the shuttle valve to the spring side of the emergency transfer valve. This results in the transfer valve moving to the emergency position and closing the emergency indicator switch, which lights an indicator light in the cockpit.

1-183. Emergency Pressure Regulating Valve. The emergency pressure regulating valve includes the valve and valve sleeve, spring, screen, a snap ring, cap and a cap retainer nut. This valve is of the piston type and maintains the required pressure drop across the emergency throttle valve by bypassing the excess fuel to the interstage of the engine fuel pump. The valve is exposed on one side to pump discharge and on the other side to a pressure downstream of the emergency idle trimmer. Flow through the idle trimmer also flows through the military flow trimmer and the sum of the pressure drops across the idle and military trimmers is also the total pressure drop across the emergency throttle valve.

1-184. Emergency Transfer Solenoid And Shuttle Valve. The emergency transfer solenoid and shuttle valve include the mounting base, filter, solenoid core, permanent magnet, armature and saddle assembly, poppet, adjusting screw, insulating sleeving, terminal box, shuttle, valve sleeve, plunger and coverplate. The transfer solenoid is a two-position solenoid, and the flapper valve is the armature. In event

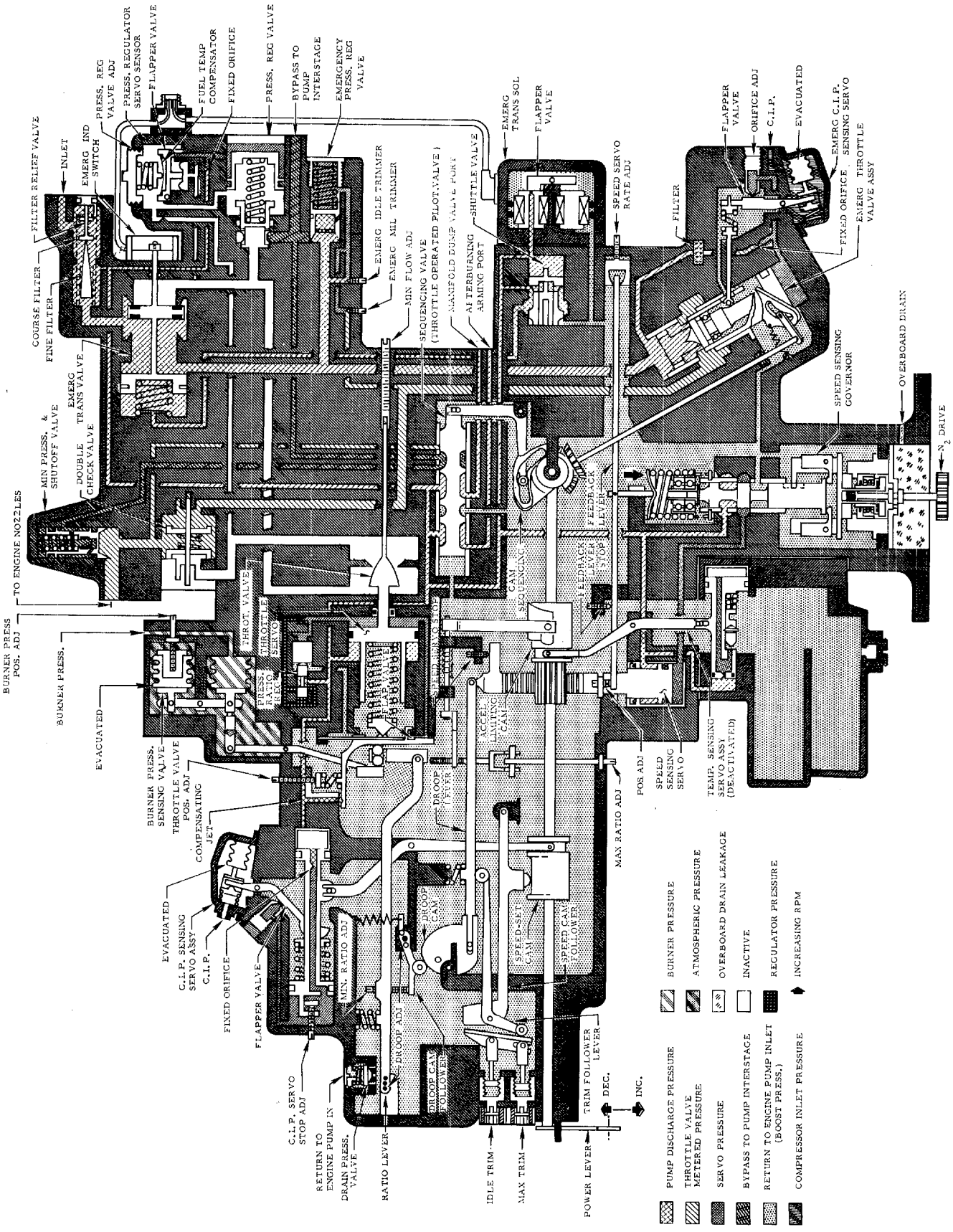


Figure 1-18. Fuel Control Schematic (Emergency System Operation)

of an electrical power failure the flapper valve will remain in the position determined by the last signal received from the cockpit selector switch. With the flapper valve in the open position, fuel at servo pressure is ported to low pressure, causing the shuttle valve to move to the normal position and drain pressure from the spring side of the emergency transfer valve. This allows pump discharge pressure to overcome the spring force of the emergency transfer valve, directing high pressure fuel to the normal system for normal control operation. With the flapper valve closed, the shuttle valve is positioned by means of servo pressure so that pump discharge pressure is directed to the spring side of the emergency transfer valve, which added to spring force causes the normal operating system to be closed off and high pressure fuel to be directed to the emergency system.

1-185. Emergency Throttle Valve. The emergency throttle valve includes the cam and sleeve assembly, a valve and cam assembly, a ball bearing, servo piston an ell seal, a backup ring, a bushing, a spindle, a servo plug, the valve deflector and cam follower assembly. The emergency throttle valve is rotated with the miter gear according to the position of the power lever. It meters high pressure fuel from the coarse filter and the emergency transfer valve through the double check valve to the minimum pressure and shutoff valve. A regulated pressure drop across the window type valve is maintained by the emergency pressure regulating valve. Axial position of the emergency throttle valve and therefore fuel flow is modified by the emergency compressor inlet pressure sensing servo.

1-186. Emergency Altitude Compensating Sensor Assembly. The altitude compensating sensor and servo includes the body flange, bellows housing, plug boss, bellows assembly, lever assembly, servo housing assembly and nozzle assembly. The altitude compensating servo positions the emergency throttle valve according to the signal from the altitude compensating bellows in response to compressor inlet pressure. The evacuated bellows contracts at low altitudes tending to open the flapper valve allowing fuel supplied by the fixed orifice in the altitude sensing servo to bleed through the flapper nozzle. Pump discharge pressure at the throttle valve overcomes servo pressure thereby opening the throttle valve. As the throttle valve opens, its action compresses the spring, which is attached to the flapper valve, tending to close the adjustable orifice and establish a new position of equilibrium.

1-187. Emergency Wiring Assembly. The emergency wiring assembly includes the switch support bracket, a switch and cable, the receptacle and terminal cover assembly. This assembly completes the electrical circuit from the emergency transfer solenoid through the receptacle to the switch in the cockpit and from the emergency indicator switch to the indicator light in the cockpit.

1-188. EMERGENCY CONTROL SYSTEM OPERATION. (See figure 1-18.) In event the normal control system malfunctions, the emergency system may be engaged by operating a switch in the cockpit, which energizes the emergency transfer solenoid so as to close the flapper valve. The flapper valve will remain in the closed position due to residual magnetism regardless of whether or not the solenoid is continuously energized. Similarly in the flapper open position, only the initial electrical impulse is required to position the flapper valve. Closing the flapper valve causes pump discharge pressure to build up in the servo area of the emergency shuttle valve. Servo action positions the shuttle valve to direct pump discharge pressure to the spring side of the emergency transfer valve, which added to spring pressure positions the valve to close off the normal operating system and direct high pressure fuel to the emergency system.

1-189. The emergency throttle valve is positioned by the power lever through action of the miter gear. The pressure drop across the throttle valve is maintained by the emergency pressure regulating valve, which is governed by spring action plus the action of metered fuel channeled through the emergency military trimmer and pump discharge pressure fuel channeled through the emergency idle trimmer. Idle and military trimming of the emergency system is achieved by setting of the trimmer adjustments (bench adjustment only).

1-190. The emergency compressor inlet pressure sensing servo or altitude compensating servo translates the throttle valve in proportion to compressor inlet pressure. Thus with the power lever stationary, an increase in compressor inlet ram pressure will result in an increase in fuel flow through bellows contraction. Adjustment is carried out by shimming under the cover to lengthen or shorten the effective length of the bellows end of the lever.

1-191. When the emergency transfer valve is seated in the emergency position, the plunger actuates the emergency indicator switch, which completes the circuit to the emergency system indicating light in the cockpit.

1-192. FUEL FLOW RATE TRANSMITTER.

Note

The fuel flow rate indicating system described below will be replaced by a pressure ratio system, see Service Bulletin 953. The following applies to engines before modification.

1-193. The fuel flow rate transmitter is installed on the underside of the engine between the fuel control and the fuel flow totalizing transmitter.

1-194. The transmitter sends an electrical signal to the cockpit, which in turn controls the position of the fuel flow rate indicator, inabling the pilot to read fuel flow in pounds per hour (pph).

Note

For details on the pressure ratio system look under heading, Engine Instruments, in this section.

VOL II

1-195. FUEL FLOW TOTALIZING TRANSMITTER.

1-196. General. The fuel flow totalizing transmitter counts the number of gallons of fuel used by the engine and provides the pilot with an accurate indication of the total number of gallons of usable fuel remaining at any given time. It is a direct displacement rotor type transmitter incorporating a bypass valve.

1-197. The fuel flow totalizing transmitter is mounted on the right-hand side of the engine and is plumbed between the fuel flow rate transmitter and the fuel pressurizing and dump valve.

1-198. Operation. Fuel enters the fuel flow totalizing transmitter which actuates a switch by means of a rotating magnet. The flowmeter switch actuates the solenoid operated counter (indicator) in the cockpit.

1-199. The counter is set at the initial fueling of the airplane to reflect the number of gallons of fuel before flight. As the fuel is used, the counter then shows the number of gallons remaining in the tanks.

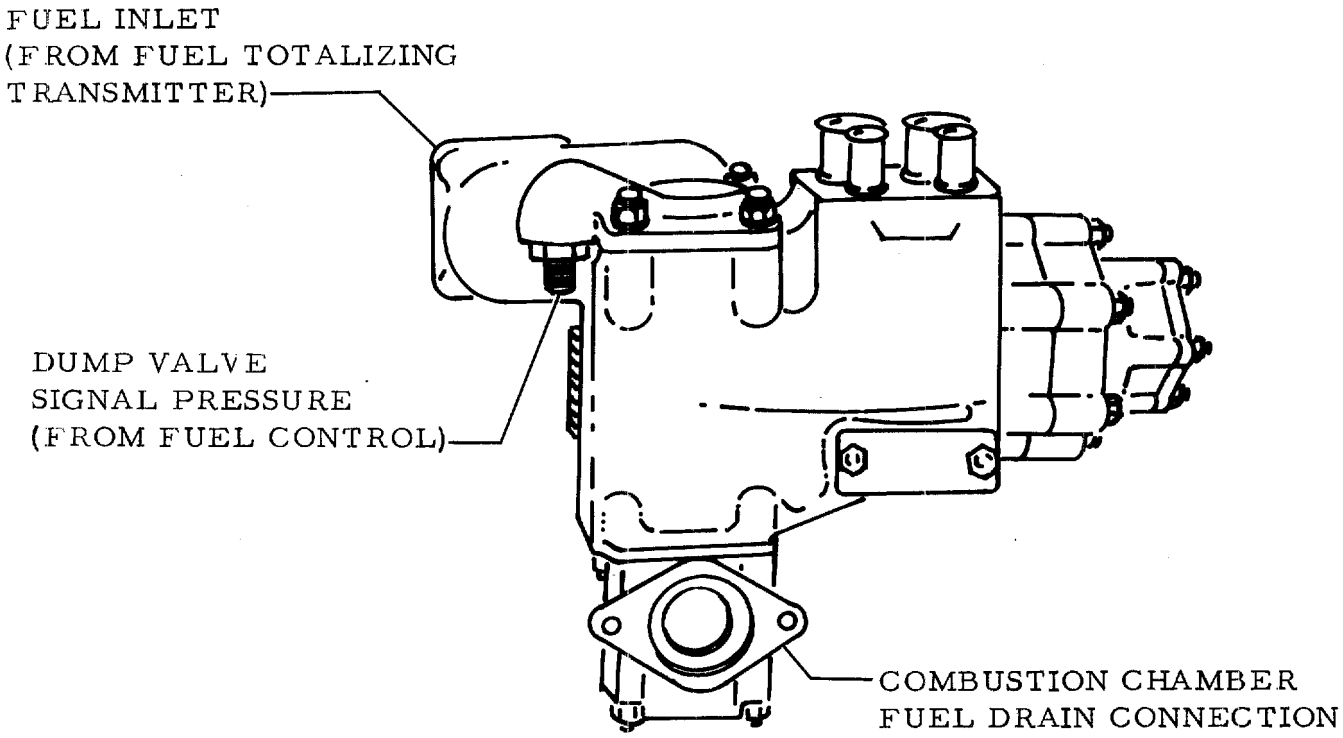
1-200. The fuel transmitter bypass valve allows fuel to bypass the transmitter rotor in case the rotor should become damaged and not rotate. The bypass valve operates when a 19 to 20 psi drop occurs across the flowmeter.

1-201. FUEL PRESSURIZING AND DUMP VALVE.

1-202. General. (See figure 1-19.) The fuel pressurizing and dump valve divides the primary and secondary manifold fuel flows to give satisfactory nozzle characteristics at all fuel flow conditions. It also drains the fuel manifold at engine shutdown.

1-203. The fuel pressurizing and dump valve is a pressure operated valve, consisting of an inlet check valve, a 200-mesh fuel inlet screen, a pressurizing valve, and a dump valve.

1-204. The fuel pressurizing valve consists of a spring-loaded, stepped area piston and cylinder assembly. One end of the large diameter cylinder contains an orifice and valve seat within which the contoured small-diameter, pintle-type piston operates to shutoff fuel flow to the secondary manifold.



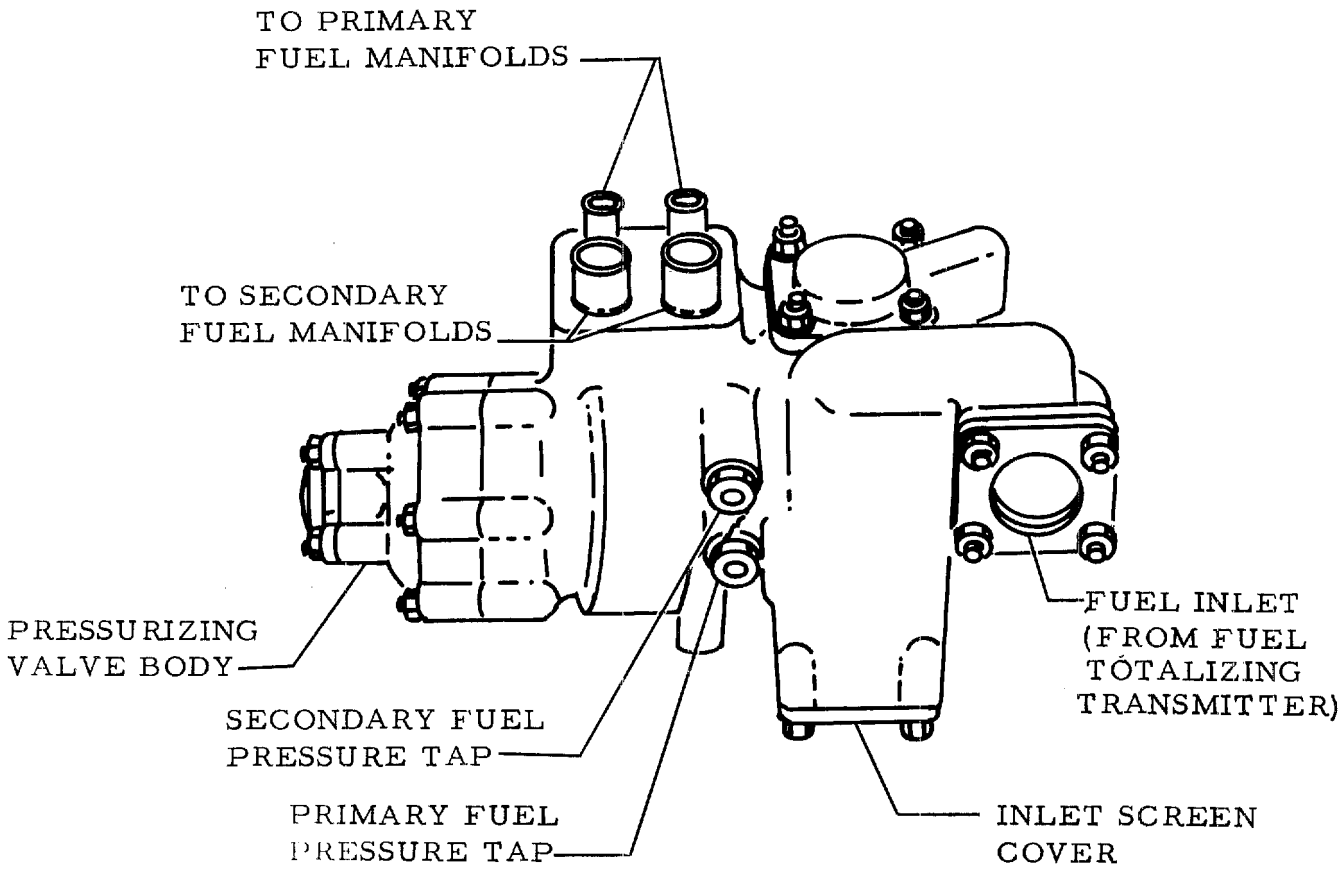


Figure 1-19. Fuel Pressurizing and Dump Valve

1-205. IGNITION SYSTEM.

1-206. GENERAL.

1-207. The ignition system (see figures 1-20 and 1-21.) as installed in J75 airplanes consists of the Normal Ignition System and the Continuous Ignition System. Difference between the two systems is described in subsequent paragraphs.

1-208. NORMAL IGNITION SYSTEM.

1-209. GENERAL. (See figures 1-20 and 1-21.) The normal ignition system is a high energy, intermittent duty, untimed electrical system designed to operate on an electrical input ranging between 16 and 30 volts direct current.

1-210. This twenty joule capacitor-type system produces sparks which ignite the atomized fuel-air mixture in the No. 4 and No. 5 combustion chambers. The remaining combustion chambers are ignited by means of interconnected flame tubes.

Note

The right-hand sparkigniter located in No. 5 combustion chamber is a dual purpose plug which will fire either the 20 joule or 4 joule system.

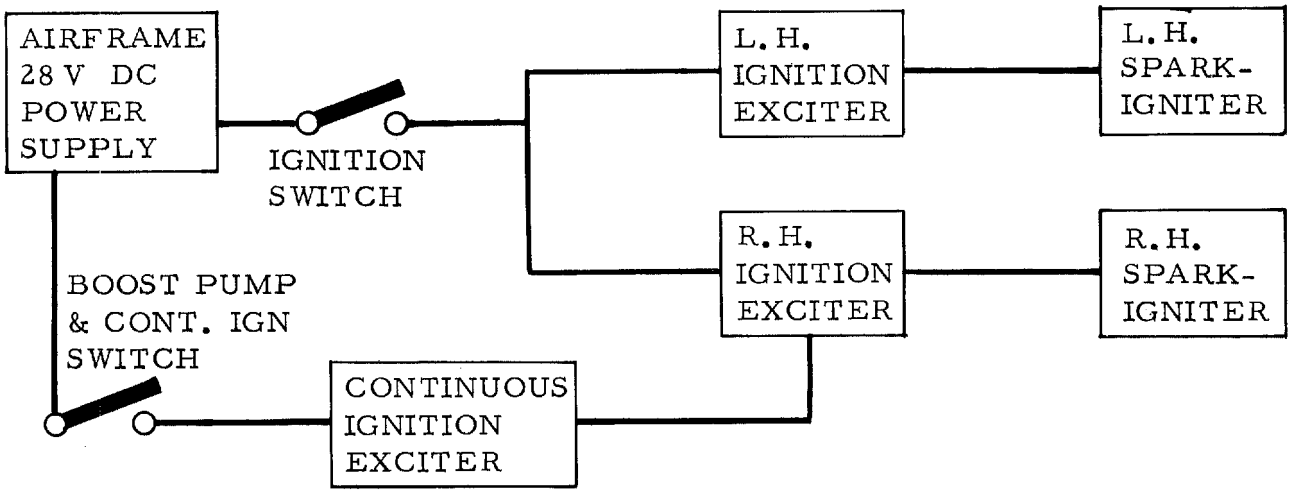


Figure 1-20. Normal and Continuous Ignition System Block Diagram

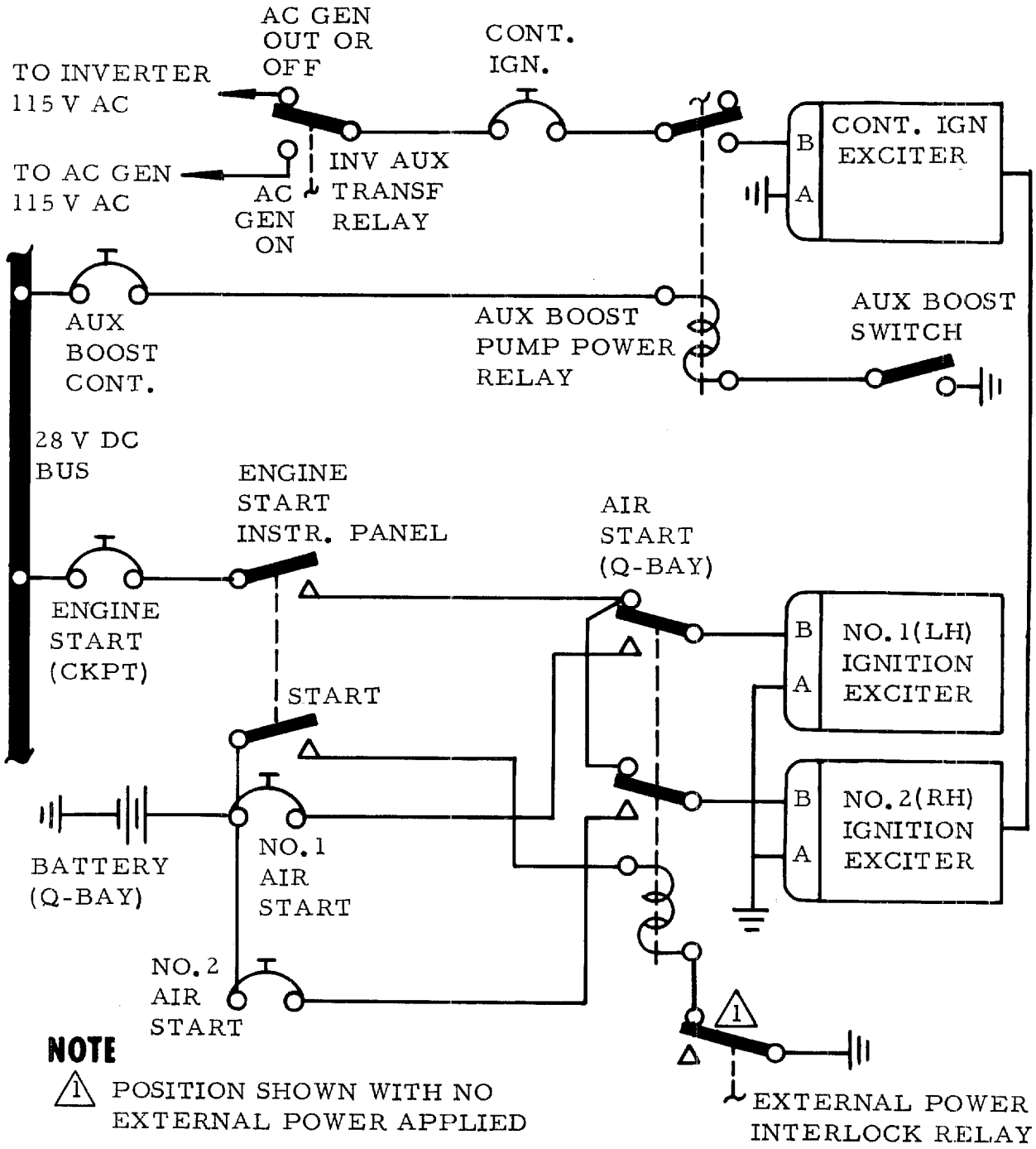


Figure 1-21. Normal and Continuous Ignition System Simplified Wiring Diagram

VOL II

1-211. Once the fuel is ignited in the combustion chambers, there is no further need for the ignition system until the next time the engine is started. This could be at the beginning of the next flight, or in the air following some trouble that would extinguish the flame.

1-212. Fuel sprayed into the combustion chambers is continuous. As long as the spark ignites the fuel, it makes no difference as to the exact instant of ignition.

1-213. This system produces two sparks per second and is turned on just before fuel is admitted to the engine. As soon as ignition occurs and the flame is established, the ignition system is turned off.

1-214. The normal ignition system incorporates two ignition exciters, and two sparkigniters interconnected by high tension ignition harnesses.

Note

The right sparkigniter is a dual purpose plug which will fire either the 20 joule or 4 joule system.

1-215. NORMAL IGNITION SYSTEM OPERATION. (See figures 1-21 and 1-22.) When normal or intermittent operation is to be employed, dc power is supplied to the input of the intermittent duty exciter from the 28-volt aircraft electrical system.

a. It is first passed through a radio noise filter to prevent high frequency feedback. From the filter, input voltage is fed to the primary of the transformer in the vibrator, which is an integral part of the vibrator assembly. From the primary a current flows through a pair of contacts, normally closed, to ground. A capacitor is connected across these contacts to damp excessive arcing.

b. With the contacts closed, the flow of current through the coil produces a magnetic field. The force exerted by this field pulls the armature free from the permanent magnet above it. Rapid acceleration builds up kinetic energy in the armature for a brief period before it strikes the contact spring. This opens the contact points quickly, the flow of current stops, and the magnetic field collapses. The armature is returned by the tension of the contact spring, and is positively held in its original position by the permanent magnet. The spring having meanwhile closed the contacts, the vibrating cycle recommences.

c. Each collapse of the magnetic field induces a high voltage in the secondary of the transformer. This produces successive pulses flowing through the gas charged rectifier, which limits the flow to a single direction, into the storage capacitors, which thus assume a greater and greater charge at a constantly increasing voltage.

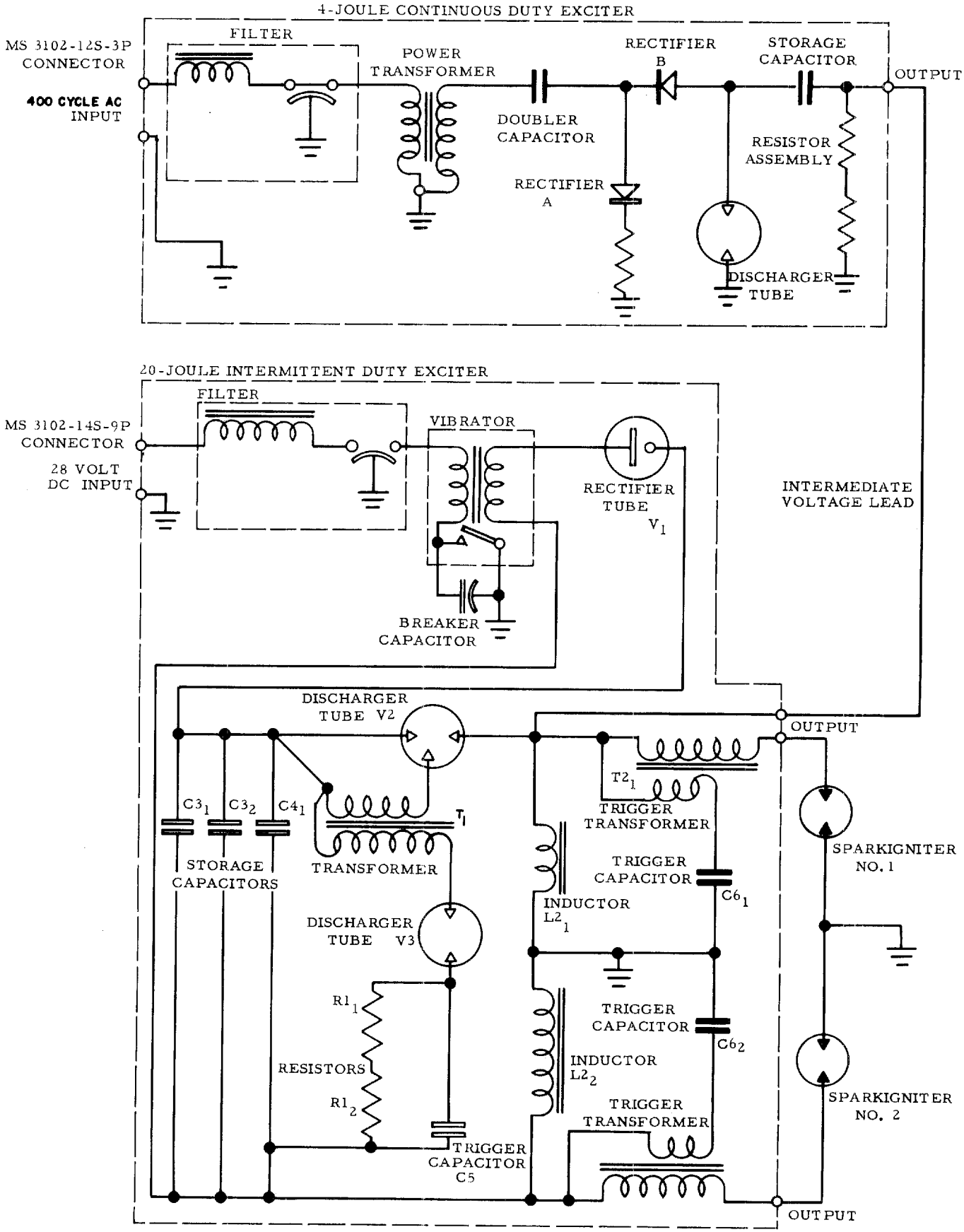


Figure 1-22. Normal and Continuous Ignition System Schematic

d. When this intermediate voltage reaches the predetermined level for which Discharger Tube V_3 has been calibrated, this tube breaks down. A small portion of the accumulated charge, flowing through the primary of Transformer T_1, induces a high voltage in the secondary. This voltage triggers the three-point, discriminating Discharger Tube V_2, which breaks down and permits a surge of current to flow from the storage capacitors through the primary of the trigger transformers into the trigger capacitors. The very high voltage thus induced in the secondary of the trigger transformers is sufficient to ionize the gaps at the sparkigniters, producing a trigger spark.

e. The remainder of the energy on the storage capacitors is immediately discharged following a path through the secondary of the trigger transformer and the high tension lead to Sparkigniter No. 1, through ground to Sparkigniter No. 2, and back through the other high tension lead and trigger transformer secondary to the storage capacitors.

f. The inductance in the inductors is high enough so that the current shunted through them is not significant, but after completion of the spark cycle they provide a return path to bleed off any residual charge on the trigger capacitors.

g. If one sparkigniter is shorted, the operation is the same, producing only one spark.

h. If the circuit to one sparkigniter is open, the operation is the same, producing only one spark. The path from the operating sparkigniter returns through ground and the inductor on the opposite side of the exciter circuit to the storage capacitors.

1-216. NORMAL SYSTEM IGNITION EXCITERS. (See figure 1-22) The function of the normal ignition exciters is to change the low tension current to high tension current and to store it for release, when triggered, by the trigger transformers.

1-217. Each of the two ignition exciters consists of an input noise filter, vibrator, trigger transformers, discharger tubes and rectifier, which are housed in a single metal container together with appropriate capacitors, inductors, and resistors.

1-218. The two ignition exciters are hermetically sealed to protect all components from adverse operating conditions and to eliminate the possibility of flashover at altitude because of pressure changes.

1-219. NORMAL SYSTEM SPARKIGNITERS. (See figure 1-23.) The sparkigniters provide sparking necessary to ignite the atomized fuel-air mixture in the No. 4 and No. 5 combustion chambers during starting.

VOL II

1-220. There are two independently operated sparkigniters inserted in the No. 4 and No. 5 combustion chambers. The remainder of the combustion chambers are interconnected by flame tubes. The igniters pass through holes in the lower rear of the diffuser case.

Note

The right-hand sparkigniter located in the No. 5 combustion chamber is a dual purpose plug which will fire either the 20 joule or 4 joule system. (See figure 1-24.)

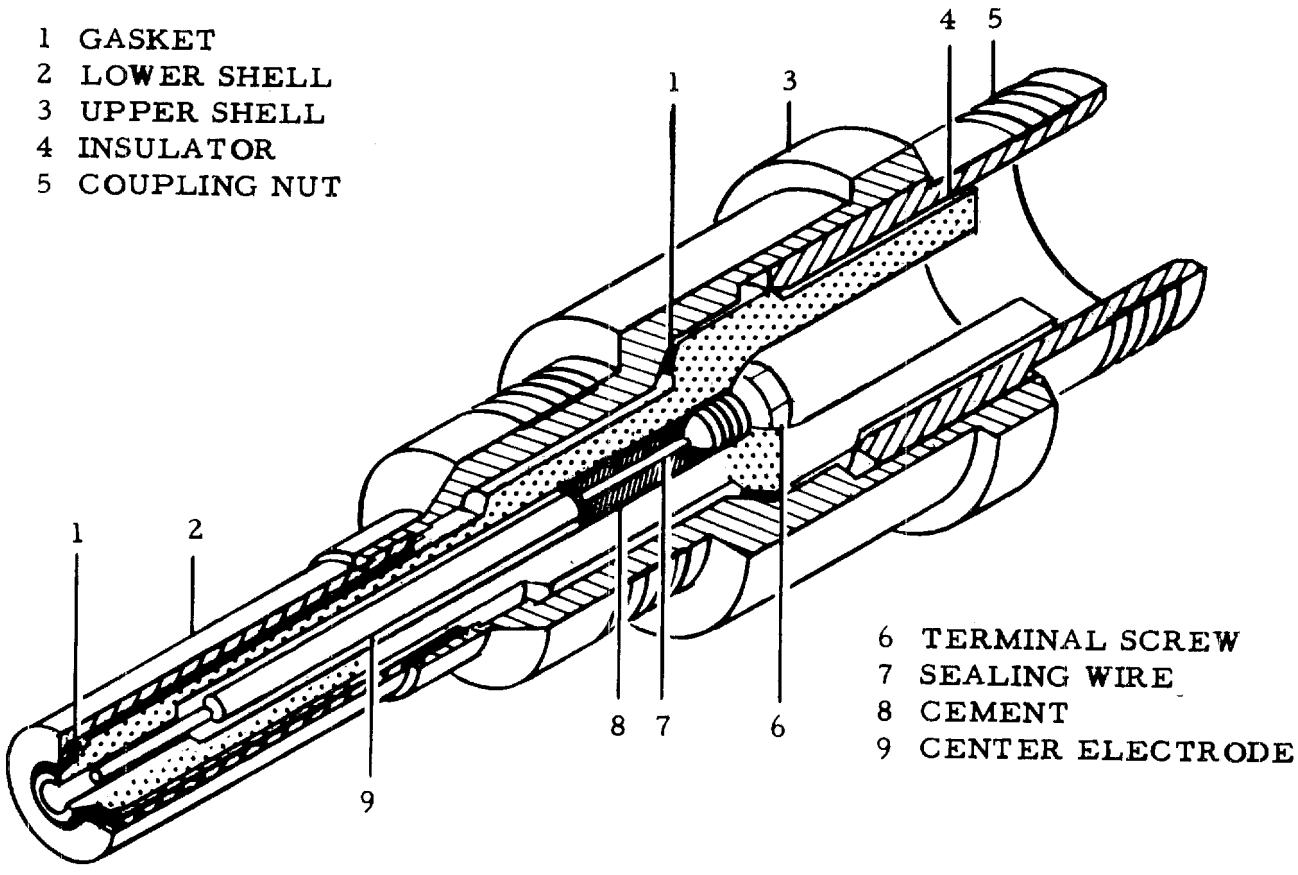


Figure 1-23. Normal System Sparkigniter

1-221. The sparkigniters provide the gap across which the electrical spark passes to ignite the gas. This is accomplished by the surge of the very high voltage of the triggering transformer across the sparkigniter gap which ionizes the gap and makes it conductive; then the storage capacitor discharges the remainder of its accumulated energy through the triggering transformer. This results in a capacitive spark of very high energy, capable of vaporizing globules of fuel and overcoming carbonaceous deposits.

1-222. CONTINUOUS IGNITION SYSTEM.

1-223. GENERAL. (See figures 1-21 and 1-22.) The continuous ignition system is designed to provide continuous sparking of the four joule sparkigniter during certain conditions of altitude and power setting which might induce a flameout.

1-224. The normal ignition system has been modified as follows:

a. The right-hand dc ignition exciter has been replaced by an exciter unit capable of operating on dc or by power supplied by an ac continuous duty exciter.

b. The left-hand dc ignition exciter which feeds the left-hand 20 joule plug was not changed.

1-225. The continuous ignition system is controlled by the Boost Pump and Continuous Ignition Switch in the cockpit and is in operation whenever flight conditions require operation of the auxiliary fuel boost pump.

1-226. The system consists of a continuous duty ignition exciter and a four joule sparkigniter.

1-227. CONTINUOUS IGNITION OPERATION. (See figure 1-22.) When continuous ignition operation is to be employed, power is supplied to the input of the continuous duty exciter from the 115-volt, 400 cycle ac source in the aircraft.

a. It is first passed through a filter which serves to block conducted noise voltage from feeding back into the aircraft electrical system. From the filter the circuit is completed through the primary of the power transformer to ground.

b. In the secondary of the power transformer an alternating voltage is generated at a level of approximately 1500 volts. During the first half cycle this follows a circuit through the doubler capacitor and Rectifier A to ground, leaving the capacitor charged. During the second half cycle, when the polarity reverses, this circuit is blocked by Rectifier A; the flow of this pulse is then through ground and the resistors to the storage capacitor, through Rectifier B and the doubler capacitor back to the power transformer.

c. With each pulse the storage capacitor thus assumes a greater and greater charge, which by virtue of the action of the doubler capacitor approaches a voltage approximately twice that generated in the power transformer. When this voltage reaches the predetermined level for which the spark gap in the discharger tube has been calibrated, this gap breaks down, and the accumulated charge on the storage capacitor reaches the output terminal of this exciter.

d. From the output terminal it is carried to the intermittent duty exciter by the intermediate voltage lead. Being prevented from reaching the storage capacitors in this unit by the discriminating Discharger Tube V_2, a portion of the charge flows through the primary of Trigger Transformer No. 1 into the associated trigger capacitor.

e. This surge of current induces a very high voltage in the secondary of the trigger transformer, sufficient to ionize the gap at Sparkigniter No. 1. The remainder of the charge is immediately dissipated as a spark at the sparkigniter, the return circuit being completed through ground to the continuous duty exciter.

f. The inductor in the intermittent duty exciter serves to bleed off any residual charge on the trigger capacitor between spark cycles.

1-228. CONTINUOUS DUTY IGNITION EXCITER. (See figure 1-22.) The function of the continuous duty exciter is to provide continuous sparking of the four joule sparkigniter at high altitude.

1-229. Power input to the continuous duty exciter is 115-volts, 400 cycles. The normal input power is supplied by the ships ac generator with the inverter system as backup.

1-230. The continuous duty exciter consists of an input noise filter, a power transformer, discharger tube, and rectifier; these are housed together in a metal container with appropriate capacitors and resistors.

1-231. The exciter is hermetically sealed to protect all components from adverse operating conditions and to eliminate the possibility of flashover at altitude because of pressure changes.

1-232. CONTINUOUS DUTY IGNITION SPARKIGNITER. (See figure 1-24.) The continuous ignition sparkigniter located in the No. 5 combustion chamber is a dual purpose plug which will fire either the 4 joule or 20 joule system. The sparkigniter is similar in detail to the normal (20 joule) sparkigniter. Refer to normal system sparkigniter.

1 LOWER SHELL
2 UPPER SHELL
3 GASKET
4 INSULATOR
5 COUPLING THREAD
6 TERMINAL SCREW
7 SEALING WIRE
8 CEMENT
9 CENTER ELECTRODE

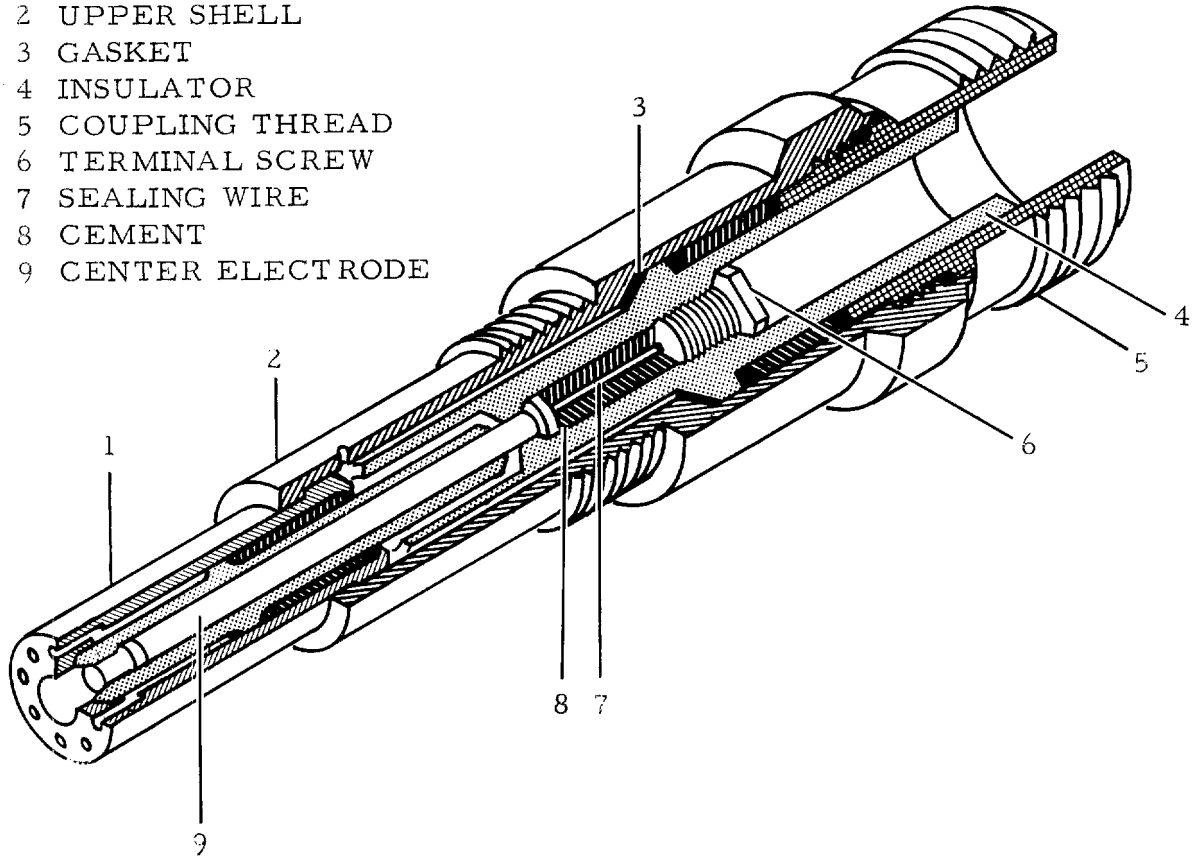


Figure 1-24. Continuous Duty Sparkigniter

VOL II

1-233. EXHAUST SYSTEM.

1-234. GENERAL.

1-235. The exhaust system (see figure 1-48) in the airplane consists of a tailpipe assembly, which is divided into two sections. The forward section bolts to the engine and is approximately four feet long. The aft portion slips over the forward section and is held in place with a notched band clamp. It is supported in the aft fuselage section with a roller-track arrangement. The aft end of the tailpipe terminates at the augmentor assembly.

1-236. TAILPIPE ASSEMBLY.

1-237. The tailpipe is a cylindrical corrosion resistant steel pipe approximately 175 inches long. The tailpipe is a series of tapered sections, starting at the engine, the inside diameter is 35.95 inches which tapers to 30.56 inches at the joint. From the joint to the start of the nozzle it tapers to 28.50 inch diameter. The nozzle exit diameter is 25.46 inches.

1-238. The forward section, which bolts to the engine, extends to the fuselage station 555 breakpoint.

1-239. The aft portion of the tailpipe is supported in the fuselage aft section by means of a roller-track arrangement, which permits tailpipe expansion. The roller assembly on the tailpipe is adjustable in order to provide the best possible alignment of the tailpipe nozzle with the augmentor. The adjustment allows the tailpipe to be moved up or down as required. In order to make the adjustment when the tailpipe is in the airplane, two one-half inch holes located on the left and right sides of the fuselage allow a Phillips head screwdriver to loosen serrated plates on the tailpipe. The serrated plates are also the support for the rollers. With the serrated plates loose the tailpipe may be moved up or down at the nozzle end of the tailpipe. When the desired position of the tailpipe has been obtained the serrated plates should be tightened.

1-240. The aft tailpipe section joins the forward tailpipe section by means of a slip joint. The joint is held together with a band clamp.

1-241. The tailpipe is covered with insulation blankets to prevent excessively high temperatures in the airplane. The blankets are composed of an upper and lower section laced together with corrosion resistant steel lockwire. Each section of blanket contains a breather vent to allow moisture to escape.

1-242. LUBRICATION, SCAVENGE AND BREATHER SYSTEM.

1-243. GENERAL.

1-244. The engine lubrication system (see figure 1-25.) consists of a pressure oil system which supplies oil to the main engine bearings and to the accessory drives, and a scavenge system which scavenges the bearing compartments, and accessory drives. The specified oil is MIL-L-23699A. Refer to Maintenance Section of this manual under heading, Servicing of Oil Tank, for acceptable alternate oils.

1-245. The oil cooling system consists of a 14-inch air-oil cooler, a 9-inch air-oil cooler, a fuel-oil cooler, and interconnecting plumbing.

1-246. A breather system connecting the individual bearing compartments, and the oil tank with the breather pressurizing valve, complete the lubrication system.

1-247. PRESSURE OIL SYSTEM.

1-248. Oil is gravity-fed from the oil tank to the inlet of the engine oil boost pump. This is a variable-pressure-rise pump. It provides an essentially constant inlet pressure at the main engine oil pump relative to oil tank pressure, by means of a boost pump regulating bypass valve. This valve may be adjusted to maintain selected main oil pump inlet pressure. A boost pump relief valve set for about 100 psi will protect the air-oil coolers, fuel-oil cooler, and associated plumbing from damage should complete stoppage occur in the airframe system.

1-249. The main oil pump forces oil through the main oil strainer downstream from the pump discharge into a manifold which directs it to the engine components requiring lubrication.

1-250. Proper distribution of the oil flows to the various locations is maintained by metering orifices and clearances.

1-251. Siphoning of the oil is prevented by a vent line connecting the top of the tank with the airframe antisiphon valve located on the upper side of the engine compartment at fuselage station 441.

1-252. SCAVENGE OIL SYSTEM.

1-253. A system of spur gear type scavenge pumps removes the oil from four collection points and forces it through passages to outlet fittings and tubes directly to the oil tank before it is cooled.

1-254. To ensure proper scavenging, the total capacity of these scavenge pumps is greater than the oil flow.

1-255. The oil at the engine outlet contains a considerable amount of entrapped air which is removed by means of a rotary breather in the N_2 accessory drive gearbox.

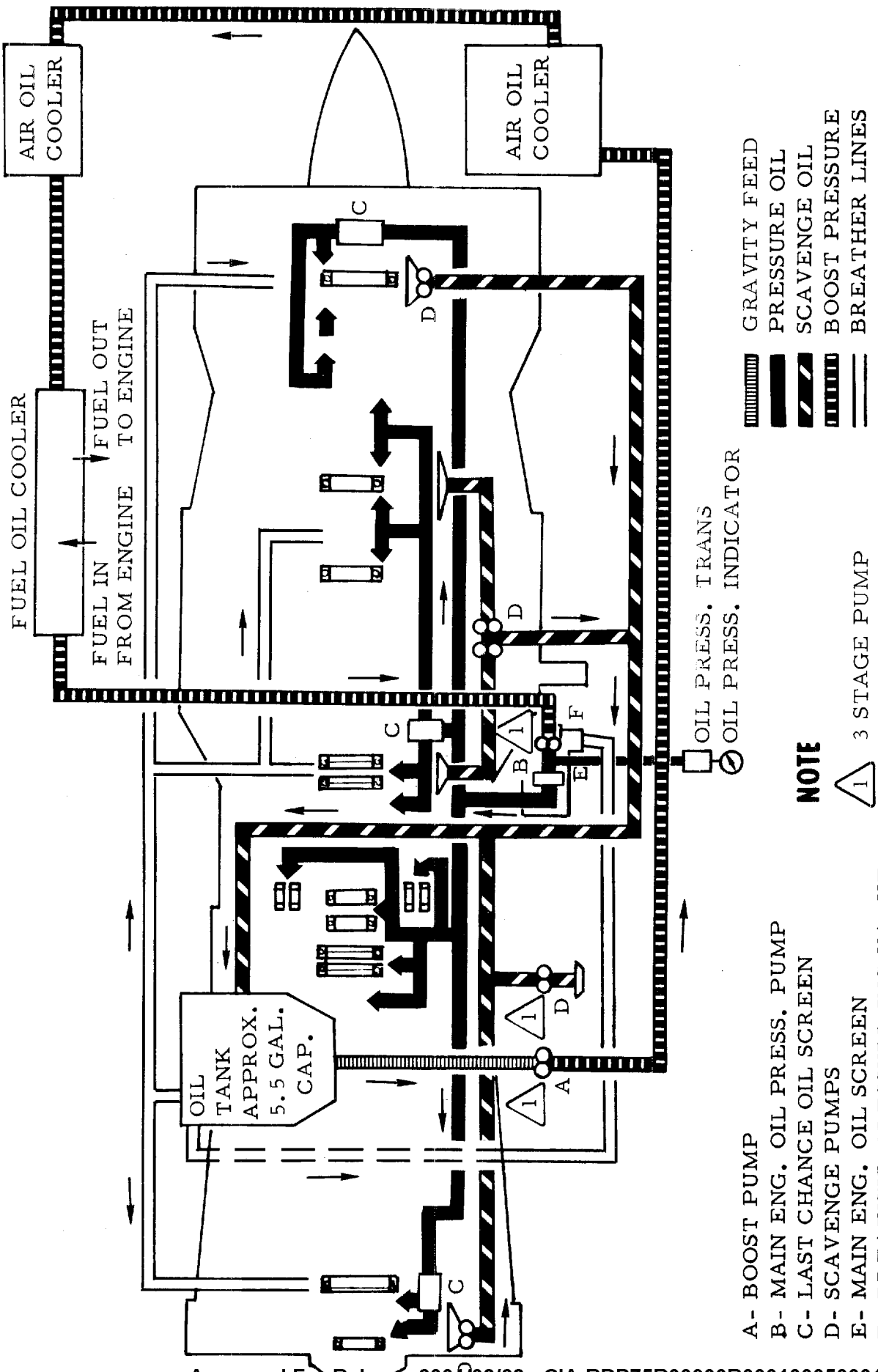


Figure 1-25. Lubrication, Scavenge, and Breather System Schematic

1-256. The heat, which is added to the oil as it passes through the engine, must be removed by the oil cooling system after the oil is drawn from the oil tank for recirculation through the engine.

1-257. OIL COOLING SYSTEM.

1-258. The oil cooling system consists of a 14-inch air-oil cooler, a 9-inch air-oil cooler, and a fuel-oil cooler.

1-259. From the oil outlet pad on the accessory drive gearbox the oil flows to the 14-inch air-oil cooler where the oil at low temperature circulates through the bypass jacket and is discharged through the bypass port. As the temperature of the oil increases the oil is directed through the core of the cooler where heat is given off to the air passing through the tubes of the cooler. For details refer to figure 1-28.

1-260. From the 14-inch air-oil cooler the oil flows to the 9-inch air-oil cooler. The oil enters the inlet port and travels through the core of the cooler and is discharged through the outlet port. For details refer to figure 1-31.

1-261. From the 9-inch air-oil cooler the oil flows to the fuel-oil cooler. The fuel-oil cooler utilizes a series of cooler tubes through which engine fuel flows. Heat from scavenge oil flowing around the tubes is transferred to the fuel. The fuel-oil cooler has a temperature sensing unit. For details refer to figure 1-33.

1-262. BREATHER PRESSURIZING SYSTEM.

1-263. To ensure proper oil flow from the main bearing oil jets, the bearing compartments are vented to atmosphere by means of a breather pressurizing system.

1-264. Breather tubes in the compressor inlet case, the oil tank, the diffuser case, and the turbine exhaust case are connected by external tubing along the right side of the engine. By means of this tubing, vapor-laden air from the various bearing compartments are brought together in the oil pump and accessory drive gearbox.

1-265. In the gearbox, a rotary breather, which is integral with the generator driveshaft gear, removes the oil from the air by centrifuging action. The relatively oil-free air reaching the center of the shaft gear is conducted through a passage in the gearbox cover to the breather pressurizing valve.

1-266. The breather pressurizing valve is designed to maintain an oil system pressure sufficient to ensure jet oil flow similar to that at sea level.

VOL II

1-267. SYSTEM OPERATION.

1-268. The oil system is designed to operate at engine compartment temperatures ranging from -46°C (-50°F) to 125°C (257°F), using engine oil specified in Maintenance Section of this manual. At maximum engine speed, the system oil pressure is 55 psig, when measured at the oil pressure transmitter connection.

1-269. From the oil tank, oil flows to the boost pressure pump. The pump receives the oil at its inlet port and discharges it at boosted pressure to the air-oil coolers and fuel-oil cooler.

1-270. From the fuel-oil cooler the oil enters the inlet port of the main engine oil pressure pump which discharges it at system working pressure to the main oil strainer.

1-271. From the main oil strainer, the oil at system pressure is directed into three supply lines.

a. One line conducts oil to the front compressor front bearings and the accessory drive shaft gear bearings.

b. The second line conducts oil upward into the intermediate case for lubrication of the front compressor rear bearing and rear compressor front bearing.

c. The third line conducts oil to the engine rear bearings.

1-272. Pressure oil distributed to the engine main bearings is sprayed on the bearings through fixed orifice nozzles.

1-273. Lubrication and Breather System Components are listed in table 1-3.

Table 1-3. Lubrication and Breather System Components.

NAME	PART NO.	VENDOR
Oil Tank	351580	Pratt & Whitney
Main Oil Pump	334716	Pratt & Whitney
Main Oil Strainer	503178 & 503184	Pratt & Whitney
Air-Oil Cooler (14-inch)	72139	Clifford Mfg.
Thermostatic Temperature Control Valve	150275-195	Airesearch
Air-Oil Cooler (9-inch)	36793	Clifford Mfg.
Fuel-Oil Cooler	87880-3	Airesearch
Breather Pressurizing Valve	361477	Pratt & Whitney

1-274. COMPONENTS DESCRIPTION.

1-275. OIL TANK. The oil tank stores the oil used in the engine lubrication system. It is a stainless steel sheet metal part having a usable capacity of 5.5 gallons and is mounted on the upper left-hand side of the engine.

1-276. The tank is curved to fit the rear half of the front compressor case and is held in place by cushioned straps which are bolted to the compressor case.

1-277. MAIN OIL PUMP. (See figure 1-26.) The function of the main oil pump is to supply pressurized oil to the main engine bearings and to the accessory drives. The pump is a three stage gear-type pump consisting of pressure, boost, and scavenge stages.

1-278. The pump is located in the left side of the oil pump and accessory drive housing.

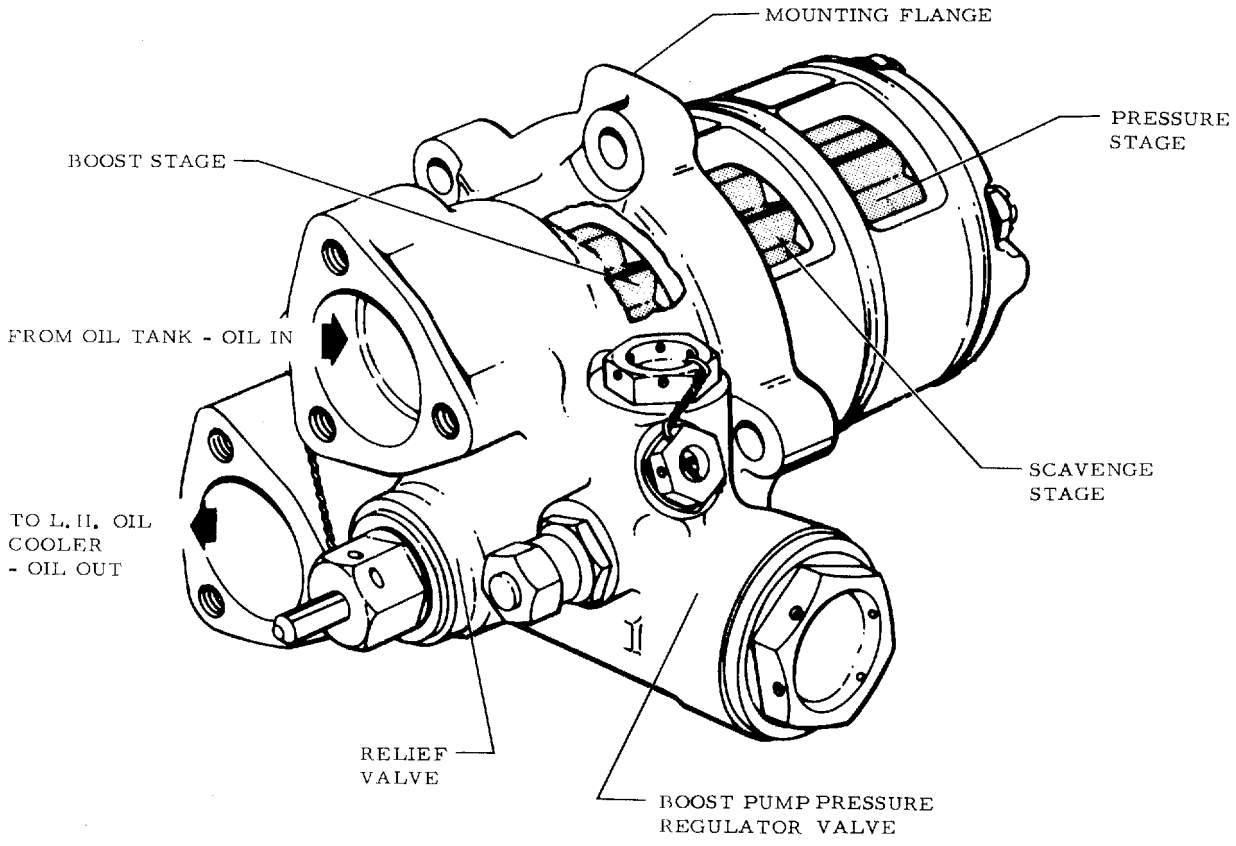


Figure 1-26. Main Oil Pump

1-279. MAIN OIL STRAINER. (See figure 1-27.) The main oil strainer reduces contamination of the lube oil which flows to the main bearing areas: thus, it minimizes the possibility of clogged oil jet nozzles.

1-280. The main oil strainer is located on the bottom of the oil pump and accessory drive gearbox. A bypass valve is mounted in the center of the filter element. If the filter element becomes clogged, the bypass valve will open and allow oil to flow through the center of the filter.

1-281. The oil strainer is in two parts and each part is composed of a series of screens in disc form, separated alternately by stamped inlet and outlet spacers, assembled around a perforated baffle. It is accessible for removal, disassembly, and cleaning.

1-282. Operation. Oil enters the inlet port, then flows from outside the screen discs toward the center of the perforated baffle. Filtered oil is discharged through the outlet port to a chamber downstream of the strainer. If the filter screens should become clogged, the oil is routed through a spring-loaded bypass valve allowing the unfiltered oil to pass into the lubrication system.

1-283. AIR-OIL COOLER. (14-inch diameter) See figure 1-28. The air-oil cooler has a frontal area of 154 square inches and utilizes ram air as a cooling agent to reduce the temperature of the scavenge oil. It is located on the left-hand side of the engine compartment at approximately fuselage station 475.

1-284. The oil cooler is constructed of aluminum alloy and consists of a welded and brazed shell assembly, enclosing a core equipped with tubes positioned by header plates. Six baffles are employed to direct oil flow around the tubes, while air flows through the tubes.

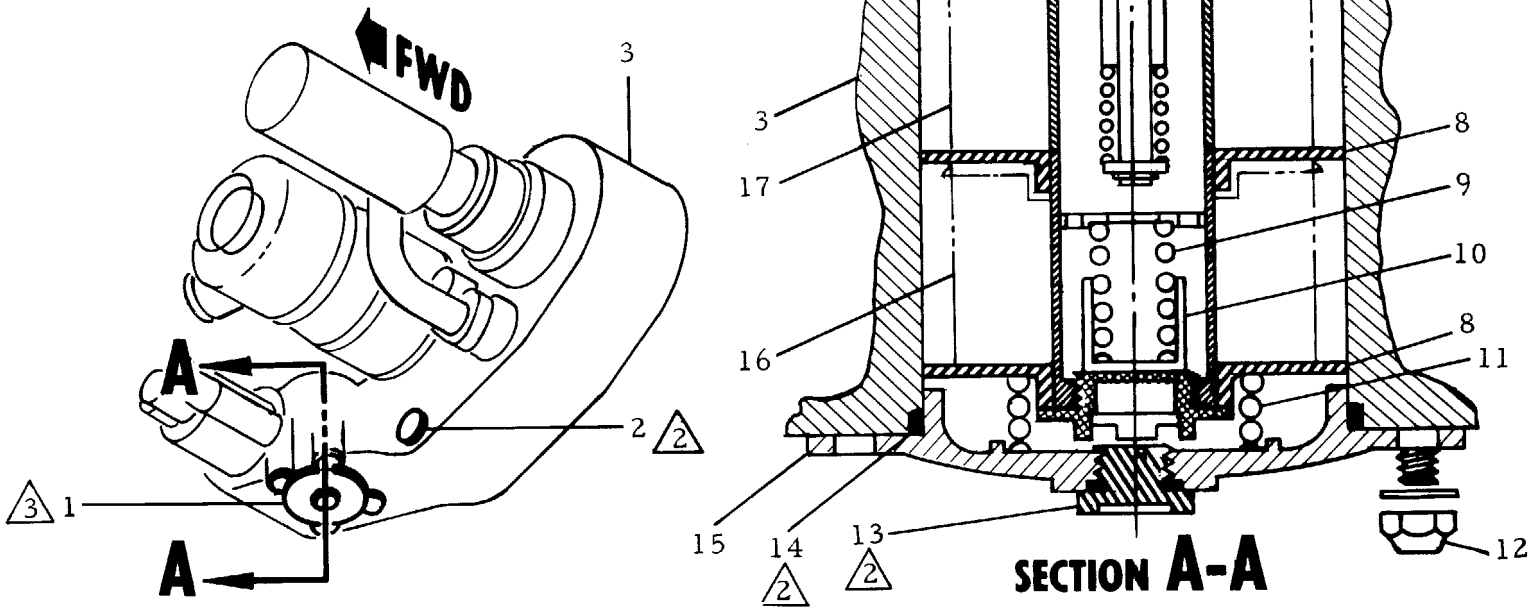
1-285. A mounting pad for attachment of a temperature control valve, and an oil drain port are provided on the cooler.

1-286. Operation. The air-oil cooler is designed to be used with a thermostatic temperature control valve which functions to regulate aircraft engine lubricating oil temperature, to limit the pressure applied to the cooler, and to protect the cooler from high pressure surges.

1-287. When a cold engine is started, oil at low temperature and high pressure is directed through the valve to the cooler assembly. Some oil enters the warmup (bypass) jacket, the remainder attempts to flow through the core of the cooler, but is impeded by the more viscous oil already in the cooler. Under these conditions oil entering the cooler circulates through the warmup jacket and is discharged from the cooler through the bypass port.

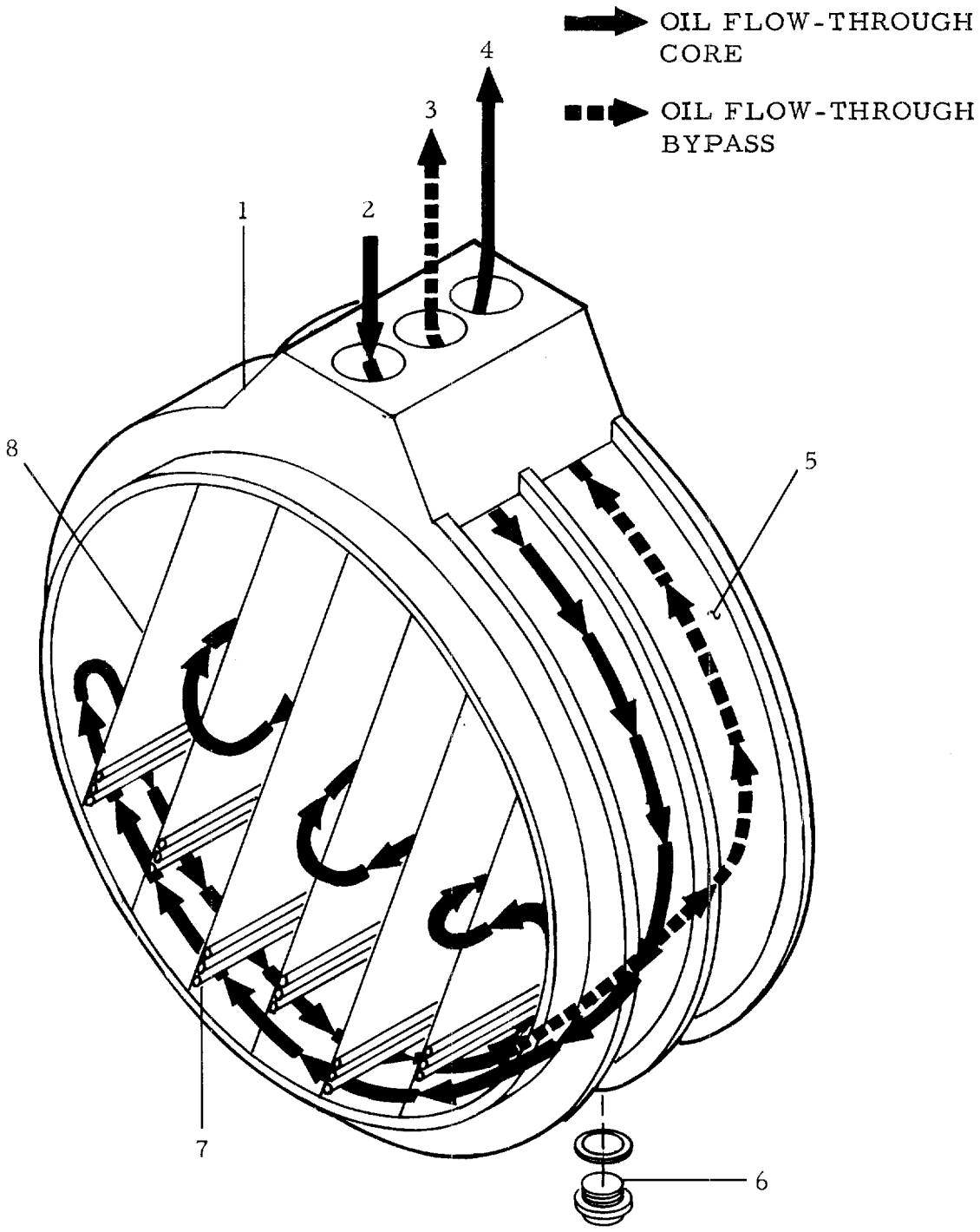
NOTE

1. AN OUTLET SPACER MUST BE AT EACH END ON ASSY, AND EACH SCREEN WILL BE BETWEEN AN OUTLET AND INLET SPACER.
2. USE NEW SEALS AT INSTALLATION.
3. INSPECT AND CLEAN MAIN OIL STRAINER EVERY 200 HOURS.



1 MAIN OIL STRAINER
2 DRAIN PLUG AND SEAL
3 ACCESSORY GEARBOX
4 SPACER SUPPORT
5 SEAT AND CHECK VALVE
6 SEAL
7 OUTLET SPACER, SCREEN, AND INLET SPACER
8 SPACER SUPPORT
9 SPRING
10 BYPASS VALVE
11 SPRING
12 RETAINER NUT
13 DRAIN PLUG AND SEAL
14 COVER SEAL
15 COVER
16 OUTER STRAINER ELEMENT
17 INNER STRAINER ELEMENT

Figure 1-27. Main Oil Strainer



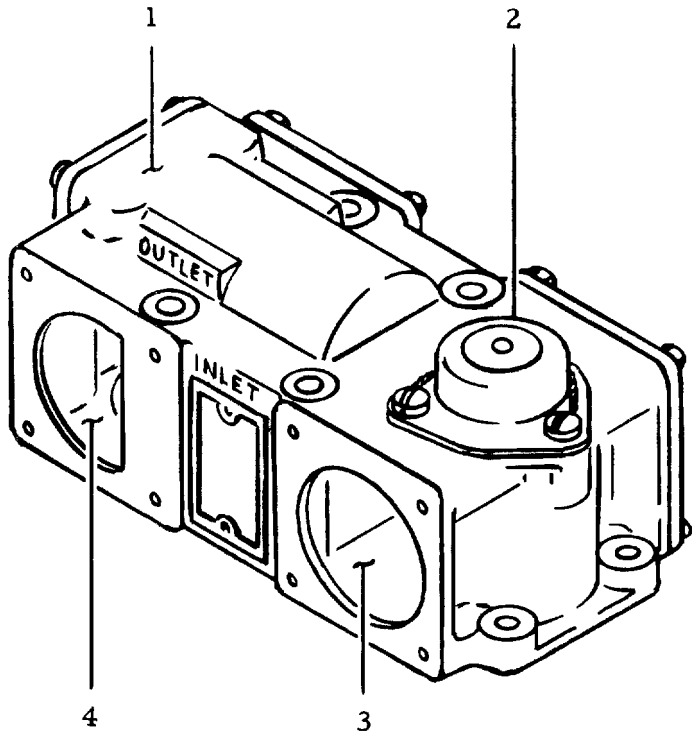
1 VALVE MOUNTING FLANGE
2 INLET PORT
3 BYPASS PORT
4 OUTLET PORT
5 WARM UP JACKET
6 DRAIN PLUG
7 AIR FLOWS THROUGH TUBES
OIL FLOWS AROUND TUBES
8 BAFFLE

Figure 1-28. Air-Oil Cooler Schematic, 14 Inch (Left-Hand Installation)

1-288. As the temperature of the oil entering the valve rises to a higher value, and the pressure conditions are reduced, oil flows into the warmup jacket and is routed by the baffles through the core of the cooler. An exchange of heat takes place between the oil flowing through the tubes. Oil is discharged from the cooler through the cooler outlet port.

1-289. THERMOSTATIC TEMPERATURE CONTROL VALVE. (See figure 1-29.) The thermostatic temperature control valve is used with the 14-inch air-oil cooler to control temperature of the oil, limit pressure applied to the cooler, and protect the cooler from high pressure surges.

1-290. The control valve consists of a ported housing which contains two flapper-type check valves, a thermostatic bypass and relief valve, and a guided valve and surge valve combination.



1 THERMOSTATIC BYPASS AND RELIEF VALVE

2 GUIDED VALVE

3 INLET CHAMBER

4 OUTLET CHAMBER

Figure 1-29. Thermostatic Temperature Control Valve

1-291. The housing contains three main chambers: one inlet chamber which forms a passage for oil flowing from the aircraft lubrication system, and one central chamber which serves as a bypass for inlet oil from the cooler to the outlet chamber. The central and outlet chambers contain flapper-type return flow check valves.

1-292. The thermostatic bypass and relief valve is located between the central and outlet chambers, with the thermostat oil temperature sensing element positioned in the outlet chamber.

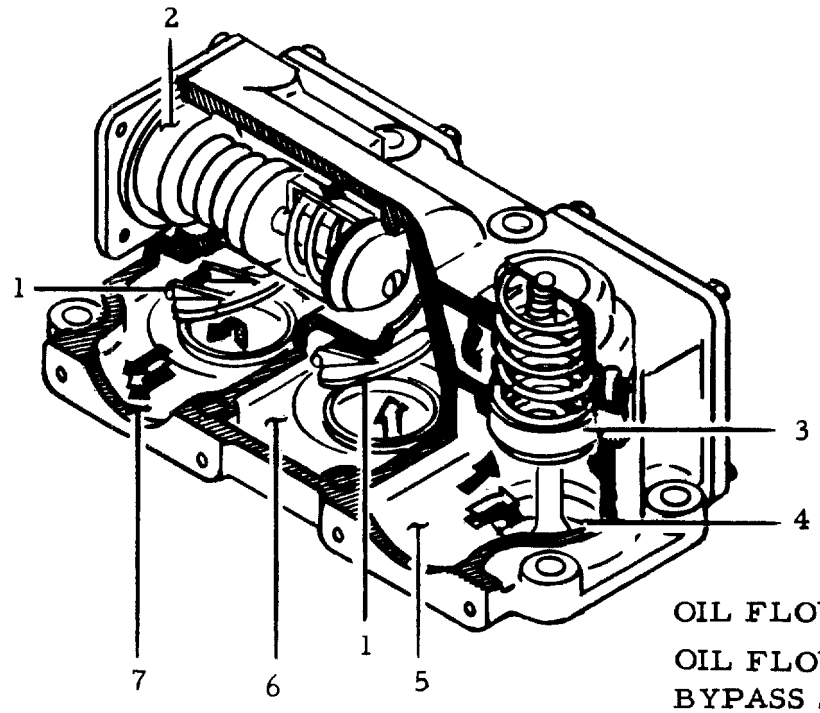
1-293. As the oil passing through the outlet chamber and around the thermostat element becomes warmer, the thermostatic bypass valve begins to close, forcing some of the oil to flow through the oil cooler core. If the outlet oil reaches the thermostatic bypass valve closing temperature, all the oil will be forced to flow through the oil cooler core. As the cooled oil from the core passes through the outlet chamber and around the thermostatic element, the thermostatic valve moves toward the open position, allowing more oil to bypass the core through the jacket. Thus the amount of oil which is cooled by passing through the core is dependent on outlet oil temperature.

1-294. If the pressure differential across the closed thermostatic bypass valve rises to pressure-relief-opening level, the valve will be forced off of its seat and allow oil to flow through the bypass port, relieving excessive differential pressure.

1-295. The guided valve and surge valve combination is located in the inlet chamber. The guided valve controls a direct passage from inlet to outlet chambers; the surge valve controls the passage between the inlet chamber and the oil cooler and bypass jacket inlet.

1-296. Operation. (See figure 1-30.) When a cold engine start is made, the thermostatic bypass and relief valve and the surge valve are open and the guided valve is closed; thus oil (at low temperature and high pressure) enters the inlet bypass jacket, the central chamber flapper valve port, and the thermostatic bypass and relief valve port to the outlet port. A certain amount of oil entering the bypass jacket attempts to flow through the oil cooler core, but its flow is impeded by the more viscous oil already in the cooler.

1-297. If the oil pressure in the inlet chamber rises to low-surge level the guided valve will crack and allow some oil to flow directly to the outlet chamber, relieving the inlet chamber pressure. If the oil pressure at the oil cooler inlet rises to surge-valve closing pressure level (high surge), the guided valve will move far enough to close the surge valve, forcing all the oil to flow directly to the outlet chamber and protecting the oil cooler from pressure in excess of the allowable momentary high-surge level.



1 CHECK VALVE

2 THERMOSTATIC BY-PASS AND RELIEF VALVE

3 GUIDED VALVE (LOW SURGE PROTECTION)

4 SURGE VALVE (HIGH SURGE PROTECTION)

5 INLET CHAMBER

6 CENTRAL CHAMBER

7 OUTLET CHAMBER

OIL FLOW BYPASSING COOLER

OIL FLOW THROUGH COOLER BYPASS JACKET

OIL FLOW THROUGH COOLER CORE

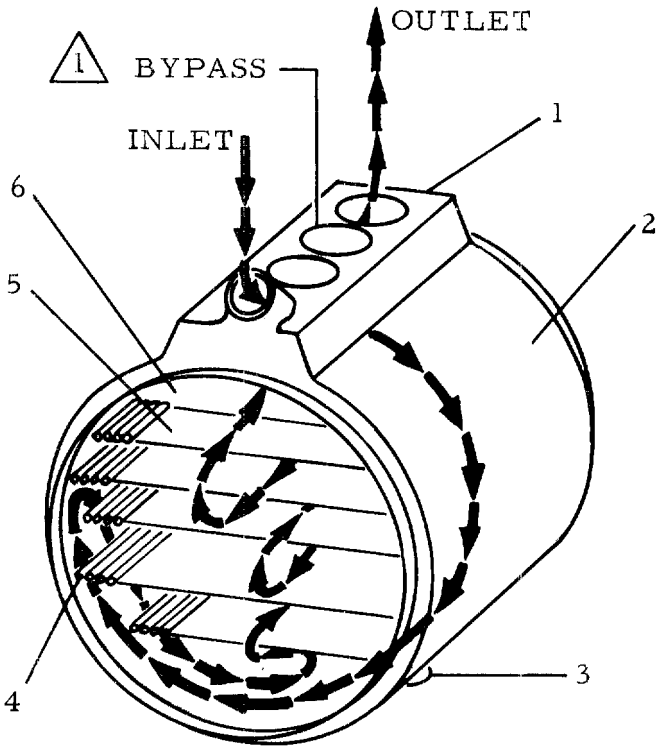
Figure 1-30. Thermostatic Temperature Control Valve Schematic

1-298. AIR-OIL COOLER. (9-inch diameter) See figure 1-31. The air-oil cooler has a frontal area of 64 square inches and utilizes ram air as a cooling agent to reduce the temperature of the scavenge oil. It is located on the right-hand side of the engine compartment at approximately fuselage station 485.

1-299. The oil cooler is constructed of aluminum alloy and consists of a welded and brazed shell assembly, enclosing a core equipped with tubes positioned by header plates. Five baffles are used to direct oil flow around the tubes, while air flows through the tubes.

1-300. A mounting pad with provisions for attaching a temperature control valve, and an oil drain port are provided on the cooler.

1-301. Operation. When a cold engine is started, oil at low temperature and high pressure enters the oil cooler through the oil inlet connection. The oil is routed by baffles to flow through the core of the cooler where heat is given off to the air passing through the tubes of the cooler. The oil is then discharged through the outlet port.



1 MOUNTING FLANGE
2 WARM UP JACKET
3 DRAIN PLUG
4 TUBES
5 BAFFLES
6 CORE

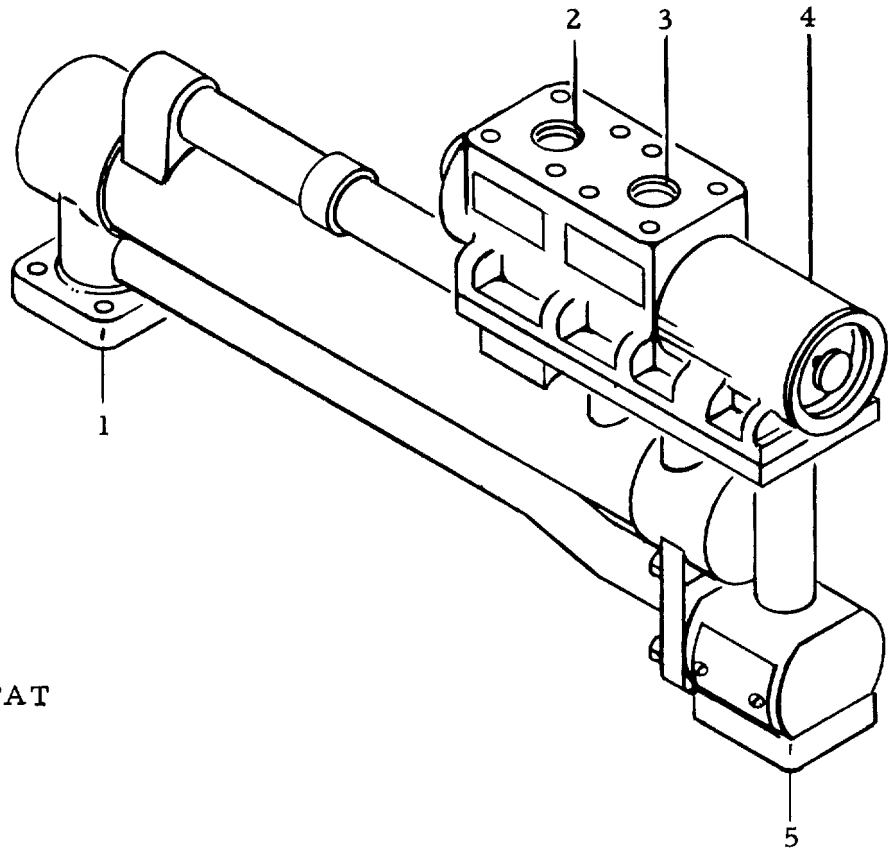
NOTE

1 BYPASS PORT SEALED OFF ON THIS INSTALLATION

Figure 1-31. Air-Oil Cooler Schematic, 9-Inch (Right-Hand Installation)

1-302. FUEL-OIL COOLER. (See figure 1-32.) The fuel-oil cooler has two purposes; one, to heat abnormally cool fuel and prevent ice formation in the fuel strainer and engine fuel control; two, to provide additional oil cooling at high altitude.

1-303. The fuel-oil cooler incorporates a fuel temperature control valve and a fuel bypass valve. Located on the right-hand side of the engine compartment at fuselage station 450, the fuel-oil cooler utilizes a series of cooler tubes, through which engine fuel flows. Heat from scavenge oil, flowing around the tubes, is transferred to the fuel.



1 FUEL IN

2 OIL OUT

3 OIL IN

4 THERMOSTAT

5 FUEL OUT

Figure 1-32. Fuel-Oil Cooler

1-304. Operation. (See figure 1-33.) Fuel enters the unit through the fuel inlet, is directed through the cooler tubes in one pass, contacts the temperature regulating thermostat and is discharged through the fuel outlet port of the fuel bypass valve. Oil from the engine oil system enters the unit through the fuel temperature control valve inlet port.

1-305. When a cold engine is started, the oil is at low temperature and high pressure. The pressure relief feature of the valve operates during a cold start to limit the maximum pressure drop across the cooler. When the differential in pressure between the "oil-in" and "oil-out" attains a specified value, the pressure drop across the valve is sufficient to overcome the force of the bypass relief spring and the valve is forced off its seat. Some of the oil then bypasses the cooler core and flows through the bypass port and the valve outlet. As the temperature of the oil increases the pressure drop through the core gradually decreases, the bypass relief valve starts to close, forcing oil through the cooler core. Heat is transferred from the oil flowing around the tubes to the fuel flowing in the tubes.

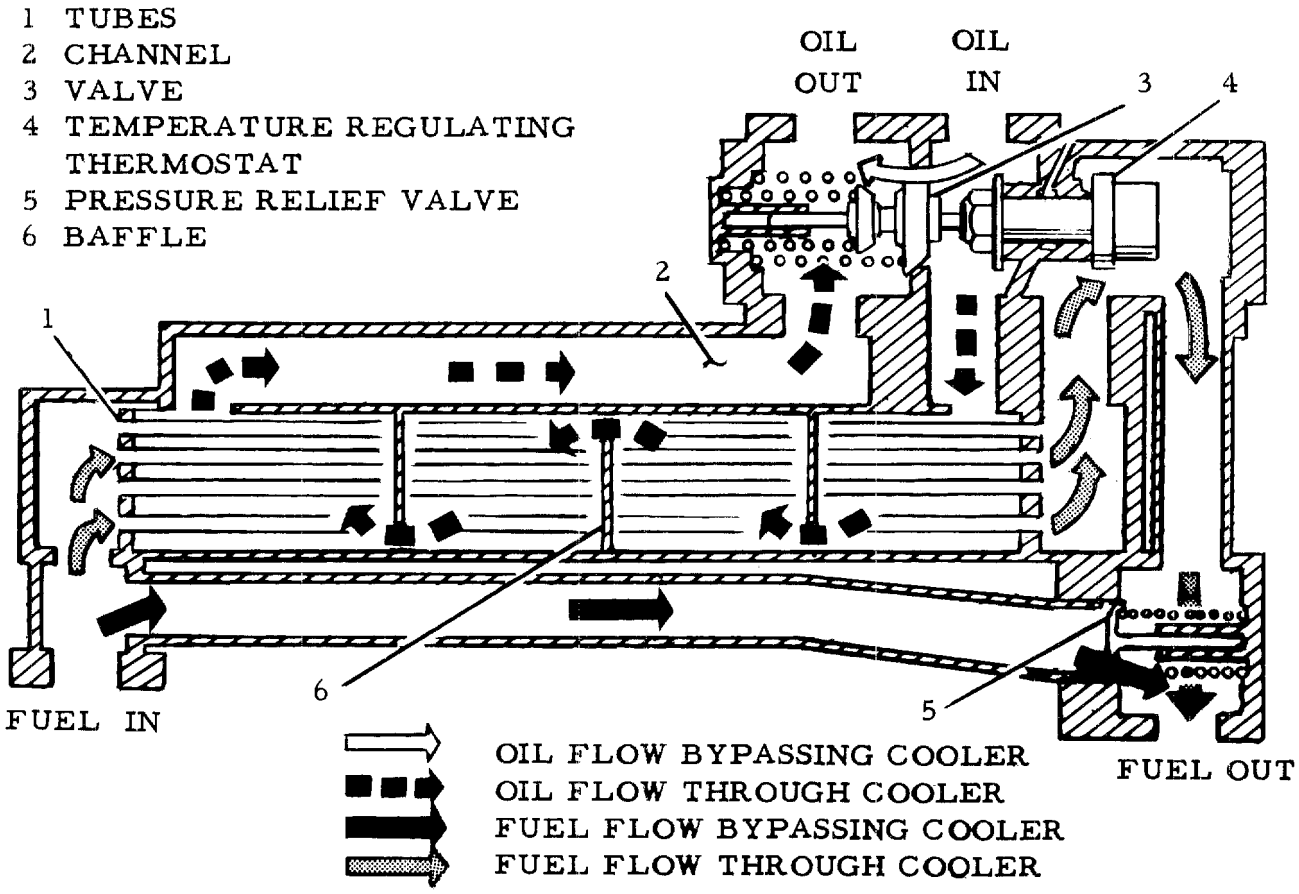


Figure 1-33. Fuel-Oil Cooler Schematic

1-306. The thermostatic bypass feature of the fuel temperature control valve operates, when the temperature of the fuel in which the thermostat element is immersed reaches a specified value. When this occurs, the thermostat element expands, causing the piston to extend against the spring force of the bypass valve, causing the valve to crack open. This allows a portion of the oil to flow through the bypass port to the outlet port, while the remainder flows through the core of the cooler. If fuel temperature rises to the maximum calibrated setting of the thermostat, the piston extends fully, forcing the valve fully open. Thus the fuel outlet temperature is dependent upon the amount of oil which is cooled by passing through the core.

1-307. The fuel bypass valve operates to limit the maximum pressure drop across the cooler on the fuel side. When the pressure differential across the closed poppet valve rises to pressure-relief-opening level, the poppet is forced off its seat and allows fuel to flow through the bypass port relieving excessive differential pressure. When the valve is closed, fuel flows by way of the fuel temperature control valve, through the tube of the bypass valve, to the outlet port.

1-308. BREATHER PRESSURIZING VALVE. (See figure 1-34.) The breather pressurizing valve regulates the air pressure in the oil breather pressurizing system to assure jet oil flow at all altitudes.

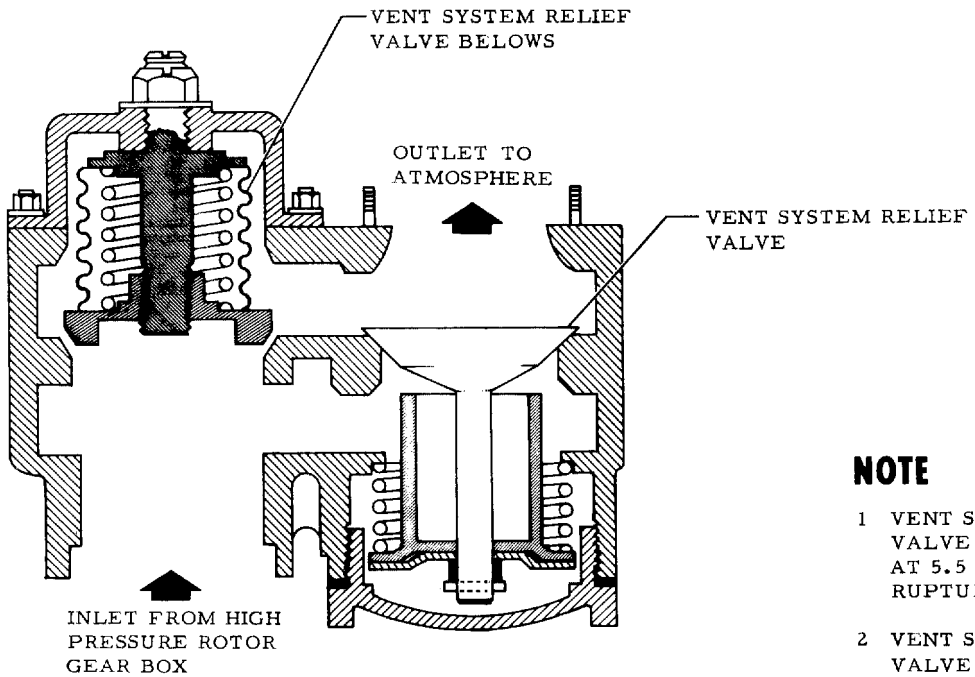


Figure 1-34. Breather Pressurizing Valve Schematic

1-309. The breather pressurizing valve is mounted on the upper right side of the oil pump and accessory drive gearbox. It consists of an aneroid-operated (spring and bellows) valve and a spring-loaded blow-off valve.

1-310. Operation. Pressurization is provided by seal leakage which enters the system. At sea level pressure, the breather pressurizing valve is open. It closes gradually with increasing altitude, and maintains an oil system pressure sufficient to assure oil flows similar to those achieved at sea level. The spring loaded blow-off valve acts as a pressure relief valve for the entire breather system. It will open only if pressure above predetermined maximums builds up in the system. The overboard line should be mounted below the pressurizing valve connection.

VOL II

OPERATIONAL CHECKOUT

1-311. ENGINE.

1-312. PREPARATION FOR ENGINE RUN.

WARNING

Observe Engine Runup precautions noted in Section I of -2-1 Maintenance Manual.

a. Fuel tanks - sufficient fuel for runup interval.

b. Oil tank - level in safe range.

c. Hydraulic tank - full.

d. Inlet guide vanes, compressor rotor and stator blades for dents, nicks or other evidence that engine has ingested foreign material.

e. Intake ducts for cleanliness, cracks or loose rivets.

f. Tailpipe and turbine for cracks or evidence of foreign material passing through turbine.

g. Runup screens, Part No. 75GH53 installed.

CAUTION

Be sure runup screens are free of foreign material.

h. Chock main wheels.

Note

Use brakes above idle rpm in addition to chocks.

i. Surface controls, flaps, etc. to be free of gust locks, flaps or surfaces to be clear for operation. Remove ladders, stands, etc.

j. Main and auxiliary fuel tank transfer valves open and lockwired; fuel boost pump valve open and lockwired.

k. Connect MA-2 or equivalent for external starting power and connect air hose to engine starter.

1-313. COCKPIT CHECK - (No Electrical Power).

a. Check for loose equipment such as: rivets, screws, bolts, washers, clip leads, clothing or anything that could be sucked through the screens during runup.

Note

Areas to be policed include: top aft portion of boundary layer, left and right air intake ducts, along hinge side of canopy, behind seat headrest, and along canopy sills.

b. Surface controls and brakes for proper operation.

c. Check cockpit equipment beginning with left console and working around clockwise to right console as follows:

(1) Fan switch OFF.

(2) Cockpit and equipment bay seal pressure switches OFF.

(3) Radios OFF.

(4) Landing light switch OFF.

(5) Fuel switch ON.

(6) Gust control FAIRED.

(7) Throttle in CUTOFF.

(8) Speed brake switch NEUTRAL.

(9) Wing flap switch NEUTRAL.

(10) Landing gear handle DOWN.

(11) Fuel transfer switch NEUTRAL.

(12) Ram air switch OFF.

(13) Face heat OFF.

(14) Cabin cooler in AUTOMATIC and temperature control at 9 o'clock position.

(15) Battery switch OFF.

(16) Inverter OFF.

(17) Pitot heat OFF.

(18) AC generator OFF.

(19) All circuit breakers IN, except emergency face heat.

(20) Emergency fuel switch NORMAL.

(21) Instrument lights and map lights OFF.

(22) Autopilot OFF.

(23) Radio compass OFF.

(24) Defroster control CLOSED.

1-314. IGNITION CHECK. (Airplane battery power only.)

a. Battery and generator switch to OFF position.

b. ENG IGNITION switch to START position.

c. Listen for operation of both sparkigniters.

d. ENG IGNITION switch, release. Sparkigniter operation should stop.

e. Battery switch to BAT & GEN. position.

f. ENG IGNITION switch to START position.

g. Listen for operation of both sparkigniters.

h. ENG IGNITION switch, release. Sparkigniter operation should stop.

i. Battery and generator switch to BAT EMER. position.

j. ENG IGNITION switch to START position.

k. Listen for firing of both sparkigniters.

l. ENG IGNITION switch, release. Sparkigniter operation should stop.

Note

For complete system checkout see Normal and Continuous Ignition System Checkout.

1-315. COCKPIT CHECK (With external power.)

Note

Install electrical cord to airplane receptacle and signal for 28-volt power to be applied.

a. Check landing gear push-to-test buttons.

b. Check main and tail gear indicators for DOWN readings.

c. Lights that should be on include the following:

(1) Generator.

(2) Inverter.

(3) Fuel system - emergency.

d. Push to test (whether lights are off or on).

(1) Gust control.

(2) DC generator.

(3) Inverter.

(4) AC generator.

(5) Fuel low level.

(6) Auxiliary boost pump.

(7) Check fire overheat switch in both directions.

e. Turn inverter ON.

Note

When inverter light goes out, cage attitude gyro.

f. Check fuel pressure, oil pressure and hydraulic pressure indicators.

Note

Indicators should read zero.

1-316. ENGINE GROUND START AND RUNUP PROCEDURE.

Note

All starts must be made on Normal Fuel System.

Signal for starting unit to start and when proper speed is attained signal for air to be applied to aircraft starter.

CAUTION

Do not exceed the duty cycle of the starter which is defined as three normal engine starts of no more than 30 seconds duration each, within a five minute period.

a. Watch emergency fuel light.

CAUTION

Light should go out between three percent and six percent rpm. If light does not go out before reaching 10 percent rpm, do NOT attempt to start.

b. At 12% rpm, place ENG IGNITION switch in START position, and hold using right hand.

CAUTION

Be sure finger is on IGNITION switch.

c. At 15% rpm, move throttle around horn to idle position, using left hand. Watch indicators for proper function on start, especially EGT for overtemperature.

d. At approximately 20% rpm, when engine starts, release ENG IGNITION switch.

e. At 35% rpm, signal for air to be cut off.

f. Disconnect starting hose and external electrical power.

g. Turn battery switch to BAT & GEN. position. Generator light should go out.

h. Push to test EGT indicator to check for proper operation.

i. Check all indicators for proper operation, per tabular listing, table 1-4.

j. Check for leaks at engine compartment and in general engine area during low power runup.

k. Tie down airplane with cables for runs over 80% rpm. For tiedown details see Section I of -2-1 Maintenance Manual.

Note

Station a crew member at a good visual point in front of airplane for signal purposes on operating wing flaps, speed brakes, etc.

1. Run engine up to power.

Note

Do not increase power until signal is given by crew member indicating that no leaks were found in leak check.

CAUTION

Do not exceed overtemperature and overspeed limits specified by table 1-5.

Table 1-4. Engine Operational Check Limits

RPM (Varies with ambient temp.)	IDLE	45 (± 1) %
	MAX	99% ⚠1
EGT (Varies with ambient temp.)	IDLE	340°C
	MAX	640° C
FUEL PRESSURE	IDLE	14 - 25 psi
	MAX	0 - 12 psi ⚠2
AMMETER		50 - 225 amps
OIL PRESSURE ⚠3 ⚠4		40 - 55 psi
OIL TEMPERATURE		125°C Max
HYDRAULIC PRESSURE		2850 - 3150 psi

⚠1 Part power stop; remove before flight.

⚠2 On takeoff fuel pressure may drop to zero.

⚠3 Normal operating pressure (minimum 35 psi at idle).

⚠4 A fluctuation in oil pressure within limits of(± 2)psi is acceptable.

Table 1-5. Engine Overtemperature and Overspeed Limits

OVERTEMPERATURE CONDITION		ACTION REQUIRED
a.	If EGT exceeds the maximum allowable limit (refer to table 1-4) for not more than 1 minute and does not exceed 700°C (1292°F).	Continue engine in service. No inspection is required.
b.	If EGT exceeds the maximum allowable limit (refer to table 1-4) for more than 1 minute but less than 2 minutes.	See Notes 1, 2 and 3. Table 4-2, TMOM -6-1.
c.	If EGT exceeds 700°C (1292°F) for less than 5 seconds.	
d.	If EGT exceeds the maximum allowable limit (refer to table 1-4) for more than 2 minutes or exceeds 700°C (1292°F) for more than 5 seconds.	See Note 5. Table 4-2, TMOM -6-1.
e.	If EGT exceeds 725°C (1337°F).	
f.	HOT START - If the engine undergoes more than 5 starts at temperatures exceeding the maximum allowable exhaust gas temperature for starting, 400°C (752°F).	See Note 5. Table 4-2, TMOM -6-1.
OVERSPEED CONDITION		ACTION REQUIRED
g.	If the observed RPM exceeds 8850 rpm (100.7%) but does not exceed 9000 rpm (102.4%).	See Notes 1, 3 and 4. Table 4-2, TMOM -6-1.
h.	If the observed RPM exceeds 9000 rpm (102.4%).	See Note 5. Table 4-2, TMOM -6-1.

VOL II

1-317. ENGINE SHUTDOWN PROCEDURE.

Note

On idle run, engine can be shut down any time, by okay signal from crew member.

a. To shut down engine, pull throttle around horn to OFF position.

b. Immediately place inverter and battery switches in OFF position.

Note

If run is made at high power, engine should be allowed to idle approximately two minutes for a cool-down period. After cool-down period at idle and immediately prior to shutdown, run engine at 75% for 2 minutes to assure that oil has been returned to tank. This is to prevent overservicing of the oil system.

c. Check operation of fuel pressurizing and dump valve. (Fuel should always dump overboard on shutdown.)

Note

In an emergency, engine can be shut down immediately irrespective of engine rpm.

1-318. ENGINE INSTRUMENTS.

1-319. ENGINE TACHOMETER SYSTEM CHECKOUT.

Note

The following checkout requires the use of the Tachometer Checkout rig (containing motor driven tachometer generator) and a dc power source.

a. Connect tachometer checkout rig receptacle to tachometer plug from powerplant.

b. Apply 28-volt power to test rig.

c. Close circuit breaker on test rig.

d. Rotate potentiometer in a clockwise direction to operate test rig tachometer generator.

e. Check ships tachometer indicator, on main instrument panel, with indicator on test rig.

Note

Make check points at 60%, 80%, and 100% rpm. They shall agree within 1/2%.

1-320. EXHAUST GAS TEMPERATURE INDICATING SYSTEM CHECKOUT.

a. System Checkout. (Engine running at idle.)

Note

The following checkout requires an external power supply.

(1) Close 1/2-amp EGT circuit breaker in equipment bay.

(2) Turn inverter on and allow exhaust gas temperature indicating system to warm up for about 1 minute.

Note

The needle on the exhaust gas temperature indicator should be at the low end of the scale (approximately 200°C).

(3) Press EGT TEST switch. The needle should move up scale.

(4) Release switch. The needle should return to low end of scale.

(5) Turn inverter off and disconnect external power supply.

b. Operational Check. (Engine not running.)

WARNING

To provide maximum service life of the EGT System, power should not be applied for extended lengths of time with the thermocouple leads open (no signal input). A proper signal is applied by either connecting the system to the engine thermocouple harness or by applying a test signal. The circuit breaker should be pulled when the system is not in use.

Note

The following check requires the use of the Minimite Tester, Model 702000 or Lewis Potentiometer, Model 73-PO, 0° to 1000°C, AL-CH, Class 17-C, or equivalent.

(1) Hook up tester as shown in figure 1-35. Observe proper polarity.

(2) Turn system on and allow to warm up for about 10 minutes.

(3) Measure temperature at thermocouple terminals on Minimite Tester.

(4) Zero and standardize tester.

(5) Make proper corrections on Minimite scale settings to compensate for external reference junction temperatures as described under Instructions for Operation of Minimite Tester.

(6) Set tester (compensated) for 200°C, 300°C, 400°C, 500°C, 600°C, 630°C, and 646°C. The indicator will follow the tester setting within (± 2)°C.

Note

The red light shall come on at 646 (± 2)°C with increasing temperature.

(7) In event of improper EGT indications, recheck procedure in use of Minimite Tester. Zero and standardize tester and recheck compensations made for external reference junction temperatures.

(8) If not corrected, check EGT system as follows:

a. Check continuity of thermocouple wires for broken leads or shorts between plug on BH185R-11 indicator and engine disconnect plug. See figure 1-7.

Note

Since these are resistance type wires the readings may be from 0 to approximately 7 ohms.

b. Check for ground on pin D of indicator plug.

c. Check for 115 V, 400 cps on pin E of indicator plug.

(9) If trouble still exists, proceed as follows:

a. Substitute a new indicator/amplifier for the existing instrument.

b. If trouble is corrected, tag and return bad component for repair.

Note

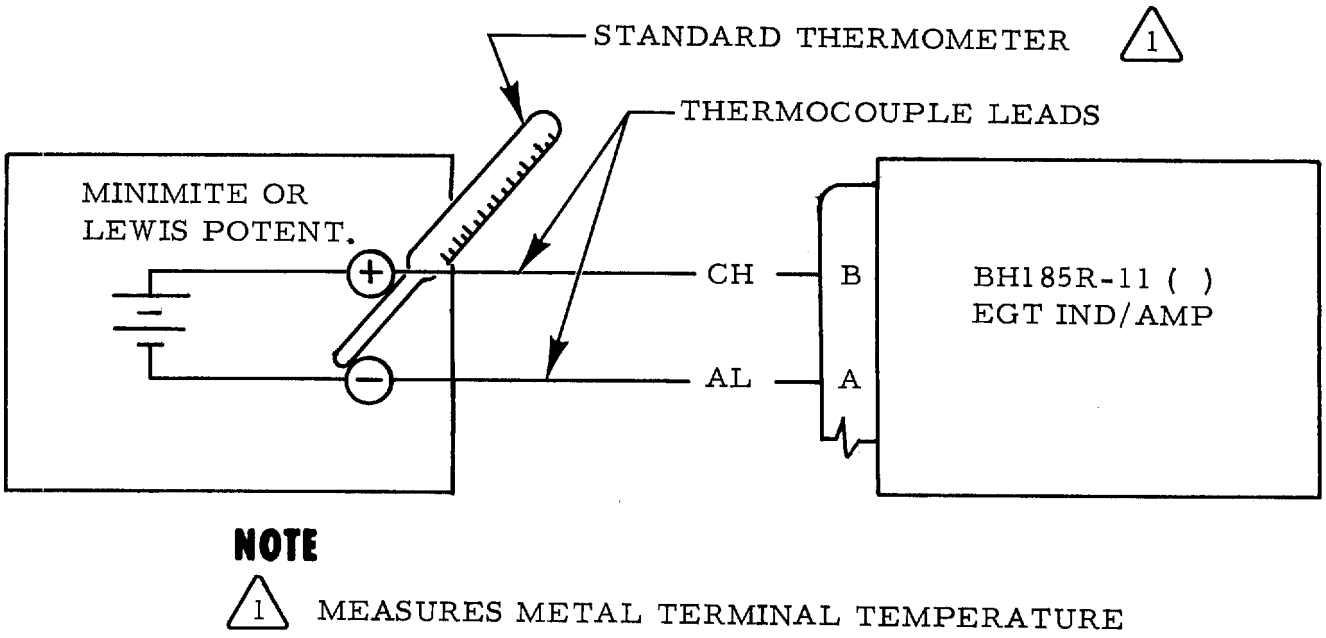
Do not attempt to adjust the indicator. The outside case of the EGT indicator will become extremely hot to the touch shortly after power is applied. This is considered normal and is NOT reason for rejection.

c. If trouble remains, replace original component.

(10) Recheck ships wiring as follows: (See figure 1-7.)

a. Disconnect bulkhead plugs and inspect for dirt or damage.

b. Check that thermocouple wires are properly installed throughout run, that is, the AL (Green Wire) is connected to pin A on all plugs and CH wire (white) is connected to pin B on all plugs.



NOTE

1 MEASURES METAL TERMINAL TEMPERATURE

Figure 1-35. Temperature Measurement

c. Instructions for Operation of Minimite Tester.

Note

Use of other type of testers will be similar. Refer to Tester Handbook for details.

(1) Read tester instructions carefully.

(2) Zero and standardize tester with extreme care. These settings are very critical.

(3) Connect tester according to desired circuit of figure 1-35.

(4) Set range switch to TEST (not CA or MV). This takes the Minimite galvanometer out of the circuit and eliminates indicator hunting. The proper voltage is still present.

(5) Measure external reference junction temperature using tables 1-6. and 1-7. below; make proper corrections to obtain Minimite scale settings.

(6) Check and adjust system as noted under Operational Check. (Engine Not Running).

(7) When reconnecting leads, be sure they are clean and tight.

Table 1-6. Standard Alumel Chromel Voltages

TEMPERATURE (DEGREES CENTIGRADE)	MILLIVOLTS
200	8.13
300	12.21
400	16.40
500	20.65
600	24.91
700	29.14
800	33.30
900	37.36
1000	41.31

Table 1-7. Corrections for External Reference Junction Temperature

EXTERNAL REFERENCE JUNCTION TEMPERATURE (Degrees Centigrade)	ADD OR SUBTRACT TO STANDARD VALUE FOR MINIMITE SETTING CA Scale
0	+ 25°C
5	+ 20
10	+ 15
15	+ 10
20	+ 5
25	0
30	- 5
35	- 10
40	- 15
45	- 20
50	- 25

Note

The Minimite is calibrated for input to a device with compensation for an external reference junction temperature of 25°C.

Interpolate as required between temperatures listed. (See examples 1 and 2.)

Example 1

Desired to check EGT system at 600°C. External reference junction temperature measured at 20°C.

To get Minimite temperature scale setting:

Standard temperature	600°C	from table 1-6.
for 20° reference junction	+ 5°C	from table 1-7.
Set Minimite	605°C	
Indicator should read	600°C	

Example 2

Desired to check EGT system at 620°C.
External reference junction temperature measured at 28°C.
To get Minimite temperature scale setting:

Standard temperature	620°C	from table 1-6.
for 28°C reference junction	- 3°C	from table 1-7.
Set Minimite	617°C	
Indicator should read	620°C	

1-321. ENGINE FUEL SYSTEM.

1-322. BLEEDING THE ENGINE FUEL SYSTEM.

1-323. The following procedure must be complied with if for any reason fuel lines to engine have been disturbed or when engine has just been installed.

a. Place a suitable receptacle, having a minimum capacity of five gallons, under pressurizing and dump valve overboard drain.

b. Disconnect fuel control-to-dump valve signal line where it attaches to pressurizing and dump valve.

c. Plug dump valve at point where signal line was disconnected.

Note

This plug is not required; however, fuel will drain from this point and may not flow in direction of 5-gallon receptacle.

d. Plug signal line with a suitable plug fitting.

e. With ignition OFF and power lever in IDLE position, rotate engine with starter until a minimum of 5 gallons have been discharged from dump valve overboard drain.

Note

Repeat above operation to be sure a minimum of 5 gallons of fuel have been bled.

f. Return power lever to OFF position and discontinue rotation of engine.

CAUTION

Limit rotation of engine to shortest possible time in order not to exceed starter operating limits. Refer to Operational Checkout of engine for starter operational limits.

g. Remove plug fittings from dump valve signal line and reconnect signal line to pressurizing and dump valve. Lockwire as required.

1-324. TRIMMING PROCEDURE FOR J75P-13 ENGINES.

1-325. The J75P-13 engine is trimmed to high compressor rotor (N_2) speed at a preselected part power setting.

1-326. Each fuel control has a Part Power Stop which is secured to the control and limits throttle movement when installed for trim purposes. After a trim run the Part Power Stop must be removed and reinstalled on the fuel control in the stowed position.

Note

This stop will not limit throttle movement when properly secured in the stowed position.

1-327. PREPARATION OF AIRPLANE FOR TRIM.

1-328. Airplane fuel supply must be adequate for engine trim run ranging in duration from one-half to one hour. A minimum fuel load of 600 gallons is required.

a. Head airplane into wind if possible; clean and clear area of obstructions.

b. Place jet operation warning signs at danger areas.

c. Place chocks under wheels and install runup cables.

d. Remove dust excluder plugs and canopy cover.

e. Inspect air intake ducts for foreign material and install runup screens.

f. Inspect tailpipe and tailpipe blankets for fuel or oil; landing gear pins installed.

g. Remove aft lower engine access door.

h. Unlock surface controls and stow locks.

i. Place landing gear control lever in DOWN position.

j. Set circuit breakers.

k. Place ram air switch in ON position.

Note

There should be no air extraction from the engine during trim runs.

l. Provide fire extinguishers and fireman standby.

m. If any fuel lines have been disturbed or a new engine installed, the fuel control must be bled. Refer to Bleeding of Engine Fuel System in this section.

1-329. ENGINE TRIM RECORD. The following data is recorded on a Trim Sheet similar to figure 1-36.

WARNING

Observe Engine Runup safety precautions noted in Section I of -2-1 Maintenance Manual.

a. Install Part Power Stop on fuel control to limit throttle travel. (Trim position).

Note

Engine is not running.

b. Observe outside air temperature (OAT) in proximity of airplane. (Engine is running and ready for trim.)

Note

Temperature should be taken in the shade away from any equipment which may influence the reading. (An accurate thermometer suspended under the wing is a satisfactory place for taking the OAT.)

c. Calculate N_2 % trim speed as follows:

(1) Determine N_2% trim speed from Trim Curve (figure 1-37.) for OAT observed in item b.

Note

For an OAT of 60°F the trim speed would be 98.3%. See Example A.

(2) Determine Gate Stop N_2% for observed OAT in item b. utilizing same curve.

Note

For an OAT of 60°F the desired Gate Stop would be 93.3%. See Example B.

d. Make start in Normal - Max EGT 400°C.

e. Allow a warmup period of at least 5 minutes prior to making any trim checks or adjustments. (This time can be utilized in checking airplane systems.) Obtain Part Power Trim target from Engine Trim Curve.

f. Advance power lever to GATE position and note rpm. If GATE RPM is set approximately 5% below Part Power, GATE RPM will show the operator with a good degree of accuracy whether the Part Power Trim target is within specified limits. Return power lever to idle.

g. Check for Idle Flat. Advance power lever on quadrant Idle stop slowly until rpm starts to respond (increase).

Note

There should be approximately one-fourth inch movement on the flat prior to RPM increase. If RPM responds immediately when power lever is advanced, reposition (lower) the quadrant Idle stop.

h. Trim Idle to 45% rpm. Cycle power lever to 70% rpm and back to Idle 2 or 3 times for check on repeatability.

Note

After runs to Part Power, Idle rpm may vary as much as 2.0% plus or minus from initial trim of 45% rpm. This is acceptable.

i. Idle adjustment should be performed as follows:

(1) If idle N_2 % requires adjustment, turn the Idle Trim Screw clockwise to increase N_2 speed and counterclockwise to decrease N_2 speed.

(2) After any adjustment of Idle Trim Screw, recheck Part Power setting.

CAUTION

Adjustment of the Idle Trim Screw may have changed the Part Power N_2 Speed. This could require several cycles of adjustment (Idle to Part Power) before reaching final trim target.

j. Advance throttle beyond gate until it contacts Part Power Stop.

CAUTION

Observe RPM and EGT maximums. EGT at part power stop should be considerably less than the specified maximum (approximately 580° to 610° C).

k. Allow engine and instruments to stabilize for approximately one and one-half minutes and note observed N_2%.

Note

If the observed Part Power N_2% is more or less than the desired figure determined in item c., make an adjustment to the MAX trim screw located on the bottom of the fuel control. If an increase in N_2% is required, turn the MAX trim screw clockwise. If a decrease is desired, turn the MAX trim screw counterclockwise. Make adjustments while engine is running at Part Power.

CAUTION

Make all adjustments to the MAX trim screw slowly and allow sufficient time for instrument stabilization.

l. Return power lever to Idle and record data.

m. Check for Repeatability. Advance power lever to Part Power, stabilize for approximately one minute and return to Idle. Make corrective adjustments as necessary.

n. Increase rpm to 70% then switch from Normal to Emergency. Advance to Part Power and record data then back to Idle and record. Allow 2-minute cooling period at Idle then Shut Down in Emergency. When engine rotation has ceased, switch back to normal.

CAUTION

Do not shift from Emergency to Normal while engine is running. Shifting from Emergency to Normal is done only after Shutdown.

Do not attempt to make adjustments on the emergency system in the field.

o. Make start in Normal and check once again for repeatability at Part Power and Idle. Allow 2-minute cooling period at Idle then shut down.

p. Remove and stow Part Power Trim Stop.

AIRCRAFT #359 ENGINE #610399 FUEL CONTROL SN #35115

1. OAT 60°F
2. TRIM RPM (N_2%) DESIRED 98.3 GATE STOP RPM (N_2%) DESIRED 93.3

A. INSTALL PART POWER TRIM STOP IN TRIM POSITION

B. IDLE RPM DATA

1. RPM 45.0% (ADJUST TO 45% (± 1%)
2. EGT 260 - 360°C (Approx.)
3. OIL PRESSURE 40 - 55 PSI (35 PSI MIN @ IDLE.)

C. TRIM AT PART POWER

1. RPM (N_2%) SET TO 98.3% WAS 98.0%
2. EGT 590°C (Approx.)
3. OIL PRESSURE 48 (40 to 55 PSI) OIL TEMP 100°C (125°C MAX)
4. GATE STOP SET TO 93.3%

D. EMERGENCY FUEL SYSTEM CHECK - SWITCH AT 70% N_2

1. EMERGENCY IDLE RPM 40 - 55% (Approx.)
2. EMERGENCY PART POWER RPM 93.0% (Approx.)

E. REMOVE PART POWER STOP AND INSTALL IN STOWED POSITION

NOTE

1. ADJUSTMENT OF THE IDLE TRIM SCREW MAY EFFECT THE MAX TRIM, THEREFORE ANY ADJUSTMENTS TO IDLE WILL REQUIRE A PART POWER TRIM CHECK.

2. THE PART POWER TRIM STOP LIMITS THROTTLE MOVEMENT WHEN INSTALLED IN THE TRIM POSITION. AFTER TRIM RUNS, BE SURE AND REMOVE THE TRIM STOP AND INSTALL IN THE STOWED POSITION.

3. DURING TRIM RUNS AT REDUCED POWER (PART POWER STOP INSTALLED) THE RPM AND EGT REACHED WILL BE CONSIDERABLY LOWER THAN SPECIFIED MAXIMUMS FOR NORMAL OPERATION.

Figure 1-36. Typical Trim Sheet

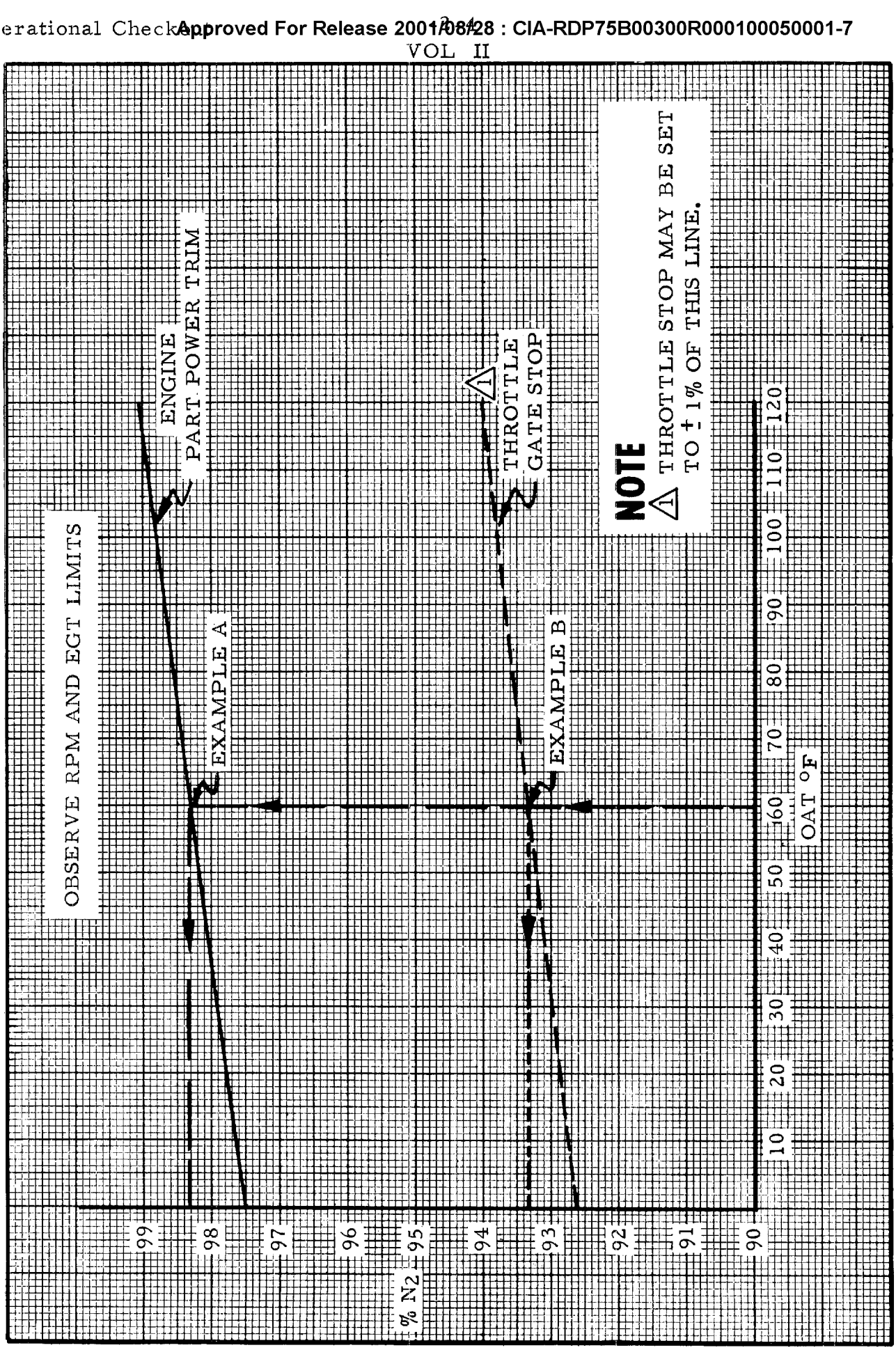


Figure 1-37. Engine Part Power Trim Curve

1-330. IGNITION SYSTEM.

1-331. GENERAL.

a. Operational checkout and testing of the ignition system is performed during the operational checkout and testing of the engine. (Refer to Engine Operational Checkout in this Section.

1-332. NORMAL IGNITION SYSTEM CHECKOUT.

1-333. TEST EQUIPMENT REQUIREMENTS. The following equipment is required for this checkout.

a. 28-Volt Test Lights.

b. External DC Power Supply.

1-334. PREPARATION.

a. Disconnect plugs from ignition units. Use 28-volt test lights for this test.

b. If impractical to use ignition unit plugs, use engine disconnect plug pins A-B and A-C.

1-335. CHECKOUT PROCEDURE.

Note

Engine is not in operation for this check.

a. Ground start check.

(1) Connect external dc power supply.

(2) Place ENG IGNITION switch on instrument panel in START position. The lights shall not light.

(3) Close ENG START circuit breaker on instrument panel.

(4) Place ENG IGNITION switch in START position. The test lights shall light.

(5) Disconnect external dc power supply.

b. Air start check.

(1) Place ENG IGNITION switch in START position. The lights shall not light.

(2) Open ENG START circuit breaker.

(3) Operate ENG IGNITION switch. Lights shall not light.

(4) Close Air Start No. 1 circuit breaker at dc load center.

(5) Place ENG IGNITION switch in START position.

a. The test light from pins A-B shall light.

b. The light from pins A-C shall not light.

(6) Open Air Start No. 1 circuit breaker.

(7) Close Air Start No. 2 circuit breaker.

(8) Place ENG IGNITION switch in START position.

a. The test light from pins A-B shall not light.

b. The test light from pins A-C shall light.

(9) Open all circuit breakers.

1-336. CONTINUOUS IGNITION SYSTEM CHECKOUT.

a. Close WARN LTS, NO. 1 INVTR control, and EMER INVTR control circuit breakers in cockpit.

b. Close the following circuit breakers on 28-volt dc bus in equipment bay.

(1) AUX BOOST PUMP (5A).

(2) NO. 1 INV (70A).

(3) EMERG INVERTER (15A).

c. Close CONT IGN circuit breaker on equipment bay ac bus (3A).

d. Connect external dc power to airplane.

(1) Place generator and battery selector switch in OFF position.

(2) Place INVERTER switch in NO. 1 position.

e. Place BOOST PUMP & CONT IGN switch in ON position. Continuous sparking should be heard at sparkigniter.

f. Apply 28-volt dc to terminal X_1 of ac generator power relay. Sparking shall cease.

g. Remove 28-volt dc from terminal X_1 of ac generator power relay. Continuous sparking should be heard at sparkigniter.

h. Place INVERTER switch in OFF position. Sparking shall cease.

Note

Balance of check must be performed during engine run with the ac generator on the bus.

i. Increase engine rpm to approximately 88% to bring ac generator frequency up to 320 cycles per second.

j. Place AC GEN - OFF/RESET - EXT PWR switch in AC GEN position. AC generator shall come on.

k. Place INVERTER switch in EMER position.

l. Check for 115-volt, 400 cycle ac at CONT IGN circuit breaker on equipment bay ac bus.

m. Place AC GEN-OFF/RESET - EXT PWR switch in OFF position. AC generator shall go OFF. No power shall be present at CONT IGN circuit breaker on equipment bay ac bus.

n. Place BOOST PUMP & CONT IGN switch in OFF position.

o. Open all circuit breakers.

TROUBLE SHOOTING

1-337. ENGINE.

1-338. GENERAL.

a. The following chart outlines the common symptoms of engine malfunctioning, the probable causes, and their remedies.

b. Before attempting to diagnose the trouble, or to work on an engine which has been reported malfunctioning during flight, consult the pilots flight report and all other available sources for any pertinent information which might give a clue for diagnosing the trouble.

TROUBLE	PROBABLE CAUSE	REMEDY
Engine fails to start.	Improper starting procedure.	Refer to correct starting procedure.
	Insufficient air.	Check to see air intake is free of obstructions. Remove obstruction.
	Main power switch.	Check main battery power switch. Place switch in ON position.
	Insufficient cranking speed.	Check auxiliary power unit and starter. Repair or replace auxiliary power unit and/or starter.
	Ignition system inoperative.	Energize ignition system momentarily with all other electrical equipment and the fuel supply shutoff. With the ear as close as possible to the sparkigniters, listen for audible sparking. CAUTION Clear engine of fuel. Check for improper or loose connections. Remove sparkigniters and inspect for condition. Clean or replace if necessary.

TROUBLE	PROBABLE CAUSE	REMEDY
Engine fails to start. (Cont'd)	Lack of fuel to engine.	Check fuel supply in tanks. Fill tanks.
		Check for non-combustible fluid or improper fuel in tanks. Drain tanks and refill with proper fuel.
		Fuel pressurizing and dump valve draining fuel overboard during entire starting attempt. Replace valve.
		Check fuel tank boost pump operation. Repair or replace boost pump.
		Check for obstructed fuel pump inlet line and fuel filter. Clean lines and filter.
		Not in idle position because of rigging error. Adjust linkage.
	Faulty cutoff valve in fuel control.	If there is fuel from aircraft fuel system and throttle linkage is rigged correctly, cutoff valve in fuel control unit is not opening. Replace fuel control.
No rpm during attempted start.	No electrical power to ship s system.	Check source of electrical power.
	Engine is frozen.	Attempt to rotate front compressor by hand. Replace engine.
	Starter drive shaft in engine accessory drive housing sheared.	If sounds of starter rotation are heard during attempted start, but engine does not rotate, shaft is sheared. Replace engine.

TROUBLE	PROBABLE CAUSE	REMEDY
Insufficient rpm during attempted start.	Excessive turbine and compressor blade rubbing.	Listen for loud scraping noise while engine is rotating. Replace engine.
Engine fails to light-off when throttle is advanced to IDLE.	No fuel to engine.	Check fuel supply and position of fuel system switches.
	Defective ignition system.	Turn on system and listen for ignition noise.
	Defective starter system.	Check tachometer for maximum speed. Starter will rotate engine. Replace starter.
HUNG START. (Engine lights but does not accelerate to idle.)	Starter cut-out too low	Check auxiliary power unit and starter. Repair or replace auxiliary power unit and starter.
	Loose or broken burner pressure sense line.	Check sense line for security or damage. Tighten or replace burner pressure sense line.
	Burner pressure limiter stuck open.	Replace fuel control.
	Fuel control acceleration schedule out of limits.	Replace fuel control.
HOT START.	Improper starting procedure.	Refer to correct starting procedure.
	Accumulation of fuel in the engine.	Perform engine clearing procedure.

TROUBLE	PROBABLE CAUSE	REMEDY
HOT START. (Cont'd)	Insufficient cranking speed.	Check auxiliary power unit and/or starter. Repair or replace.
Engine lights-off but fails to accelerate to IDLE speed.	Inadequate air supply for starter.	If engine starts, but fails to accelerate due to lack of help from the starter, auxiliary power unit or air supply is inadequate. Use larger capacity auxiliary power unit.
	Engine is frozen.	Attempt to rotate front compressor by hand. Replace engine.
Low speed instability.	Idle speed too low.	Check IDLE rpm. Adjust fuel control.
Ground idle speed incorrect.	Idle speed setting on fuel control incorrect.	Check tachometer IDLE rpm. Adjust engine idle speed.
Engine will not reach or exceeds maximum rpm on NORMAL system.	Misadjusted throttle linkage.	Check pointer on fuel control unit quadrant. Adjust throttle linkage.
	Incorrect maximum speed setting on fuel control.	If linkage is correctly rigged fuel control unit may be out of adjustment. Adjust fuel control.
	Defective fuel control.	If trouble persists after linkage and fuel control adjustment, the fuel control is probably defective. Replace fuel control.
	Clogged filter screen in fuel control unit.	Clean filter and check engine operation. If condition persists, fuel control is defective. Replace fuel control.
Engine surges during acceleration or fails to accelerate properly.	Defective fuel control.	Replace fuel control.
	Clogged strainers in engine-driven fuel pump or fuel control.	Clean filters.

TROUBLE	PROBABLE CAUSE	REMEDY
Engine fails to decelerate when throttle is retarded.	Misadjusted fuel flow setting.	Replace fuel control.
Engine flames out during deceleration.	Fuel control switch in EMERGENCY position.	Switch to NORMAL.
	Defective fuel control.	Replace fuel control.
Engine continues to run a short time with throttle in CLOSED position.	Defective cut-off valve in fuel control	Replace fuel control.
Engine overtemperature. See table 1-5.	Improperly trimmed fuel control.	Check engine trim. Trim engine.
	Defective exhaust gas temperature indicating system.	Check thermocouples and harness. Repair and/or replace faulty units.
	Defective fuel control.	Replace fuel control.
	Internal engine damage.	Perform visual inspection. Send engine for physical inspection.
Engine overspeed. table 1-5.	Faulty indicating system.	Check instrumentation. Repair and/or replace faulty units.
	Improperly trimmed fuel control.	Check engine trim. Trim engine.
	Defective fuel control.	Replace fuel control.
	Internal engine damage.	Perform visual inspection. Send engine for physical inspection.

TROUBLE	PROBABLE CAUSE	REMEDY
High idle on final approach for landing.	Incorrect rigging, flexing of aircraft wings will not allow arm on fuel control to come back to proper setting.	Check for correct angle of fuel control arm, rerig and check idle speed.
Engine continues to run with power lever in CLOSED position.	Power lever rigging error.	Adjust lever linkage.
	Cutoff valve in fuel control unit not functioning properly.	Replace fuel control.
Failure of engine to decelerate properly.	Fuel control rigging error.	Inspect linkage. Adjust linkage.
	Malfunctioning fuel control.	Replace fuel control.
Engine light-off, but fails to accelerate to IDLE.	Faulty acceleration system in fuel control unit.	Replace fuel control.
	Clogged fuel control inlet filter screens.	Inspect and clean fuel control inlet filter screens.
Engine fails to change over to EMERGENCY system when it is selected.	No power to control switch.	Using a voltmeter, check for proper voltage. Replace switch.
	Defective wiring between switch and fuel control.	Check continuity between switch and fuel control.
	Defective solenoid actuator on fuel control.	If preceding two steps indicate that power is available at fuel control unit, solenoid actuator is faulty. Replace fuel control.

TROUBLE	PROBABLE CAUSE	REMEDY
Unstable operation on EMERGENCY system.	Too rapid throttle movement on EMERGENCY system.	Try making slower throttle movements. Check engine during steady state operation. Make slower throttle movements.
	Defective fuel control.	If engine operation is stable on NORMAL system, but unstable on EMERGENCY system, fuel control unit is defective. Replace fuel control.
	Other internal damage to engine.	If engine is unstable on EMERGENCY and NORMAL systems fuel control is probably not at fault. Check other fuel system accessories.
Fluctuation of rpm and turbine exhaust temperature.	Defective engine fuel system.	If both rpm and turbine exhaust temperature vary without moving throttle, switch to EMERGENCY system and check operation. If engine stabilizes on EMERGENCY system, engine fuel system is defective.
	Internal engine damage.	If operation on emergency system does not stabilize engine, engine fuel system is not defective and other engine trouble is present. Replace engine.
	Defective instruments and/or instrument circuits.	Use instruments with units of known accuracy and check engine operation. Replace faulty instruments.
Engine surges during acceleration.	Defective fuel control unit.	Control unit is faulty. Replace fuel control.
	Throttle advanced too rapidly in NORMAL and EMERGENCY system.	Excercise care while operating in NORMAL and EMERGENCY system.

TROUBLE	PROBABLE CAUSE	REMEDY
Inability of engine to obtain maximum fuel flow.	Incorrect trim.	Check trim. Replace fuel control if trim cannot be obtained.
	Incorrect travel of power lever linkage.	Check power lever linkage for proper travel between the lever and fuel control. Readjust or replace linkage.
	Loose connection in the combustion chamber pressure to fuel control(P_b)line.	Check line for air leak. Tighten connections.
	Clogged fuel filters.	Remove and inspect the fuel filters. Replace filters.
Fluctuating rpm.	Water in fuel.	Check for water or other foreign material in fuel. Drain tank and refill.
	Air in fuel system.	Purge air from system by operating engine.
	Clogged fuel filters.	Check filters. Clean or replace filters.
Engine roughness and/or vibration.	Interference between turbine rotor inner air seals and the inner seal rings.	Check for scraping noise as engine slows down after closing fuel pressurizing and dump valve. Replace engine.
	Main bearing failure.	Check the oil strainer for metal particles. Remove engine for overhaul.
	Malfunctioning accessory.	Check for unusual noises from accessories. Bearing failures. Replace faulty unit; generators, hydraulic pumps, etc.

TROUBLE	PROBABLE CAUSE	REMEDY
Engine roughness and/or vibration. (Cont'd)	Erratic fuel flow.	Replace fuel control.
	Failure of cooling turbine or water separator in air-frame air conditioning system.	Check and replace faulty units.
	Improper alignment of tailpipe.	Check installation of tailpipe and proper adjustment.
	Loose engine mounts.	Check for proper torque of trunnions (ball bats).
	Loose aircraft doors, flaps, antennas, etc.	Check and rerig doors. Inspect and check for correct setting of flap travel limit switches. Check and tighten loose external antennas, etc.
High exhaust duct temperature.	Engine over trimmed.	Check engine trim. Retrim
	Insufficient air.	Check the air intake for obstructions. Remove obstructions.
	Defective thermocouple leads or temperature indicator.	Check thermocouple leads and instruments. Repair or replace thermocouple leads and instruments.
	Damaged compressor blades. Damaged turbine blades or nozzle guide vanes.	Visually inspect compressor blades, turbine blades, and nozzle guide vanes for damage. Replace engine.
Low exhaust duct temperature.	Defective thermocouple leads or instruments.	Check thermocouple leads and instruments. Repair or replace defective leads or instruments.
	Malfunctioning fuel control.	Check for proper trim. Replace fuel control if trim speed cannot be attained.

TROUBLE	PROBABLE CAUSE	REMEDY
Fluctuating tailpipe temperatures.	Trouble is outside the fuel control if tailpipe temperature fluctuates at a constant rpm, airspeed, altitude and power lever position.	Check thermocouples, leads and instruments. Repair or replace as necessary.
Low or fluctuating oil pressure.	Insufficient oil supply.	Check oil level. Service oil system.
	Defective indicating system.	Check indicating system electrically. Replace defective units.
	Clogged or dirty strainer.	Pull oil strainer. Clean strainer.
	Relief valve adjusting screw backed off.	Adjust relief valve.
	Defective oil pressure transmitter and/or indicator.	Replace cockpit instrument with indicator of known accuracy and recheck pressure. Replace instrument.
	Pressure pump failure.	Check oil pressure transmitter and indicator for proper operation. If pressure indicating system is satisfactory and pressure remains low after cleaning the oil strainer, the pressure pump has failed. Replace engine.
Excessive oil pressure.	Defective oil pressure transmitter and/or indicator.	Replace cockpit instrument with instrument of known accuracy and recheck pressure. Replace instrument.
	Clogged bearing jets.	Replace engine.

TROUBLE	PROBABLE CAUSE	REMEDY
	Misadjusted relief valve.	If pressure indicating system is satisfactory and engine operational check does not disclose any apparent malfunctioning, the relief valve can be adjusted. Adjust relief valve.
Low oil pressure at altitudes above 35,000 to 40,000 feet.	Defective breather pressurizing valve.	Replace valve.
Excessive oil consumption.	Cracked carbon seals at bearing locations.	Check inlet and exhaust areas for collection of oil. Reject engine and send to United Aircraft Depot.
	Defective oil pressure and scavenge lines or connections.	Visually inspect oil lines and connections for evidence of leaks. Replace tubing as necessary.
	Defective breather pressurizing valve.	Excessive breathing of oil vapor from overboard vent. Replace breather pressurizing valve.
	Capped or clogged breather lines or valves.	Check to ensure lines and valve are free of foreign objects.
	Oil leakage.	Visually inspect all external tubing and case parting flanges for evidence of oil leaks. Tighten connectors. Replace seals or gaskets as necessary.
	Loose oil tank cap.	Check oil tank cap. Tighten cap.
	Breather pressurizing valve not functioning properly.	Remove and check the valve for proper operation. Replace breather pressurizing valve.

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive oil consumption. (Cont'd)	Main bearing oil seal leakage.	Check for engine smoking, oil in the exhaust duct; oil in the fuel drain collector. Replace engine.
		Also check for over service of oil system. Scavenge run the engine or check oil tank quantity plus drain engine accessory section.
High or low oil pressure.	Oil pressure indicator not functioning properly.	Check oil pressure indicator with Master indicator. Replace oil pressure indicator.
	Oil pressure relief valve sticking.	Remove oil pressure relief valve and examine for dirt or foreign matter. Clean thoroughly and, if necessary, clean up the valve with crocus cloth or replace valve.
	Oil pressure transmitter.	Replace transmitter.

Note

The engine should be rejected in cases where the amount of discharge from the overboard breather shows a definite increase with time or where the oil consumption shows a rapid increase and/or the oil consumption exceeds two pints per hour. Isolate the engine section responsible for the breather discharge as an aid in determining corrective action required.

Oil consumption estimated average (30 hour period) is two (2) pints per hour.

When average exceeds two (2) pints per hour a close check of oil consumption should be made and engine removed at discretion of local Director of Maintenance.

TROUBLE	PROBABLE CAUSE	REMEDY
Oil pressure fluctuation.	Weak, broken or cracked relief valve spring.	Replace spring or pressure relief valve.
	Defective indicator or transmitter.	Replace faulty unit.
	Air trap in system.	Bleed line to transmitter.
	Insufficient voltage.	If fluctuation of oil pressure is accompanied with fluctuation of hydraulic pressure, exhaust gas temperature, and pressure ratio, check voltage and frequency of inverter.

1-339. ENGINE INSTRUMENTS.

1-340. ENGINE TACHOMETER SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
Tachometer indicator will not read 100 percent when tachometer check circuit does read 100 percent.	Faulty indicator or generator.	Replace defective unit or units and repeat system checkout.
No reading on airplane indicator with reading on tachometer check circuit.	Faulty tachometer.	Replace unit.
	Open or grounded phase from tachometer generator.	Check circuit and repair defective lead.
No rpm indication on airplane indicator or tachometer check circuit.	Open or shorted lead in airplane leads.	Check circuit and repair defective lead.
	Faulty tachometer. generator.	Replace unit.

1-341. EXHAUST GAS TEMPERATURE INDICATING SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
Exhaust Gas Temperature indicator circuit exceeds tolerances.	Faulty EGT indicator/amplifier.	Check indicator/amplifier. Replace unit if defective.
	One or more thermocouples inoperative.	Check thermocouples. Replace if defective.
	Circuit shorted to ground.	Check circuit.
	Circuit shorted between leads. Also loose or dirty leads.	Check circuit. Clean and tighten connections.

1-342. ENGINE PRESSURE RATIO TRANSMITTER.

TROUBLE	PROBABLE CAUSE	REMEDY
Transmitter not operating or pressure ratio indication erratic.	Disconnected or loose pressure line.	Secure connection.
	Sticking pressure ratio indicator.	Replace indicator.
	Faulty electrical connection or insufficient voltage.	Make certain that electrical connections are secure and operating voltage is correct.
	Internal defect in transmitter.	Replace defective unit.

1-343. ENGINE STARTING SYSTEM.

1-344. STARTER.

TROUBLE	PROBABLE CAUSE	REMEDY
Starter will not operate.	Excessive load on air inlet or outlet connection, causing turbine wheel or exducer to bind against scroll assembly.	Check for excessive load at connections. Correct condition to relieve load.
	Foreign material between turbine wheel and exducer and scroll assembly.	If trouble cannot be readily corrected, replace starter.
	Scroll assembly damaged or warped, binding turbine wheel or exducer.	Replace starter.
Starter operates slowly or binds.	Excessive load on air inlet or outlet connection causing turbine wheel or exducer to bind against scroll assembly.	Check for excessive load at connections. Correct condition to relieve load.
	Air inlet duct connection loose.	Tighten connection.
	Air inlet or outlet duct clogged.	Clear duct.
	Foreign material between turbine wheel or exducer and scroll assembly.	If trouble cannot be readily corrected, replace starter.
	Scroll assembly damaged or warped, binding turbine wheel or exducer.	Replace starter.
	Gear or bearing worn or damaged.	Replace starter.

TROUBLE	PROBABLE CAUSE	REMEDY
Starter operates noisily.	Excessive load on air inlet or outlet connection, causing turbine wheel or exducer to bind.	Check for excessive load at connections. Correct condition to relieve load.
	Gear or bearing worn or damaged.	Replace starter.
	Oil supply low.	Drain balance of oil. Inspect oil for metal chips or grit. Refill oil or replace starter as required. If oil is replaced, recheck for noise.
Starter vibrates during operation.	Turbine wheel or exducer blade broken.	Replace starter.
	Drive pawl spring broken. Pawl out of position.	Replace starter.
Starter fails to cut off or cuts off too late.	Drive pawls jammed.	Replace starter.
Starter cuts off too soon.	Flyweight return spring damaged.	Replace starter.
Starter acceleration is too rapid or erratic.	Balance line port connection loose.	Tighten connection.
Starter leaks oil.	Oil fill or drain plug loose or plug gasket damaged.	Tighten plug or replace gasket.
	Bolts between housing and case assemblies loose.	Tighten bolts. If leakage persists, replace starter.
	Over serviced.	Drain and reservice.
Oil appears in turbine exhaust port.	Damaged or worn oil seat.	Replace starter.

1-345. IGNITION SYSTEM.

WARNING

Because the voltage to the sparkigniters is dangerously high, the ignition switch must be in the OFF position before removal or checking of any of the ignition system components. A sufficient period of time must elapse between the operation of the ignition system and the removal or checking of components to ensure the complete dissipation of energy from the ignition system.

TROUBLE	PROBABLE CAUSE	REMEDY
No spark at sparkigniter.	Dirty or defective sparkigniter.	Remove inoperative sparkigniter. Clean or replace sparkigniters as necessary.
	Open in ignition circuit.	Check circuit continuity. Replace broken leads or connections.
	Defective 20 joule exciters, or 4 joule continuous exciter.	Isolate faulty unit by substituting units known to be good. Replace faulty unit.
	No external power.	Check external power source.
Flame out.	Lack of fuel to engine.	Check fuel supply. Fill tanks.
	Broken or obstructed fuel line, valve, or pump.	Check fuel lines, valves, and pumps. Replace broken line or remove obstruction.
	Inadvertent placing of power lever in cutoff.	
	Hydraulic fuel boost pump failure.	Check and replace defective unit.

TROUBLE	PROBABLE CAUSE	REMEDY
Flame out. (cont'd)	Incorrect airspeed, pressure ratio or exhaust gas temperature.	Check calibration of units and replace defective instruments.
	Inadvertently rapid movement of power lever at altitude.	Review technique.
	Incorrect size of tailpipe.	Check tailpipe nozzle diameter (25.46 inches).

MAINTENANCE

1-346. ENGINE.

1-347. REPLACEMENT OF PARTS.

WARNING

The engine oil may soften paint or stain clothing with which it comes in contact. Painted surfaces on which the oil has been spilled should be cleaned immediately. Prolonged skin contact may cause dermatitis. Wash skin thoroughly after contact.

1-348. Removal and installation procedures are included for those accessories which require special procedures.

1-349. It is desirable to remove only those accessories in need of replacement. In some cases the accessory to be removed may not be accessible until adjacent accessories, tubes, hoses, cables or clamps have been removed.

1-350. On removing or disconnecting hoses, lines, tubes or fittings, mating parts should be identified to assure proper reassembly. Note the location and relative position of each fitting being transferred to a replacement control. Proper alignment will facilitate reassembly.

1-351. New gaskets, seals, tabwashers, and cotterpins will be used at assembly. Seals should be properly installed to preclude leakage after assembly. O-Ring seals should be coated with petrolatum (Federal Specification VV-P-232, or equivalent).

1-352. Extreme care and cleanliness are necessary in the handling of accessories. All precautions should be used to prevent foreign material from entering the engine or engine systems.

1-353. All bolts, nuts, screws, and hose, or tube fittings are to be torqued at assembly. For lockwiring procedure, see Section I of -2-1 Maintenance Manual.

Note

All fuel and oil line "BT" nuts and jam nuts must be lockwired to prevent loosening.

1-354. During accessory removal, all lines, tubes and hoses will be drained and sealed with metal caps or other approved seals. Seals should not be removed until the lines are to be reconnected. All open ports on the replaced controls should be capped.

1-355. Mating flanges should be clean and free from foreign material when mating parts are installed.

VOL II

1-356. GENERAL TORQUE MAINTENANCE INFORMATION.

1-357. GENERAL.

1-358. Tables 1-8 through 1-13. provide torque values for all the various standard and special fasteners used on the engine. Unless otherwise specified, thread lubricants shall be engine oil or equivalent unless otherwise specified.

1-359. CASTLE NUTS.

1-360. Where torque figures for castle nuts are provided in the minimum column only, these nuts shall be tightened, if necessary, to properly align the locking slot. Where torque figures are provided in the minimum and maximum columns, the alignment of the locking slot must be obtained without exceeding the maximum torque. If this is not possible, another nut shall be used. After tightening nuts to the recommended torque they shall not be loosened to permit insertion of lockwire or cotterpins.

1-361. RETAINING NUTS.

1-362. When retaining nuts securing heated parts must be torqued, allow parts to reach a temperature equilibrium before application of final torque.

1-363. TORQUE VALUES FOR NUTS, BOLTS, AND SCREWS.

1-364. NUTS.

1-365. The torque values in table 1-8. shall apply to nuts where the height of the nut is approximately equal to the major diameter of the thread. For thin nuts, where the height of the nut is approximately half the size of the major diameter, reduce the torque values 50 percent.

1-366. BOLTS AND SCREWS.

1-367. Bolts or screws and nuts on flanges, using metal tubular gaskets must be initially torqued to the required limits and then retorqued until recommended torque remains constant. Values do not apply to hollow bolts and screws.

Table 1-8. Torque Values for Nuts, Bolts, and Screws

THREAD SIZE	TORQUE LIMITS		THREAD SIZE	TORQUE LIMITS	
	MIN.	MAX.		MIN.	MAX.
.112-40	4	6	.375-16	200	270
.138-32	8	10	.375-24	225	300
.164-32	15	20	.4375-14	325	430
.164-36	15	20	.4375-20	360	480
.190-24	20	30	.500-13	500	650
.190-32	20	30	.500-20	560	750
.216-24	35	45	.5625-12	700	950
.216-28	35	45	.5625-18	800	1050
.250-20	50	70	.625-11	1000	1300
.250-28	65	85	.625-18	1150	1500
.3125-18	110	150	.750-10	1700	2300
.3125-24	125	170	.750-16	2000	2600

1-368. FLEXIBLE TUBE CONNECTIONS.

1-369. Before applying the torques listed in table 1-9., the tubes must be properly aligned and the seal wet with engine oil and bottomed.

1-370. It is to be expected that these flexible tube connections will loosen slightly over a period of time due to the seating of the rubber in the mating parts. After the first ten hours of engine time and then again after the next ten hours of engine operation, the connections should be torque-checked for tightness.

Table 1-9. Torque Values for Flexible Tube Connections

	TORQUE LIMITS LB-IN. FOR SINGLE AND DOUBLE WALL TUBES	
TUBE SIZE	MIN.	MAX.
.125	25	30
.188	25	30
.250	25	30
.312	30	35
.375	30	35
.500	55	60
.625	65	70
.750	70	80
.875	75	85
1.000	80	90
1.125	100	110
1.250	100	110
1.500	100	110

1-371. HOSE, TUBE, AND THREADED CONNECTIONS.

1-372. The torque value for the nut on all hose fittings and tubes (not covered by flexible tube connections) shall be in accordance with table 1-10. No attempt should be made to correct any leakage of the joint by overtightening. The fitting should be disassembled and checked for nicks, burrs, dirt, etc. If necessary, use new parts.

1-373. Torque requirements for tube nuts with brazed-on ferrules are based on thread size of the nut. Torque requirements for tube nuts without ferrules are based on tube size. Refer to specific tables for required torque recommendations.

1-374. The minimum values listed, in the following table under aluminum fittings, are recommended for all steel and aluminum jam nuts and locknuts of the type used on fittings for tubes and hose connections. On elbow type fittings, the jam nut shall be torqued after the connecting tube or hose has been installed and properly aligned. The thread sizes should be used for determining torque rather than the listed tube sizes.

Table 1-10. Torque Values for Hose, Tube and Threaded Connections.

			ALUMINUM FITTINGS (LIQUID OR AIR) AND STEEL FITTINGS FOR AIR*		STEEL FITTINGS FOR LIQUIDS*	
HOSE SIZE	TUBING OD	THREAD SIZE	MIN.	MAX.	MIN.	MAX.
3	.188	.375-24	30	50	70	80
4	.250	.4375-20	40	65	90	100
5	.312	.500-20	60	80	135	150
6	.375	.5625-18	75	125	270	300
6	.375	.625-18	100	175	320	350
8	.500	.750-16	150	250	450	500
10	.625	.875-14	200	350	650	700
10	.625	.875-16	200	350	650	700
12	.750	1.000-14	275	450	800	900
12	.750	1.0625-12	300	500	900	1000
16	1.000	1.250-12	400	650	1150	1300
16	1.000	1.3125-12	500	700	2200	2400
18	1.125	1.500-12	600	900	2200	2400
20	1.250	1.625-12	600	900	2200	2400
24	1.500	1.875-12	600	900	2200	2400

* If either of the mating surfaces is aluminum, the required torque limits for aluminum fittings apply.

1-375. INSTALLATION OF CRUSH TYPE ASBESTOS - FILLED GASKETS.

1-376. Install all crush type gaskets except the self-centering type, with the unbroken surface against the flange of the plug or part being tightened against the seal. Turn mating part until sealing surfaces are in contact and tighten to the angle of turn shown in table 1-11.

Table 1-11. Torque Values for Crush Type Asbestos Filled Gaskets

THREAD PITCH OF PART TO BE TIGHTENED	ANGLE OF TURN (DEGREES)	
	ALUMINUM ASBESTOS	COPPER ASBESTOS
8 threads per inch	135	67
10 threads per inch	135	67
12 threads per inch	180	90
14 threads per inch	180	90
16 threads per inch	270	135
18 threads per inch	270	135
20 threads per inch	270	135
24 threads per inch	360	180
28 threads per inch	360	180

1-377. STEEL PIPE PLUGS IN ALUMINUM OR MAGNESIUM.

1-378. In the event that a pipe plug leaks after it has been tightened to these limits, do not tighten further, but remove it and apply more antiseize white lead base sealing compound (JAN-A-669) to the threads. Reinstall the plug and tighten it to the desired limits. Torque limits should be reduced about 20 percent when installing a plug in a hot engine part. (See table 1-12.)

Table 1-12. Torque Values for Steel Pipe Plugs in Aluminum or Magnesium

THREAD SIZE	TORQUE LIMITS	
	MIN.	MAX.
1/16 in. ANPT	30	40
1/8 in. ANPT	30	40
1/4 in. ANPT	70	85
5/16 in ANPT	70	85
3/8 in. ANPT	95	110
1/2 in. ANPT	140	160
3/4 in. ANPT	210	230
1.0 in. ANPT	285	315
1-1/4 in. ANPT	355	385

1-379. HEX-HEAD STRAIGHT THREADED FLANGED PLUGS.

1-380. When using a hex-headed straight threaded flanged plug with an O-ring seal, tighten the plug until the underside of the head makes contact with its mating face and then tighten to a maximum of 50 additional pound-inches.

1-381. INSTALLING OR ATTACHING THE VARIOUS COMPONENTS OF THE IGNITION SYSTEM.

1-382. All plug-in type threaded connections should be torqued to fingertight plus a five degree maximum turn.

1-383. All cigarette type electrical connections (intermediate voltage leads and high tension leads) should be torqued until the connection is bottomed on its shoulder. This normally takes approximately 140 to 160 pound-inches.

1-384. SPECIAL TORQUES.

1-385. Use torque values given in table 1-13. when tightening nuts, bolts, or fittings which require a special torque because of a special fit, construction, or function.

Table 1-13. Special Torques

DESCRIPTION	TORQUE	
	MIN.	MAX.
Oil Pump and Accessory Drive Housing Main Drain Plug Bushing	300	350
Main Drain Plug	75	100
Main Oil Screen Drain Plug	350	375
Fuel Pressurizing and Dump Valve Retaining Bolts	500	550
Combustion Chamber Overboard Fuel Drain Adapter Plug	90	100
Fuel Pressurizing and Dump Valve Plug	550	600
Sparkigniter	300	360

1-386. ENGINES AND ENGINE METAL CONTAINERS.

1-387. The following is a list of pertinent information on J75P-13 engines and engine metal containers:

Engine - 4800 lbs. (Approximately)
Container Steel Drum (Less Engine)-Net 4800 lbs. (Approximately)

Container Length	-	17 ft. 10 in.
Container Width	-	5 ft. 11 in.
Container Height	-	6 ft. 7 in.
Container Cubic	-	515.0 cu. in.
Engine Length	-	189 in.
Engine Diameter	-	43 in.
Gross Weight with Engine, Fuel Control and Fuel Pump	-	9600 lbs. (Approximately)

Note

Container steel drum and engine may vary slightly in weight.

1-388. REMOVAL OF ENGINE FROM METAL CONTAINER.

Note

The procedure of removing the engine from the container will require a free overhead space of approximately eight feet minimum exclusive of the distance from the top of the container to the hoist hook. The hoist capacity must be sufficient to handle a load of 6,500 poinds to lift the engine and 11,000 pounds to lift the loaded container. These weights do not include the weight of lifting slings, and in all cases the hoist must have an adequate safety factor.

1-389. PROCEDURE. The procedure for removing the engine from a shipping container is as follows:

a. Remove dust cover from oval access port.

b. Relieve air pressure within container by removing air filler valve core.

CAUTION

Air pressure must be relieved before disassembling the container.

c. Remove all pertinent papers from record holder receptacle located at front end of container in A-frame web.

d. Attach a chain or cable sling to lifting eyes in top section of container (marked "LIFT HERE, TOP").

Note

Make certain that the container is in the proper floor position directly under the hoist so that the cover will rise straight without hitting the engine.

e. Remove bolts fastening top and bottom halves of container together.

f. Carefully raise top half of container straight up until free and clear of engine.

g. Install left and right rear engine mount fittings and engine lifting links at approximately 11 o'clock and 1 o'clock positions on turbine exhaust case.

h. On engine hoist assembly, Part No. GH48-75, install forward cradle assembly, Part No. 75GH32-500 and clevis assembly, Part No. 75GH116-1; rear cradle assembly, Part No. 75GH71 and yoke assembly, Part No. 75GH70 and two safety pins, Part No. GH48-12.

Note

Check to see that cone washers, Part No. 75GH116-5 and 75GH70-4, are not cocked.

i. Lift engine hoist assembly, Part No. GH48-75, with Regent hoist or A-frame and position above engine.

j. Attach forward cradle clevis assembly to top engine lug on compressor intermediate case and rear cradle assembly to engine lifting links on turbine exhaust case.

Note

Take up engine load by tightening up on forward cradle clevis bolt until bolt thread is even with top of cradle clevis nut.

k. Take up slack on engine hoist assembly.

l. Remove bolts securing each front support to side rails.

m. Remove bolts securing each rear support to side rails.

n. Lift engine straight up and free of container.

CAUTION

Never lift the engine when it is secured in the lower half of the shipping container.

o. Remove front and rear shipping supports from engine.

p. Install forward adapter ring and adapter fittings at left and right sides of compressor intermediate case.

Note

Adapter rings and adapter fittings are a part of Adapter Kit (Air Logistics Corp.) Part No. 106315-501.

q. Install aft adapter ring and adapter fittings at left and right sides of turbine exhaust case.

r. Lower engine on engine transportation trailer, Part No. 75GH109-1, and set adapter brakes. See figure 1-39.

s. Unload forward hoist adapter by loosening forward cradle clevis bolt and removing pin.

t. Remove bolts attaching rear hoist adapter to engine lifting links at turbine exhaust case. Remove engine hoist assembly.

u. Prepare engine for installation in airplane by removing all lockwire used to secure movable parts, and remove necessary plugs, covers and caps to accommodate installation connections, vents, and drains. Remove air inlet and exhaust opening covers.

CAUTION

To assure safety of operation, it is extremely important that all plugs, caps, and covers used for shipping purposes only, be replaced by appropriate flight parts. In order to facilitate visual identification, a light yellow color is adopted for shipping parts.

1-390. J75 ENGINE FLEXIBLE PRESERVATION CONTAINER.

1-391. The J75 engine flexible preservation container (DRICLAD) is of a light weight design fabricated by Navan Products Inc., Part No. VK193-0429. It is made from flexible, inert, plastic materials and extruded plastic zippers. Both have very low water vapor and gas transmission rates. The container is of the clamshell type with a security flap over the zipper and is reusable. The desiccant can be replaced with a minimum of effort.

1-392. The DRICLAD container includes the following per Specification MIL-C-9959:

Pressure Relief Valves (4) (Set at 1.00 psi)	-	located on top aft side of container
Suction Relief Valves (4) (Set at 1.00 psi)	-	located on top forward side of container
Drain Valve	-	located on bottom center of container
Air Valve	-	located on forward right side of container
Humidity Indicator	-	located on top forward side of container
Desiccant Pockets	-	located on lower left side of container
Repair Kit	-	located on aft left side of container
Installation Instructions	-	located on forward left side of container

1-393. DRICLAD container will normally be pressurized to approximately 1/4 psi with nitrogen gas.

1-394. REMOVAL OF FLEXIBLE PRESERVATION CONTAINER FROM ENGINE WHILE MOUNTED ON TRANSPORTATION TRAILER.

1-395. PROCEDURE. (See figure 1-38.) The following removal procedure is with the use of Engine Transportation Trailer, Part No. 75GH109-1 (Air Logistics Corp. Model 3060J) and Flexible Preservation Container, (Navan Products Inc., Part No. VK193-0429).

a. Open zipper by gripping opposite zipper flanges with thumb and fingers. Squeeze in and down. This makes zipper part at upper surface edges. Once 4 to 6-inches are open the remaining zipper can be opened by pulling it apart. (See figure 1-38., View A.)

CAUTION

DO NOT TEAR APART

b. Lift flexible container from upper half of engine.

c. Remove all pertinent papers from record holder receptacle.

d. Remove desiccant bags from pockets provided in lower left side of flexible container.

e. On engine hoist assembly, Part No. GH48-75, install forward cradle assembly, Part No. 75GH32-500 and clevis assembly, Part No. 75GH116-1; rear cradle assembly, Part No. 75GH71 and yoke assembly, Part No. 75GH70 and (2) safety pins, Part No. GH48-12.

Note

Check to see that cone washers, Part No. 75GH116-5 and 75GH70-4, are not cocked.

f. Lift engine hoist assembly, Part No. GH48-75, with Regent hoist or A-frame and position above engine.

g. Attach forward cradle clevis assembly to top engine lug on compressor intermediate case and rear cradle assembly to engine links on turbine exhaust case.

Note

Take up engine load by tightening up on forward cradle clevis bolt until thread is even with top of cradle clevis nut.

h. Take up slack on engine hoist assembly.

i. Loosen roller adapter brakes on transportation trailer.

j. Raise engine (approximately 6-inches) and remove quick disconnect pins attaching roller adapters to engine mount fittings. Place roller adapters and adapter rings on trailer rails.

k. Raise engine approximately 15-inches more while holding flexible container up so as not to get it caught on trailer. Remove trailer from work area.

l. Remove (4) container attaching plates and screws from engine mount fittings.

m. Remove flexible container carefully over engine mount fittings and from under engine.

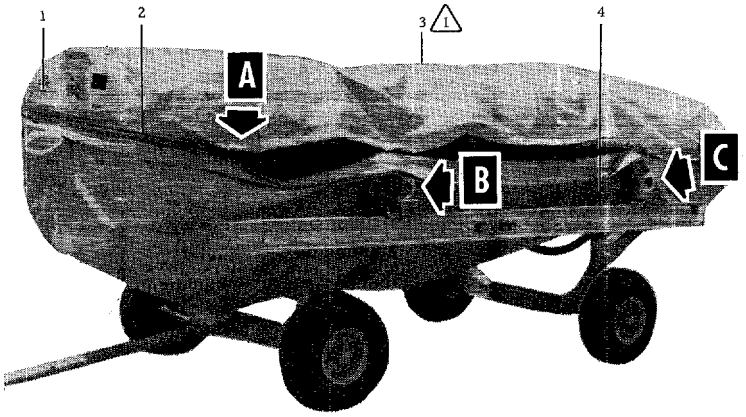
n. Reinstall (4) container attaching plates and screws on engine mount fittings.

o. Push trailer under engine.

p. Lift roller adapters and adapter rings. Install quick disconnect pins through engine mount fittings and roller adapters.

q. Lower engine down on trailer rails. Set roller adapter brakes.

r. Remove Regent hoist or A-frame with engine hoist assembly attached.



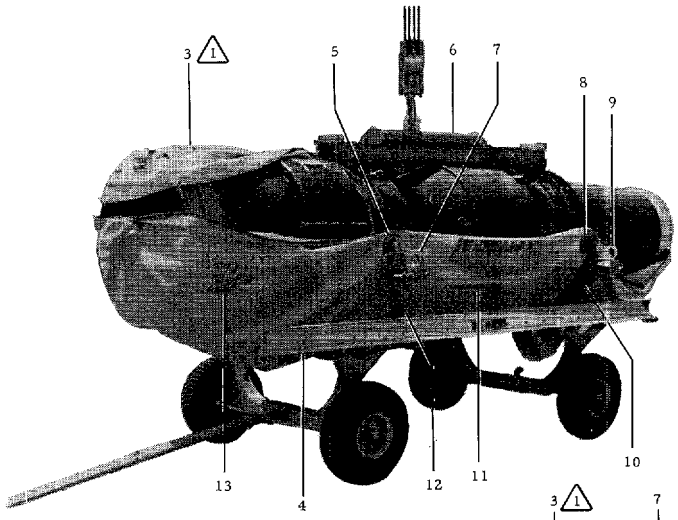
NOTE

1. FLEXIBLE PRESERVATION CONTAINER, NAVAN PROD., PART NO. VK 193-0429.
2. THE REMOVAL PROCEDURE COVERED IS WITH THE USE OF ENGINE TRANSPORTATION TRAILER, PART NO. 75GH109-1 (AIR LOGISTICS CORP., MODEL 3060J) AND ADAPTER KIT (AIR LOGISTICS CORP., PART NO. 106315-501).

(1) REMOVE SECURITY WIRE ATTACHING CONTAINER FLAPS TOGETHER.

(2) OPEN ZIPPER BY GRIPPING OPPOSITE ZIPPER FLANGES WITH THUMB AND FINGERS. SQUEEZE IN AND DOWN. THIS MAKES ZIPPER PART AT UPPER SURFACE EDGES. ONCE 4 TO 6-INCHES ARE OPEN THE REMAINING ZIPPER CAN BE OPENED BY PULLING IT APART. (SEE VIEW A)

CAUTION
DO NOT TEAR APART



(3) LIFT FLEXIBLE CONTAINER (3) FROM UPPER HALF OF ENGINE.

(4) REMOVE ALL PERTINENT PAPERS FROM RECORD HOLDER (13) AND DESICCANT BAGS FROM DESICCANT POCKETS (11).

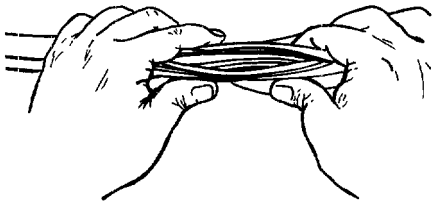
(5) ON ENGINE HOIST ASSEMBLY (6), INSTALL FORWARD CRADLE ASSEMBLY AND CLEVIS ASSEMBLY: REAR CRADLE ASSEMBLY AND YOKE ASSEMBLY, AND TWO SAFETY PINS.

(6) LIFT ENGINE HOIST ASSEMBLY (6) WITH REGENT HOIST OR A-FRAME AND POSITION ABOVE ENGINE.

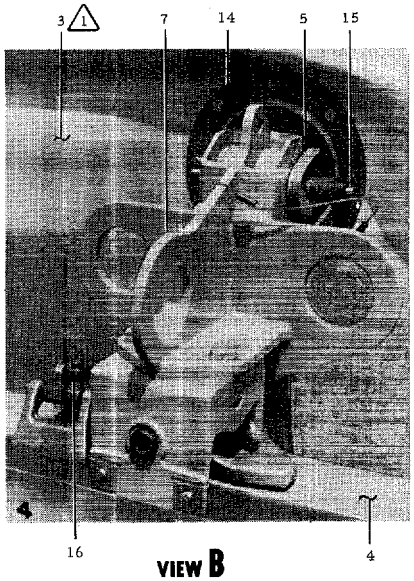
(7) ATTACH FORWARD CRADLE CLEVIS ASSEMBLY TO TOP ENGINE LUG ON COMPRESSOR CASE AND REAR CRADLE TO ENGINE LINKS ON TURBINE EXHAUST CASE.

(8) TAKE UP SLACK ON ENGINE HOIST ASSEMBLY.

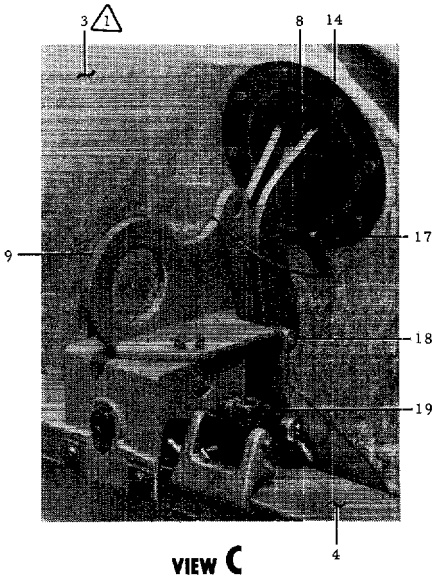
(9) LOOSEN ROLLER ADAPTER BRAKES (16, 19) ON TRAILER, RAISE ENGINE ABOUT 6-INCHES AND REMOVE QUICK DISCONNECT PINS (15, 17) ATTACHING ROLLER ADAPTERS (7, 9) TO ENGINE MOUNT FITTINGS (5, 8). (SEE VIEWS B AND C).



VIEW A
TO OPEN ZIPPER



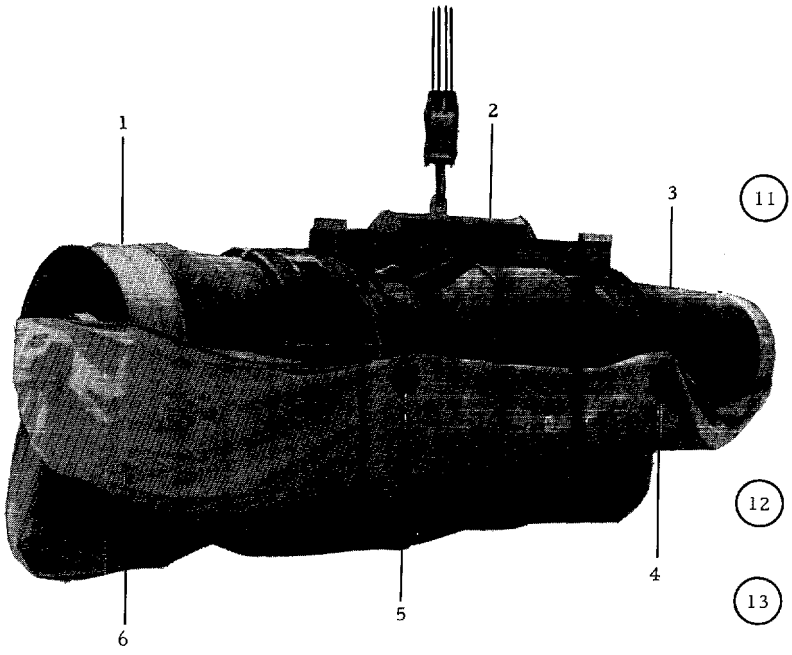
VIEW B
FWD ROLLER ADAPTER INSTALLATION



VIEW C
AFT ROLLER ADAPTER INSTALLATION

1 AIR VALVE
2 ZIPPER TRACK AND FLAPS
3 FLEXIBLE PRESERVATION CONTAINER
4 TRANSPORTATION TRAILER
5 FWD ENGINE MOUNT FITTING
6 ENGINE HOIST ASSEMBLY
7 FWD ROLLER ADAPTER
8 AFT ENGINE MOUNT FITTING
9 AFT ROLLER ADAPTER
10 AFT ADAPTER RING
11 DESICCANT POCKETS (INSIDE)
12 FWD ADAPTER RING
13 RECORD RECEPTACLE HOLDER
14 CONTAINER ATTACHING PLATE
15 FWD QUICK DISCONNECT PIN
16 FWD ROLLER ADAPTER BRAKE
17 AFT QUICK DISCONNECT PIN
18 AFT FITTING ATTACHING BOLT
19 AFT ROLLER ADAPTER BRAKE

Figure 1-38. Removal of Flexible Preservation Container from Engine Mount Fitting (Sheet 1 of 2)



(10) LOWER ROLLER ADAPTERS AND ADAPTER RINGS ON TRAILER RAILS. REMOVE TRAILER FROM WORK AREA.

NOTE

HOLD CONTAINER (6) UP AT BOTH ENDS WHILE REMOVING TRAILER.

(11) REMOVE (FOUR) CONTAINER ATTACHING PLATES AND SCREWS FROM ENGINE MOUNT FITTINGS (4, 5).

(12) REMOVE CONTAINER (6) CAREFULLY OVER ENGINE MOUNT FITTINGS (4, 5) AND FROM UNDER ENGINE.

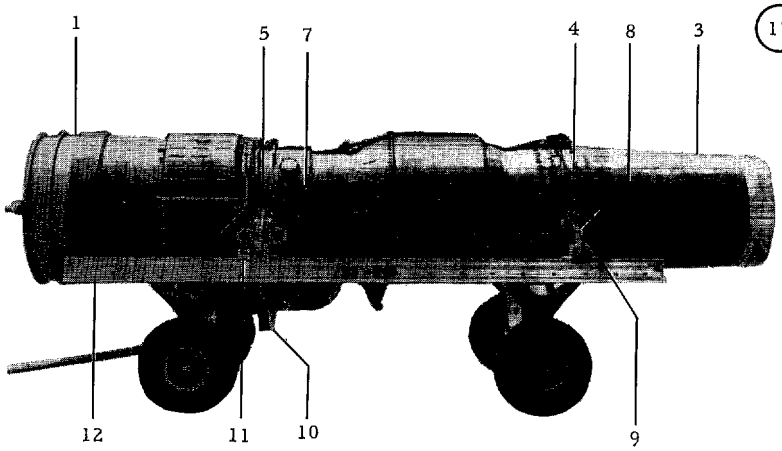
(13) REINSTALL (FOUR) CONTAINER ATTACHING PLATES ON ENGINE MOUNT FITTINGS (4, 5).

(14) PUSH TRANSPORTATION TRAILER (12) UNDER ENGINE.

(15) LIFT ROLLER ADAPTERS AND ADAPTER RINGS AND INSTALL QUICK DISCONNECT PINS THROUGH ENGINE MOUNT FITTINGS (4, 5) AND ROLLER ADAPTERS (7, 8).

(16) LOWER ENGINE ONTO TRAILER RAILS AND SET ROLLER ADAPTER BRAKES (9, 11).

(17) REMOVE REGENT HOIST OR A-FRAME WITH ENGINE HOIST ASSEMBLY (2) ATTACHED.



1 ENGINE EXTENSION DUCT ASSEMBLY
2 ENGINE HOIST ASSEMBLY
3 TAILPIPE ADAPTER
4 AFT ENGINE MOUNT FITTING
5 FORWARD ENGINE MOUNT FITTING
6 FLEXIBLE PRESERVATION CONTAINER
7 FORWARD ROLLER ADAPTER
8 AFT ROLLER ADAPTER
9 AFT ADAPTER BRAKE
10 FORWARD ADAPTER RING
11 FORWARD ADAPTER BRAKE
12 TRANSPORTATION TRAILER

Figure 1-38. Removal of Flexible Preservation Container from Engine While Mounted on Transportation Trailer (Sheet 2)

1-396. GROUND TRANSPORTATION OF ENGINE.

Note

Ground transportation of engine is with the use of the Engine Transportation Trailer, Part No. 75GH109-1 (Air Logistics Corp. Model 3060J and Adapter Kit, Part No. 106315-501). See figure 1-39.

a. Check transportation trailer for serviceability.

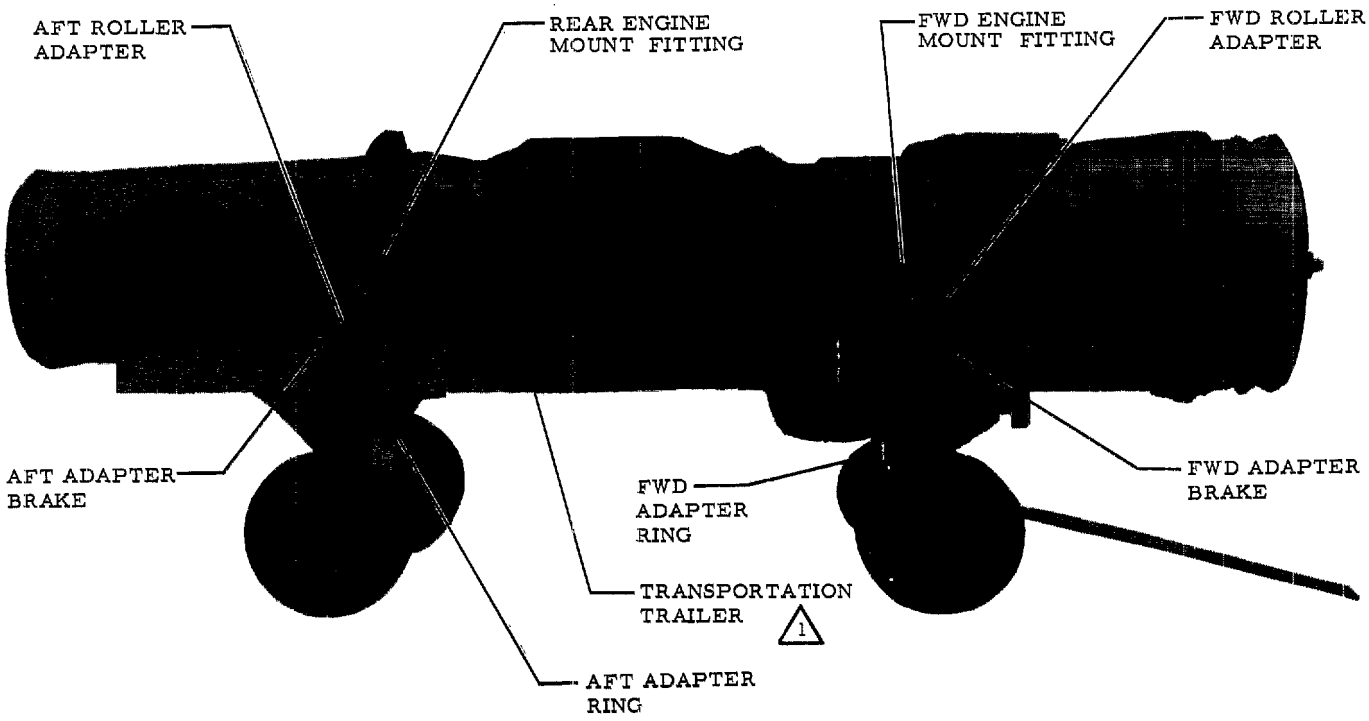
Tire Size = 7.50 x 10
Tire Inflation = 30 psi

b. Check that all roller adapter brakes are locked prior to moving engine.

c. Maximum towing speed is 20 mph.

Note

Transportation trailers will be used for both ground transportation and engine buildup.



NOTE

1/2 TRANSPORTATION TRAILER, PART NO. 75GH109-1 (AIR LOGISTICS CORP., MODEL 3060J) ADAPTER KIT, PART NO. 106315-501, INCLUDES LEFT AND RIGHT ENGINE MOUNT FITTINGS, LEFT AND RIGHT ROLLER ADAPTERS, AND FORWARD AND AFT ADAPTER RINGS.

Figure 1-39. Engine Transportation Trailer

1-397. ENGINE BUILDUP.

1-398. Engine buildup instructions for the J75P-13 engine are shown in figure 1-40. Consult drawing 75P85 for listing of QEC parts.

Note

This procedure and procedure under, Transfer of Engine from Transportation Trailer to Installation Trailer are used for buildup of a new or overhauled engine after its removal from the storage container and prepares the engine for installation in the airplane. If the transfer of accessories from the old engine to the new engine is necessary, Removal of Engine from Airplane procedure should be accomplished before or concurrently with this procedure.

1-399. ENGINE BLEED AIR MANIFOLD

1-400. The engine bleed air manifold is located on the top center section of the engine.

Note

If it is necessary to transfer manifold parts from old engine to new engine, proceed as follows:

1-401. REMOVAL. (See figure 1-40.)

a. Remove engine in accordance with instructions under Removal of Engine from Airplane.

Note

Forward flange joint is disconnected at this time.

b. Disconnect left and right manifold flange attaching points on upper top burner section of engine.

c. Remove bleed air manifold and install Pratt & Whitney protective covers using short bolts and gaskets.

Note

Protective covers and short bolts should be found in the bottom of the shipping container. Save Pratt & Whitney bolts (long), Part No. 215377 or NAS1005-2, for reuse.

1-402. INSTALLATION.

a. Remove Pratt & Whitney covers, gaskets, and short bolts. Discard old gaskets and place Pratt & Whitney covers and short bolts in bottom of shipping container for reuse.

b. Place new gaskets, Pratt & Whitney Part No. 186948, on the two bleed manifold flanges.

Note

A new gasket must be used whenever manifold is installed or joint is unbolted in service.

c. Apply two short lengths of cellulose type scotch tape on opposite sides of each gasket to keep it from dislodging and center the two manifold flanges over the engine manifold pads.

Note

The tape does not need to be removed. Do not use masking tape.

d. Tighten manifold flange bolts, Pratt & Whitney Part No. 215377 or NAS1005-2, to 125 - 140 lb/in. torque, and lockwire bolt heads together.

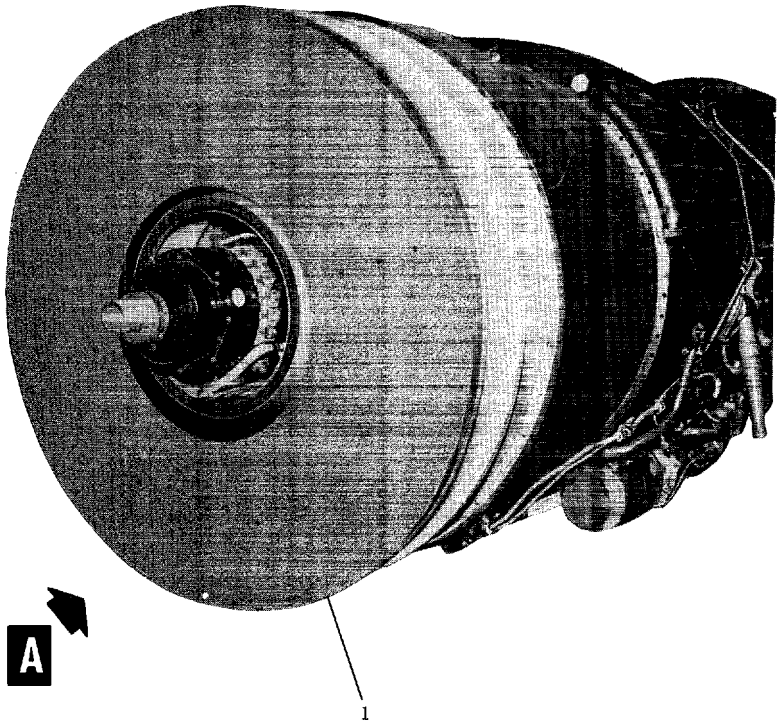
Note

After installation there will be a preceptible gap between tube mounting flange and engine pad. This is a normal condition and does not affect the sealing capacity of the joint.

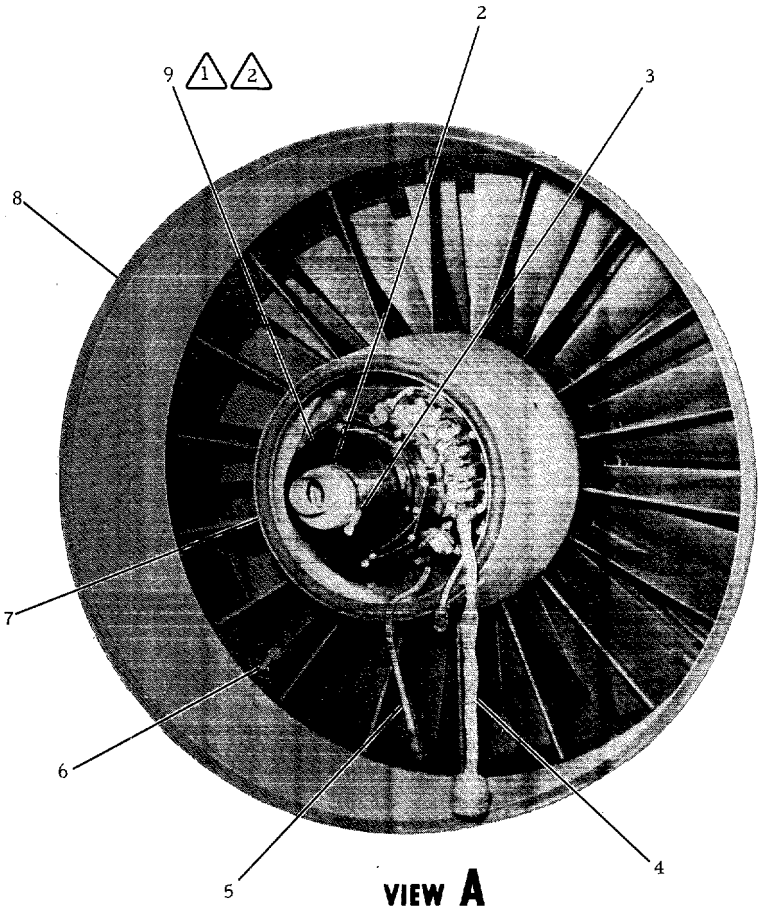
e. Install engine in accordance with instructions under Installation of Engine in Airplane.

Note

Access for connecting the Marman joint is accomplished through the upper forward engine access door. An additional Marman joint is also accessible from this location. It is normally loosened and the duct rotated when making the engine installation. This is to provide additional clearance while installing the engine. After the manifold is connected both Marman joints should be torqued. See -2-3 Air Conditioning and Pressurization Manual for torque values.



1. REMOVE ENGINE FROM SHIPPING CONTAINER (SEE INDEX THIS SECTION)
2. INSTALL TAILPIPE ADAPTER, TAILPIPE ASSEMBLY AND BLANKETS (SEE INDEX THIS SECTION)
3. INSTALL PROTECTIVE COVER (1) AT COMPRESSOR INLET
4. INSTALL AIR SEAL ASSEMBLY (7) ON ENGINE (LOCKWIRE BOLTS)
5. INSTALL ELECTRICAL LEADS (4) AND FRONT BEARING SEAL DRAIN FITTING ON AC GENERATOR
6. INSTALL GENERATOR SPLINE ADAPTER AND AC GENERATOR (9) ON ENGINE PAD (N_1)
7. INSTALL FRONT BEARING SEAL DRAIN HOSE (5), AIR ADAPTER (2) AND CLAMP (3) ON AC GENERATOR
8. INSTALL COMPRESSOR INLET PRESSURE SENSING PROBE (P_{t2}) (6)
9. INSTALL DUCT ASSEMBLY (8) ON ENGINE (LOCKWIRE BOLTS)



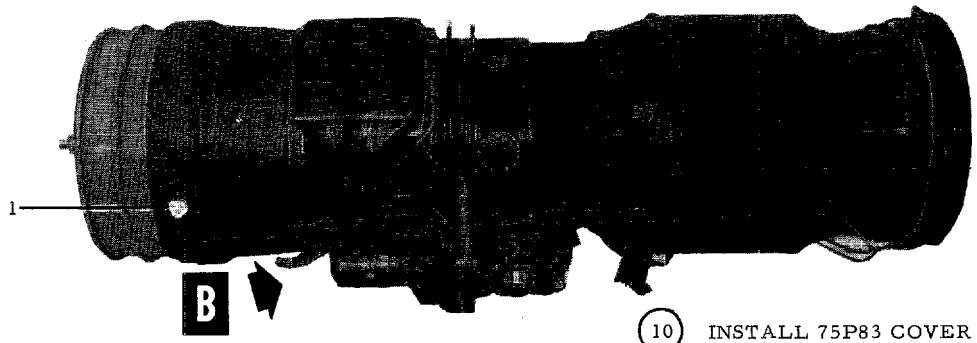
VIEW A
COVER REMOVED FOR CLARITY

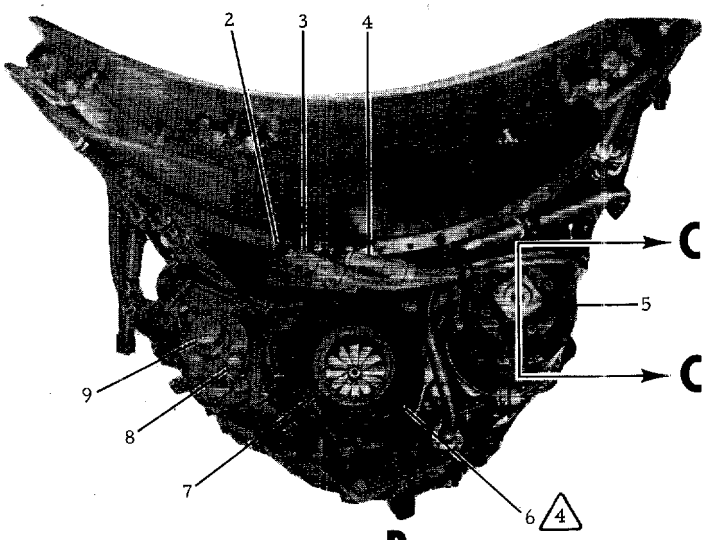
NOTE

1. DO NOT INSTALL GASKET BETWEEN GENERATOR FLANGE AND ENGINE PAD.
2. APPLY LUBRICANT, SPECIFICATION MIL-G-3545 OR LUBE PLASTIC NR3 CLASS 9156 (FSN 9150-223-4003), TO GENERATOR DRIVE SPLINES.

1 PROTECTIVE COVER
2 GENERATOR AIR ADAPTER
3 CLAMP
4 AC GENERATOR LEADS
5 FRONT BEARING SEAL DRAIN HOSE
6 ENGINE PRESSURE RATIO PROBE
7 SEAL ASSEMBLY
8 DUCT ASSEMBLY
9 AC GENERATOR AND SPLINE ADAPTER

Figure 1-40. Engine Buildup (Sheet 1)





VIEW B

1 75P83 COVER ASSEMBLY
2 75P90 BRACKET
3 DC GENERATOR ELECTRICAL LEADS
4 DC GENERATOR ELECTRICAL LEADS
5 DC GENERATOR
SEE SECTION C-C
6 STARTER
AN4047-1 GASKET
7 GH87 STARTER AIR ADAPTER
AN900-53 GASKET
40030-397 CLAMP
(NOT SHOWN)
8 216077 OR LS5041-15 O-RING
75P69 ADAPTER
MS28034-1 OIL TEMPERATURE BULB
9 HYDRAULIC PUMP
AN4047-1 GASKET

(10) INSTALL 75P83 COVER ASSY (1) ON ENGINE

(11) REMOVE ALLEN PLUGS FROM OIL SUPPLY AND RETURN PORTS (10)

(12) INSTALL 75P88 STUD (13) ON ENGINE PAD

(13) INSTALL GASKET (17), ADAPTER ASSY (12) O-RING (14), DC GENERATOR (15), AND AIR ADAPTER (16) ON ENGINE

(14) INSTALL HARNESS BRACKET (2) AND GENERATOR LEADS (3) AND (4) ON BRACKET

(15) INSTALL GASKET AND STARTER (6) ON ENGINE PAD

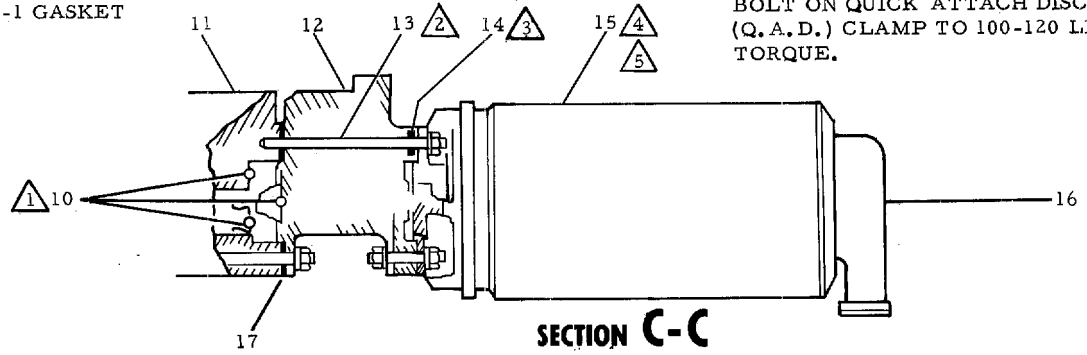
(16) INSTALL AIR ADAPTER, GASKET AND CLAMP (7) ON STARTER

(17) INSTALL ADAPTER, O-RING AND OIL TEMPERATURE BULB (8) ON ENGINE

(18) INSTALL GASKET AND HYDRAULIC PUMP (9) ON ENGINE

NOTE

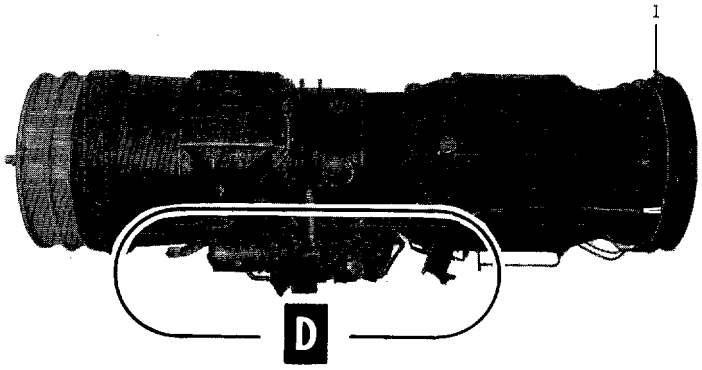
1. REMOVE ALLEN PLUGS BEFORE INSTALLING ADAPTER ASSY (12).
2. REMOVE EXISTING GEARBOX STUD AND REPLACE WITH 75P88 STUD.
3. USE 75P29-3 WASHERS WHEN REQUIRED TO ENSURE PROPER COMPRESSION OF O-RING.
4. LUBRICATE GENERATOR AND STARTER DRIVE SPLINE WITH LUBRICANT, SPECIFICATION MIL-G-3545 OR LUBE PLASTIC NR3, CLASS 9156 (FSN9150-223-4003).
5. WHEN INSTALLING GENERATOR, TIGHTEN BOLT ON QUICK ATTACH DISCONNECT (Q.A.D.) CLAMP TO 100-120 LB. IN. TORQUE.



SECTION C-C

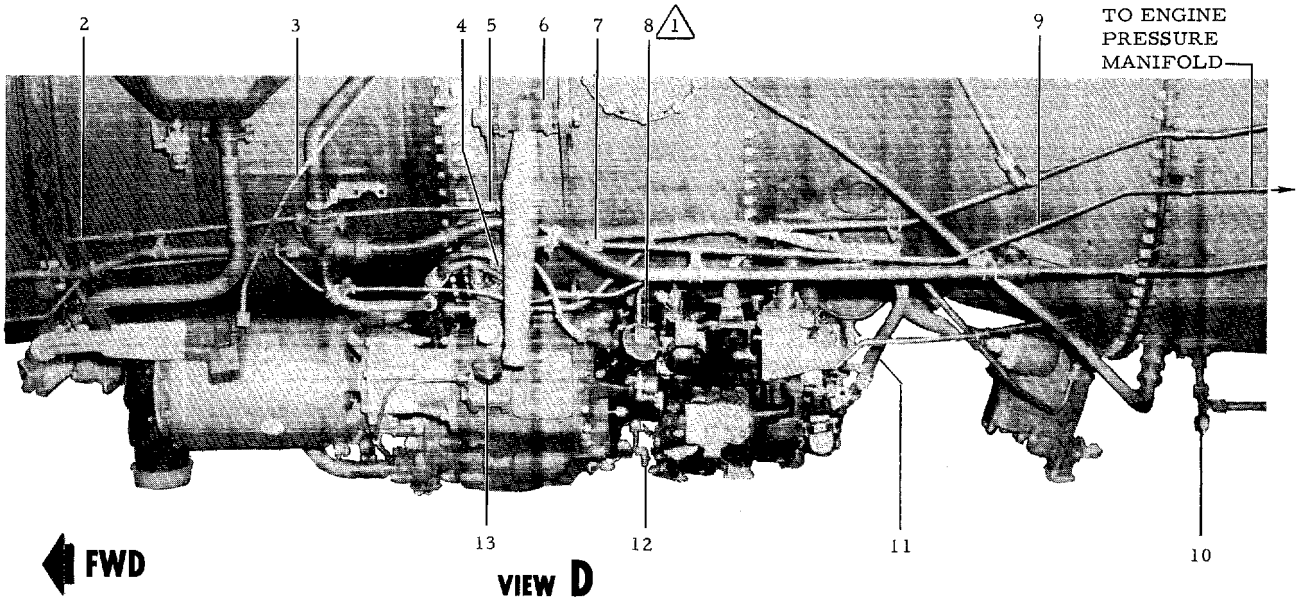
10 ALLEN PLUGS
11 ACCESSORY DRIVE GEARBOX (MAIN)
12 75P29 ADAPTER ASSY
13 75P88 STUD
14 2-110 OR MS2956-110 O-RING
75P29-2 WASHER
75P29-3 WASHER 3
15 DC GENERATOR
16 GENERATOR AIR ADAPTER
17 AN4047-1 GASKET

Figure 1-40. Engine Buildup (Sheet 2)



NOTE

1 LUBRICATE TACH GENERATOR DRIVE SPLINE WITH LUBRICANT, SPECIFICATION MIL-G-3545 OR LUBE PLASTIC NR3, CLASS 9156 (FSN9150-223-4003)



1 TOP REAR ENGINE MOUNT ASSY
2 COMPRESSOR INLET PRESSURE SENSING TUBES (P_{t2}) (TO COMPRESSOR INLET PRESSURE SENSING PROBE)
3 OIL SCUPPER DRAIN TUBE
LS5041-4 O-RING
4 OIL PRESSURE TRANSMITTER AND HOSE ASSY
LS5041-4 AND LS5041-6 O-RINGS
5 COMPRESSOR INLET PRESSURE SENSING CONN. (P_{t2}) (TO TRANSMITTER-MAIN WHEEL WELL)
6 75P7 BALL BAT
7 EXHAUST PRESSURE SENSING HOSE CONN. (P_{t7}) (TO TRANSMITTER-MAIN WHEEL WELL)
8 TACH GENERATOR
16532 GASKET (P & W)
9 EXHAUST PRESSURE SENSING TUBE (P_{t7})
10 COMBUSTION CHAMBER FUEL DRAIN TUBE AND FITTINGS
11 FUEL TOTALIZING TRANSMITTER TUBE AND HOSE
12 ENGINE COMPONENTS SEAL DRAIN ELBOW
MS29512-4 O-RING
13 75P47 OIL INLET FITTING
460-715-20 GASKET (P & W)
OIL PUMP SENSING TUBE

(19) INSTALL TOP REAR MOUNT ASSY (1) (SEE FIGURE 1-11)

(20) INSTALL COMPRESSOR INLET PRESSURE SENSING TUBES (2) AND HOSE (5)

(21) INSTALL OIL SCUPPER DRAIN TUBE, O-RING AND ELBOW (3)

(22) INSTALL OIL PRESSURE TRANSMITTER, O-RINGS AND HOSE (4)

(23) INSTALL LEFT BALL BAT (6) (SEE FIGURE 1-11)

(24) INSTALL TACH GENERATOR AND GASKET (8)

(25) INSTALL EXHAUST PRESSURE SENSING TUBE (9) AND HOSE (7)

(26) INSTALL COMBUSTION CHAMBER DRAIN FITTINGS AND TUBES (10) AND FUEL TOTALIZING TRANS. TUBE (11)

(27) INSTALL ENGINE SEAL DRAIN ELBOW AND O-RING (12)

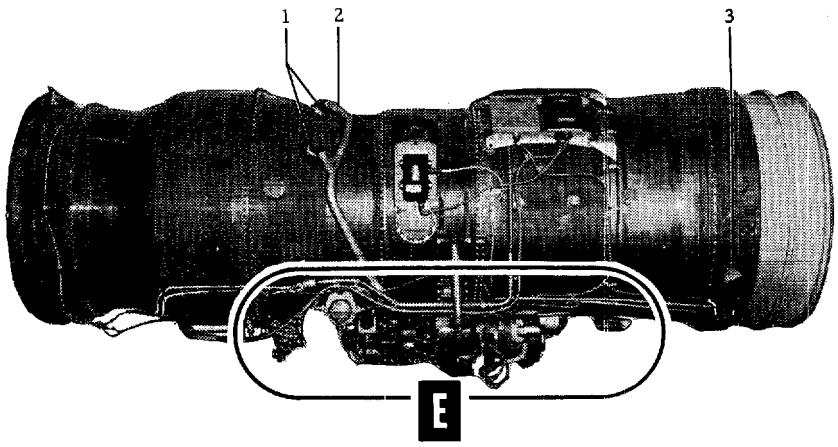
(28) INSTALL ENGINE OIL INLET FITTING, SENSING TUBE, AND GASKET (13)

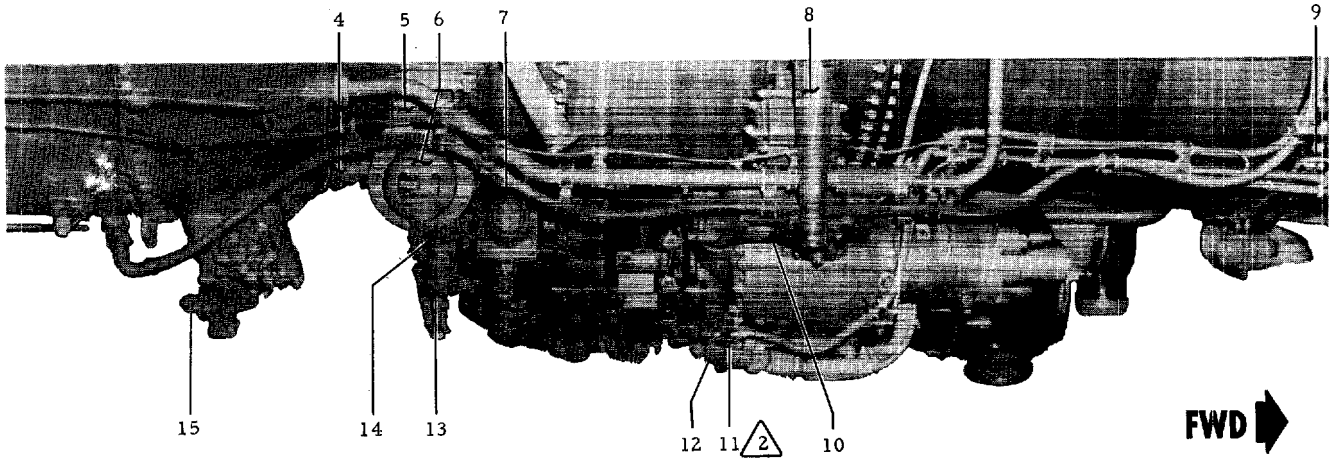
Figure 1-40. Engine Buildup (Sheet 3)

NOTE

1. TIGHTEN BOLTS TO 125-140 LB. IN. TORQUE AND LOCKWIRE.

2. AFTER ENGINE HAS BEEN INSTALLED IN AIRPLANE REMOVE IGNITION HARNESS BRACKET FROM FORWARD UNDERSIDE OF ENGINE AND ATTACH TO AFT SIDE OF N_2 CASE.





VIEW E

1 75P23 MANIFOLD ADAPTER
261643 GASKET (P & W)
221410 BOLT (P & W) 1
2 75P24-8 MANIFOLD ASSY
186948 GASKET (P & W)
75P9 BOLT 1
3 75P27-3 COVER
4 FUEL TOTALIZING TRANSMITTER TO PRESSURIZING & DUMP VALVE TUBE AND HOSE
75P41 PRESS. & DUMP VALVE INLET FITTING
MS29513-219 GASKET
5 FUEL TOTALIZING TRANSMITTER BRACKET
6 FUEL TOTALIZING TRANSMITTER
MS29512-16 GASKET
AN833-16D ELBOW
7 FUEL INLET FITTING
460-015-32 GASKET
8 75P8 BALL BAT
9 COMPRESSOR INLET PRESSURE SENSING TUBE (P_{t2})
10 OVERBOARD BREATHER CONNECTION
11 75P49 BRACKET ASSY
12 EGT, IGNITION, AND ENGINE CONTROLS HARNESS ASSYS
13 FUEL PRESSURE TRANSMITTER
MS29512-12 GASKET
14 FUEL SNUBBER FITTING
MS29512-12 GASKET
15 75P43 PRESS. & DUMP VALVE DRAIN FITTING
MS29513-216 GASKET

(29) INSTALL MANIFOLD ADAPTER (1) AND MANIFOLD ASSEMBLY (2) USING NEW GASKETS

(30) INSTALL COVER (3) ON ENGINE, IF REQUIRED

(31) INSTALL FUEL SNUBBER FITTING (14) AND FUEL PRESSURE TRANSMITTER (13) TO ENGINE FUEL PUMP

(32) INSTALL FUEL INLET FITTING (7)

(33) INSTALL RIGHT BALL BAT (8) (SEE FIGURE 1-11)

(34) ATTACH HARNESS BRACKET (11) TO UNDERSIDE OF ENGINE N_2 CASE

(35) INSTALL EGT, IGNITION AND ENGINE CONTROLS HARNESS ASSEMBLIES (12)

(36) INSTALL FUEL TOTALIZING BRACKET (5) AND TRANSMITTER (6) ON ENGINE

(37) INSTALL PRESS. & DUMP VALVE INLET FITTING AND TUBE (4)

(38) INSTALL PRESS. & DUMP VALVE DRAIN FITTING (15)

Figure 1-40. Engine Buildup (Sheet 4)

1-403. OIL SPECIFICATION CHANGE. (Engine not installed in airplane.)

Note

This procedure is recommended for flushing of oil through engine during changeover of oil from one oil specification to another. Only one flushing of engine is necessary. See this section under heading Servicing of Oil Tank for specified oils.

1-404. Flush engine oil system as follows:

a. Drain engine oil tank and N_2 accessory gearbox.

b. Secure drains and service oil tank with five (5) quarts of specified oil.

c. Motor engine over twice. Do not exceed starter limits.

Note

Refer to Operational Checkout Section for starter operational limits.

d. Drain engine oil tank and N_2 accessory gearbox.

e. Secure drains and service oil tank to proper oil level.

f. Make entry of type oil (Specification) used in engine on Engine Historical Record Form DD829.

1-405. TRANSFER OF ENGINE FROM TRANSPORTATION TRAILER TO INSTALLATION TRAILER.

1-406. PROCEDURE. (See figure 1-41.) The following engine transfer procedure is with the use of Engine Transportation Trailer, Part No. 75GH109-1 (Air Logistics Corp., Model 3060J); Installation Trailer (Air Logistics Corp., Model 4160C or 4160D) and Adapter Kit (Air Logistics Corp, Part No. 106315-501).

Note

Transfer of engine should be accomplished on level surface.

a. Check that all roller adapter brakes are locked prior to moving transportation trailer and installation trailer.

b. Prepare installation trailer by performing the following steps:

(1) Make certain that trailer is in serviceable condition. Refer to T.O. 35D3-3-34-11.

(2) Place lateral and horizontal adjustments in center position.

Note

Fore and aft red lines on bottom center of trailer must line up.

(3) Raise installation trailer rails to approximately the height of transportation trailer rails.

(4) Line up center of installation trailer with center of transportation trailer and butt ends of both trailers together. Raise or lower installation trailer as required. See figure 1-41.

c. Lock ends of both trailer rails. See figure 1-41, Detail A.

d. Set wheel brakes on both trailers.

e. Unlock roller adapter brakes on transportation trailer and slowly roll engine toward installation trailer using 1/2-inch drive swing handle at each roller adapter.

f. Hold spring-loaded stops (pins) down in order to pass over from transportation trailer to installation trailer.

g. Continue to roll engine until engine is centered on installation trailer.

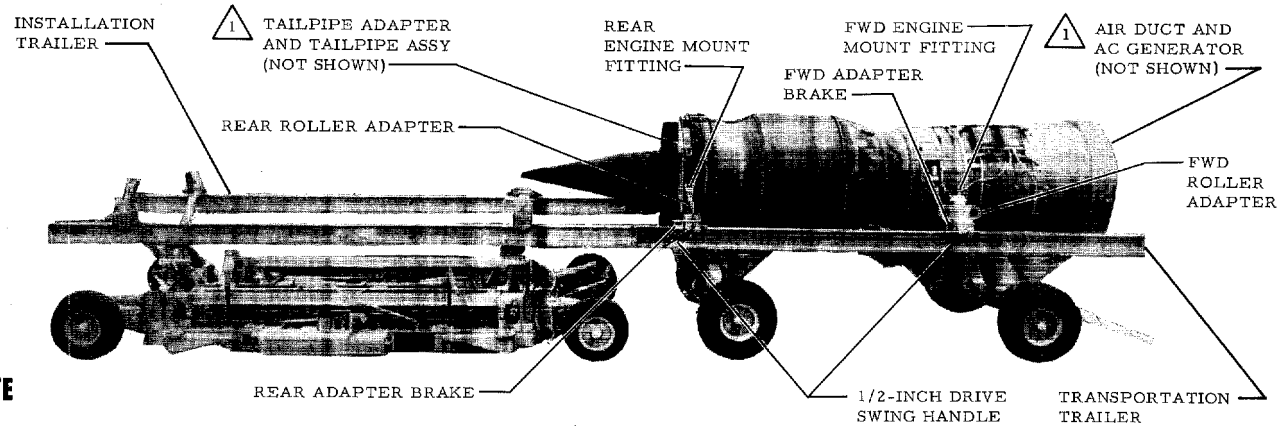
h. Lock roller adapter brakes after positioning center of gravity load.

i. To disconnect trailers, adjust rail height of installation trailer until quick-release pins can be removed by hand.

j. Unlock trailer wheel brakes and move to location desired. Reset wheel brakes.

Note

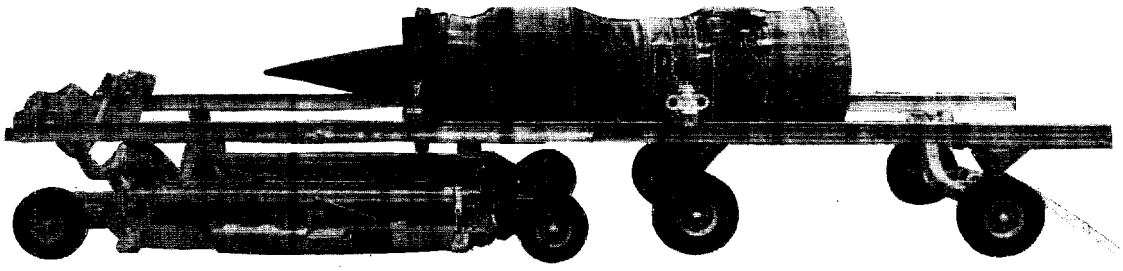
This completes preparation of powerplant for installation in airplane. Proceed to Engine Removal or Engine Installation as applicable.



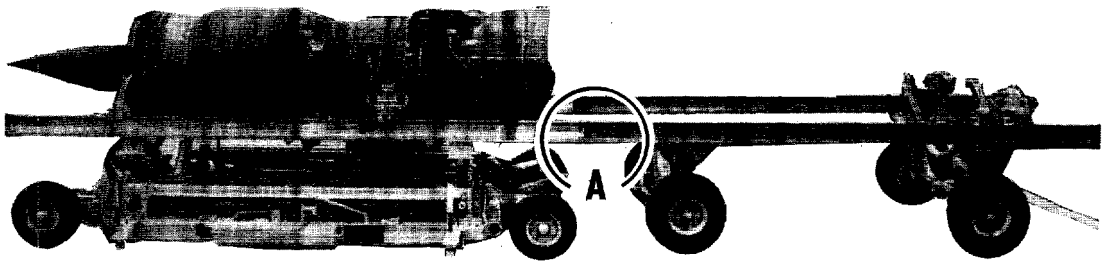
NOTE

1 TAILPIPE ADAPTER TAILPIPE ASSY AND ENGINE ACCESSORIES SHOULD BE INSTALLED PRIOR TO TRANSFER OF ENGINE FROM TRANSPORTATION TRAILER TO INSTALLATION TRAILER.

ENGINE ON TRANSPORTATION TRAILER

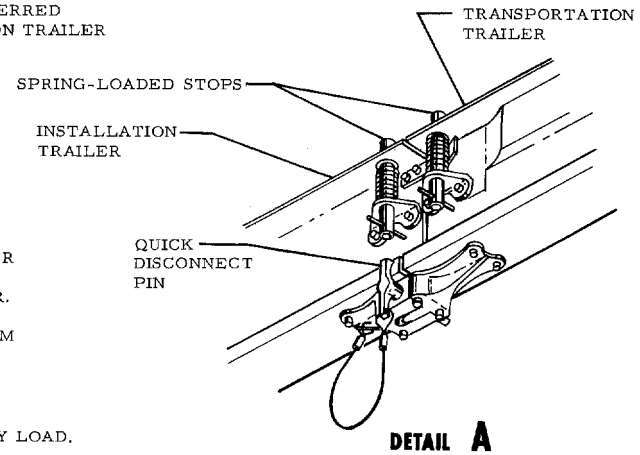


ENGINE ON BOTH TRAILERS



ENGINE TRANSFERRED TO INSTALLATION TRAILER

1. RAISE INSTALLATION TRAILER TO HEIGHT OF TRANSPORTATION TRAILER.
2. LINE UP CENTER OF INSTALLATION TRAILER WITH CENTER OF TRANSPORTATION TRAILER AND BUTT ENDS OF BOTH TRAILER RAILS TOGETHER.
3. LOCK ENDS OF BOTH TRAILER RAILS (SEE DETAIL A).
4. SET WHEEL BRAKES ON BOTH TRAILERS.
5. UNLOCK ROLLER ADAPTER BRAKES ON TRANSPORTATION TRAILER AND SLOWLY ROLL ENGINE TOWARD INSTALLATION TRAILER USING 1/2-INCH DRIVE SWING HANDLE AT EACH ROLLER ADAPTER.
6. HOLD SPRING-LOADED STOPS DOWN IN ORDER TO PASS OVER FROM TRANSPORTATION TRAILER TO INSTALLATION TRAILER.
7. CONTINUE TO ROLL ENGINE UNTIL ENGINE IS CENTERED ON INSTALLATION TRAILER.
8. LOCK ROLLER ADAPTER BRAKES AFTER POSITIONING OF GRAVITY LOAD.
9. DISCONNECT TRAILER BY REMOVING QUICK DISCONNECT PINS.



DETAIL A

RIGHT-HAND SHOWN LEFT-HAND SIMILAR

Figure 1-41. Transfer Of Engine From Transportation Trailer To Installation Trailer

1-407. REMOVAL OF ENGINE FROM AIRPLANE.

1-408. ENGINE DISCONNECT POINTS. The engine disconnect points are shown in figure 1-42.

1-409. PROCEDURE. The following removal procedure is with the use of Installation Trailer (Air Logistics Corp., Model 4160C or Model 4160D) and Adapter Kit (Air Logistics Corp.) Part No. 106315-501. (See figure 1-43.)

Note

Adapter Kit consists of forward left and right engine fittings, Part No. 106315-61 and 106315-62, respectively; rear left and right engine fittings, Part No. 106315-75; flexible container attaching plates, Part No. 106315-67; forward adapter ring, Part No. 106315-5, and rear adapter ring, Part No. 106315-9.

a. Place airplane on ground handling cart, Part No. 75GH56, with pin located in middle hole position (W/L 100).

Note

Place rear ground handling cart jacks on floor for stability.

b. Remove fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

c. Remove heat shield over top rear engine mount.

d. Install rear yoke assembly, Part No. 75GH70, through rear engine mount access door.

e. Install track support, Part No. 75GH118, to airframe at fuselage station 555 breakpoint. Use aft section attach bolts to secure support to fuselage bulkhead.

f. Install left and right engine tracks, Part No. 75GH104-1 L/R.

g. Install rear cradle assembly, Part No. 75GH71, through top front mount access door and slide in track assembly to top rear engine mount location.

h. Install front cradle assembly, Part No. 75GH32-500, through top front mount access door.

i. Install front mount clevis assembly, Part No. 75GH116-1.

j. Disconnect engine at disconnect points shown in figure 1-42.

CAUTION

When disconnecting lines, ducts, wires or hoses, move disconnects to a position that allows clearance when engine is moved out of fuselage.

k. Raise forward hanger to relieve weight from left and right trunnions (ball bats).

l. Raise rear of engine high enough to disconnect top rear engine mount.

m. Rotate rear engine mount and eyebolt to down position.

n. Disconnect left and right trunnions from fuselage structure.

o. Move engine back approximately three inches and remove trunnions from engine.

p. Prepare trailer by performing the following steps:

(1) Make certain that trailer is in serviceable condition. Refer to T.O. 35D3-3-34-11.

(2) Place lateral and horizontal adjustments in center position.

Note

Fore and aft red lines on bottom of trailer must line up.

(3) Push installation trailer in so that forward ends of rails are 10 to 12 inches past aft end of fuselage station 555 bulkhead. Apply trailer brakes. (See figure 1-43.)

(4) Place installation trailer jacks firmly on floor.

(5) Raise trailer rails to approximately installation height.

CAUTION

Station men at various points so that clearance of engine with fuselage can be observed at all points at all times.

q. Roll engine aft approximately four and one-half feet so that aft engine mount fittings may be attached to exhaust case of engine. (See figure 1-43.)

r. Lower or raise trailer and attach aft engine mount fitting to adapter ring with pip pins. (See figure 1-43.)

s. Raise trailer rails up under aft adapters until engine weight is on aft adapters.

t. Remove aft engine cradle assembly, Part No. 75GH71, and yoke assembly, Part No. 75GH70.

u. Continue to roll engine aft and adjust engine vertically and horizontally as necessary.

Note

Check clearance between engine and fuselage at all points.

v. Roll engine aft until aft portion of oil tank lines up with fuselage station 555 breakpoint.

w. Attach forward engine mount fittings to compressor intermediate case of engine.

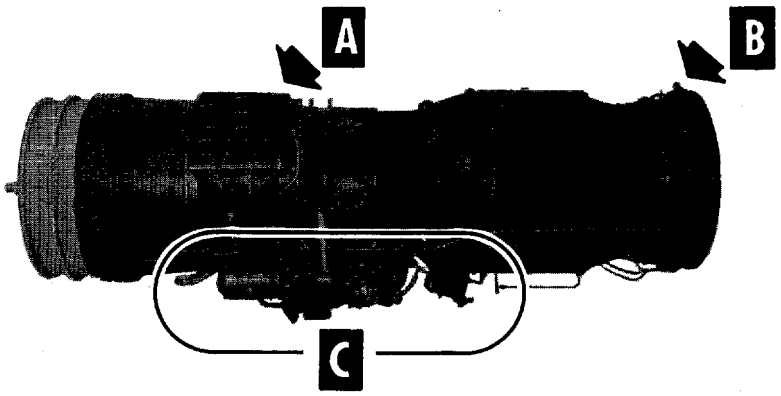
x. Lower or raise trailer as required and attach forward engine mount fittings to adapter ring using pip pins. (See figure 1-43.)

y. Lift trailer rails up under adapters until engine weight is entirely upon roller adapters.

z. Remove forward top mount and roll engine aft to clear airplane. Apply brakes on all roller adapters.

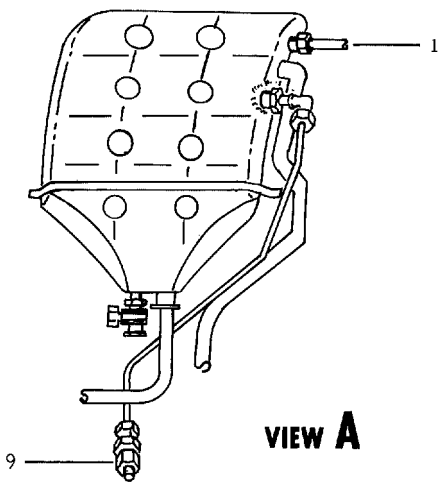
aa. Raise trailer jacks. Roll trailer and engine away from airplane.

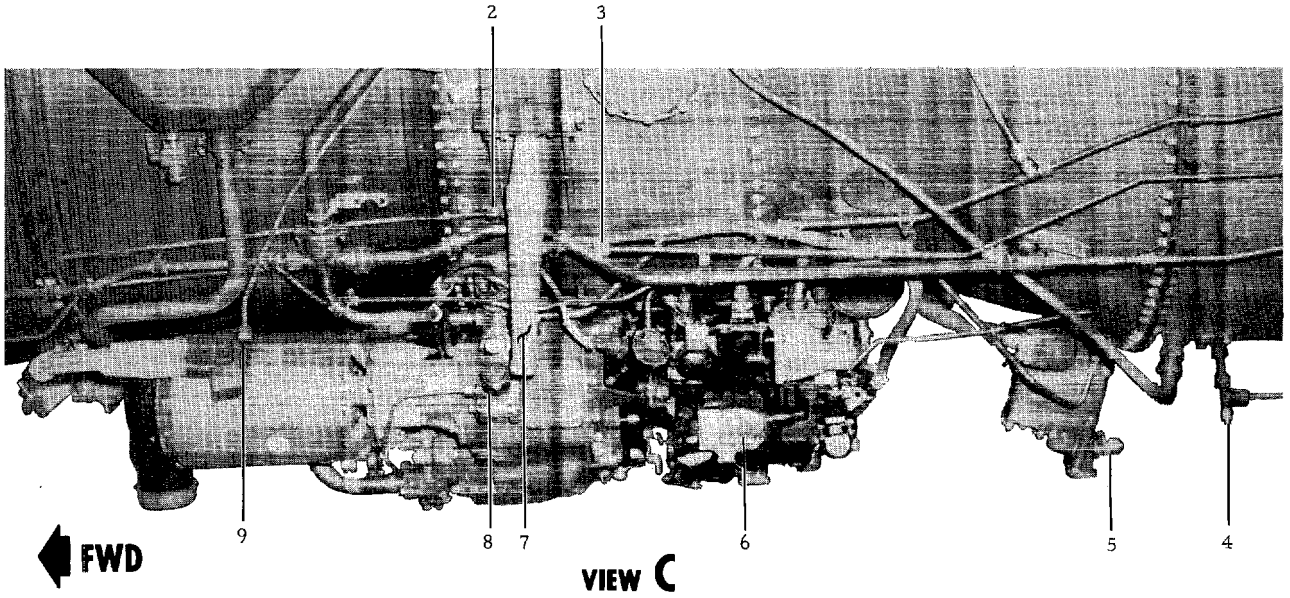
ab. Remove installation/removal track, Part No. 75GH104-1 L/R, and support assembly, Part No. 75GH118, from airplane.



NOTE

LOCATION OF ACCESS PANELS MAY BE FOUND IN SECTION I OF -2-1 MAINTENANCE MANUAL.





1 OIL TANK ANTISIPHON LINE (1/4")
(THROUGH FRONT ENGINE HOIST ACCESS PANEL)
2 COMPRESSOR INLET PRESSURE SENSING CONN. (P_{t2})
(THROUGH LEFT ENGINE MOUNT ACCESS PANEL)
3 EXHAUST PRESSURE SENSING CONN. (P_{t7})
(THROUGH LEFT ENGINE MOUNT ACCESS PANEL)
4 COMBUSTION CHAMBER DRAIN
(THROUGH AFT LOWER ENGINE ACCESS PANEL)
5 FUEL PRESSURIZATION AND DUMP VALVE DRAIN
(THROUGH AFT LOWER ENGINE ACCESS PANEL)
6 THROTTLE CONTROL
(THROUGH AFT LOWER ENGINE ACCESS PANEL)
7 LEFT ENGINE MOUNT
(THROUGH LEFT ENGINE MOUNT ACCESS PANEL)
8 OIL RETURN (1 1/2" FLEX)
(THROUGH FWD LOWER ENGINE ACCESS PANEL)
9 OIL TANK SCUPPER DRAIN
(THROUGH FWD LOWER ENGINE ACCESS PANEL)
10 TOP REAR ENGINE MOUNT
(THROUGH TOP REAR ENGINE MOUNT ACCESS PANEL)

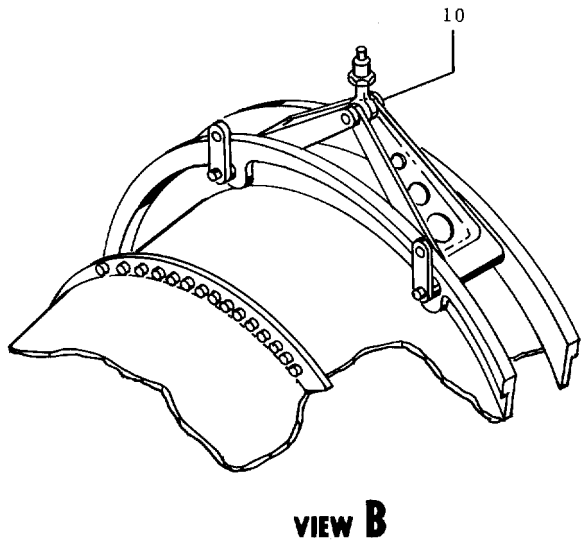
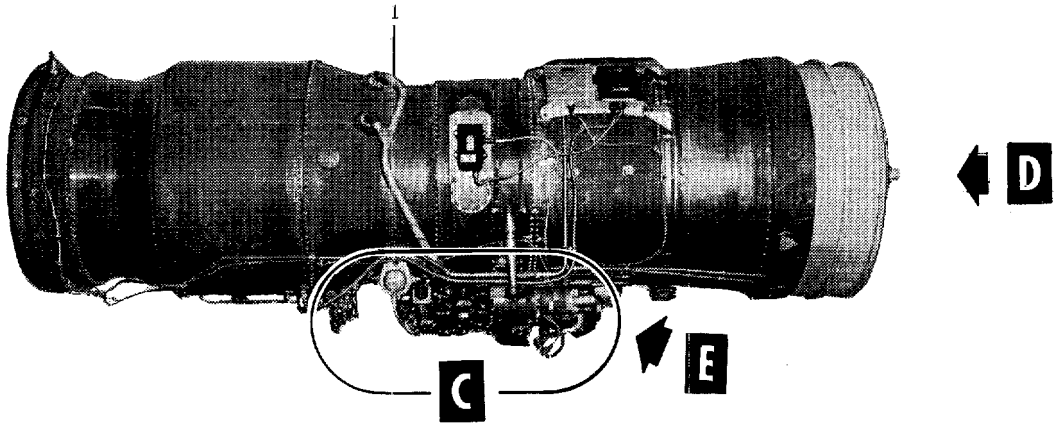
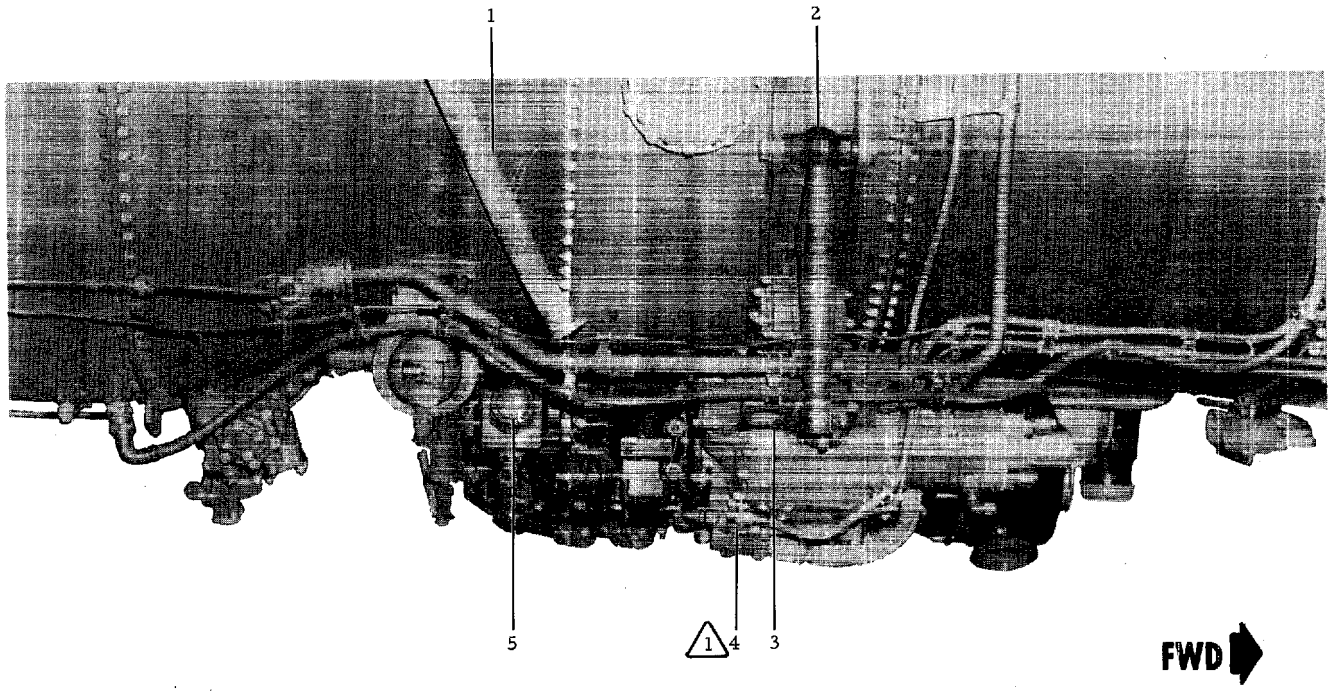


Figure 1-42. Engine Quick Disconnect Points (Sheet 1)





VIEW C

NOTE

1 DETACH AND TIE IGNITION BRACKET TO FORWARD UNDERSIDE OF ENGINE PRIOR TO ENGINE REMOVAL.

1 ENGINE BLEED AIR MANIFOLD (THROUGH AFT LOWER ENGINE ACCESS PANEL)

2 RIGHT ENGINE MOUNT (THROUGH RIGHT ENGINE MOUNT ACCESS PANEL)

3 N_2 CASE VENT (THROUGH AFT LOWER ENGINE ACCESS PANEL)

4 EGT, IGNITION AND EMERGENCY PLUG CONNECTIONS (THROUGH FWD LOWER ENGINE ACCESS PANEL)

5 MAIN FUEL INLET (THROUGH AFT LOWER ENGINE ACCESS PANEL)

Figure 1-42. Engine Quick Disconnect Points (Sheet 2)

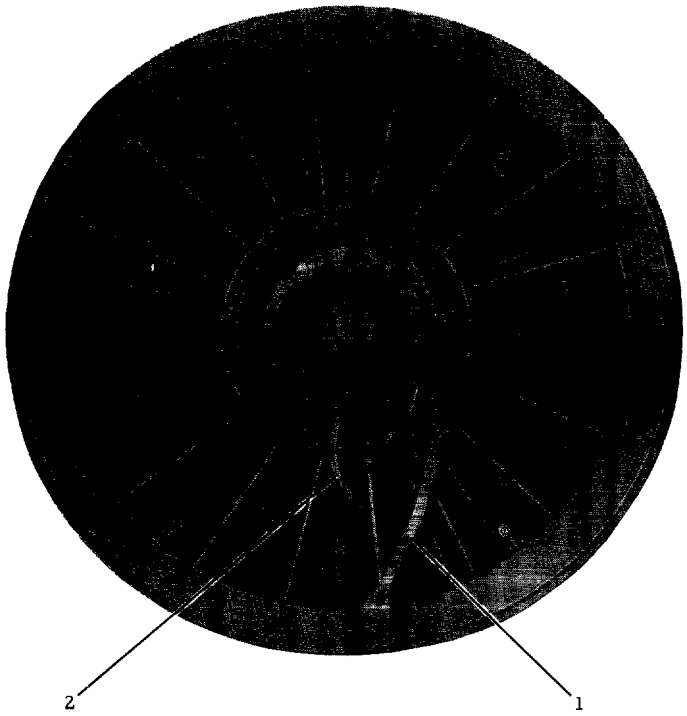
1 AC GENERATOR ELECTRICAL LEADS (THROUGH MAIN WHEEL WELL)

2 FRONT BEARING SEAL DRAIN (THROUGH MAIN WHEEL WELL)

3 DC GENERATOR ELECTRICAL LEADS (THROUGH FWD LOWER ENGINE ACCESS PANEL)

4 OIL OUTLET (TO COOLERS) (THROUGH FWD LOWER ENGINE ACCESS PANEL)

5 DC GENERATOR AIR INTAKE (THROUGH FWD LOWER ENGINE ACCESS PANEL)



VIEW D

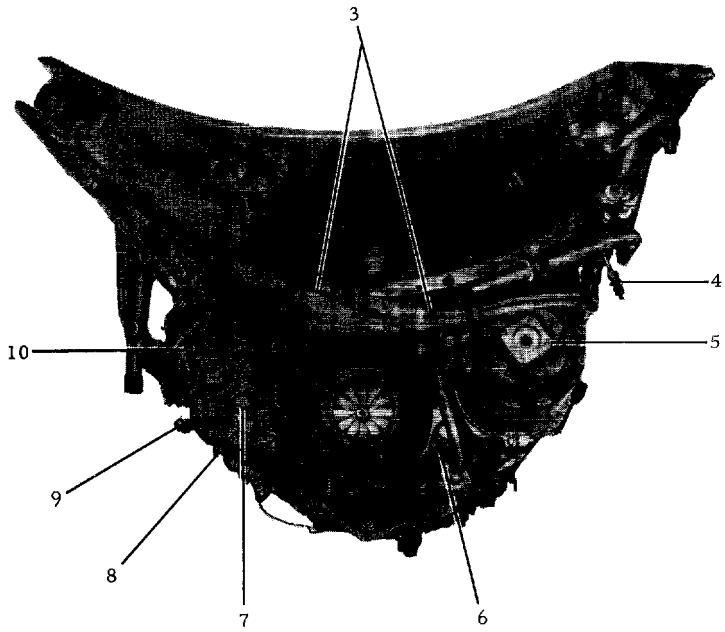
6 OIL RETURN (TO ENGINE) (THROUGH FWD LOWER ENGINE ACCESS PANEL)

7 HYDRAULIC PUMP SUCTION (3/4") THROUGH FWD LOWER ENGINE ACCESS PANEL)

8 HYDRAULIC PUMP CASE DRAIN (THROUGH FWD LOWER ENGINE ACCESS PANEL)

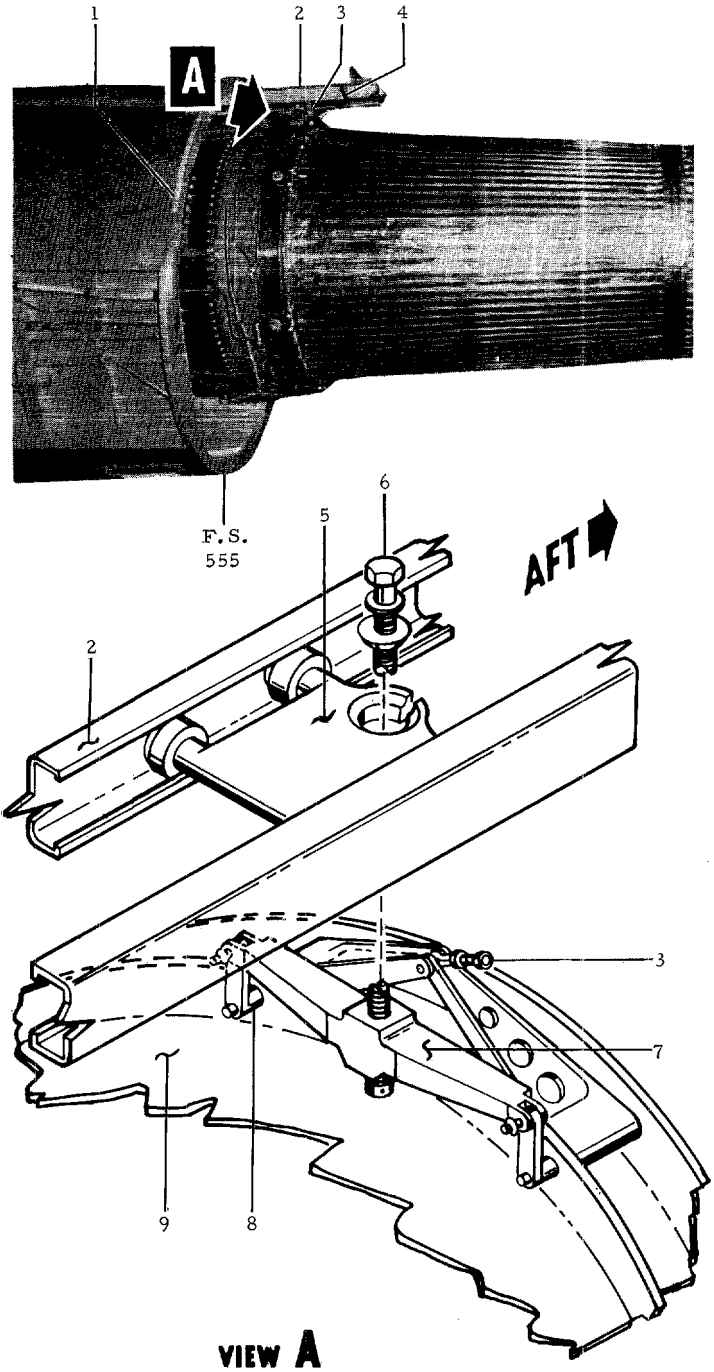
9 HYDRAULIC PUMP BYPASS (THROUGH FWD LOWER ENGINE ACCESS PANEL)

10 HYDRAULIC PUMP PRESSURE (5/8") (THROUGH FWD LOWER ENGINE ACCESS PANEL)



VIEW E

Figure 1-42. Engine Quick Disconnect Points (Sheet 3)



TOP AFT ENGINE-TO-TRACK INSTALLATION

1 TRACK SUPPORT
2 INSTALLATION/REMOVAL TRACK
3 TOP AFT ENGINE MOUNT
4 TRACK SAFETY PIN
5 AFT CARRIAGE CRADLE ASSEMBLY
6 AFT CRADLE BOLT
AFT CRADLE WASHER
AFT CONE WASHER
7 AFT CARRIAGE YOKE ASSY
8 LIFTING LINK (TYPICAL - 2 PLACES)
9 ENGINE TURBINE EXHAUST CASE

NOTE

THE REMOVAL PROCEDURE COVERED IS WITH THE USE OF INSTALLATION TRAILER (AIR LOGISTICS CORP., MODEL 4160C OR 4160D) AND ADAPTER KIT (AIR LOGISTICS CORP., PART NO. 106315-501).

(1) PLACE AIRPLANE ON GROUND HANDLING CART WITH PIN IN MIDDLE HOLE POSITION (W/L 100).

NOTE

PLACE AFT GROUND HANDLING CART JACKS ON FLOOR FOR STABILITY.

(2) REMOVE FUSELAGE AFT SECTION IN ACCORDANCE WITH INSTRUCTIONS IN -2-1 MAINTENANCE MANUAL.

(3) REMOVE HEAT SHIELD AT TOP REAR ENGINE MOUNT LOCATION.

(4) INSTALL AFT YOKE ASSEMBLY (7) THROUGH AFT ENGINE MOUNT ACCESS DOOR

(5) INSTALL TRACK SUPPORT (1) TO AIRFRAME AT FUSELAGE STATION 555 BREAKPOINT. USE AFT SECTION ATTACH BOLTS TO SECURE SUPPORT TO FUSELAGE BULKHEAD.

(6) INSTALL ENGINE INSTALLATION/REMOVAL TRACKS (2) TO UPPER PART OF ENGINE COMPARTMENT.

(7) INSTALL AFT CARRIAGE CRADLE (5) THROUGH TOP FORWARD MOUNT ACCESS DOOR AND SLIDE IN TRACK ASSEMBLY (2) TO TOP AFT ENGINE MOUNT LOCATION.

(8) INSTALL FORWARD TOP MOUNT CRADLE (12) AND CLEVIS ASSEMBLY (15) THROUGH TOP FORWARD MOUNT ACCESS DOOR. (SEE SHEET 3).

(9) DISCONNECT ENGINE AT DISCONNECT POINTS SHOWN IN FIGURE 1-42.

CAUTION

WHEN DISCONNECTING LINES, DUCTS, WIRES OR HOSES, MOVE DISCONNECTS TO A POSITION THAT ALLOWS CLEARANCE WHEN ENGINE IS MOVED OUT OF FUSELAGE.

(10) RAISE FORWARD HANGER TO RELIEVE WEIGHT FROM LEFT AND RIGHT TRUNNIONS (BALL BATS). (SEE VIEW A, SHEET 3)

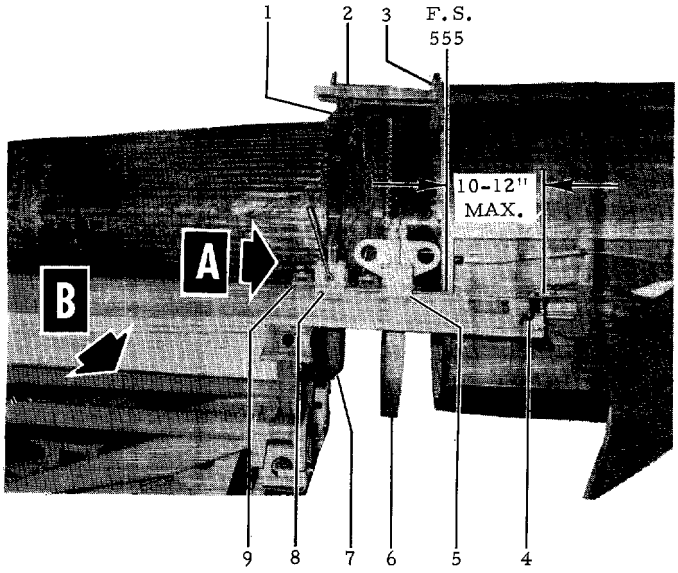
(11) RAISE REAR OF ENGINE HIGH ENOUGH TO DISCONNECT TOP AFT ENGINE MOUNT.

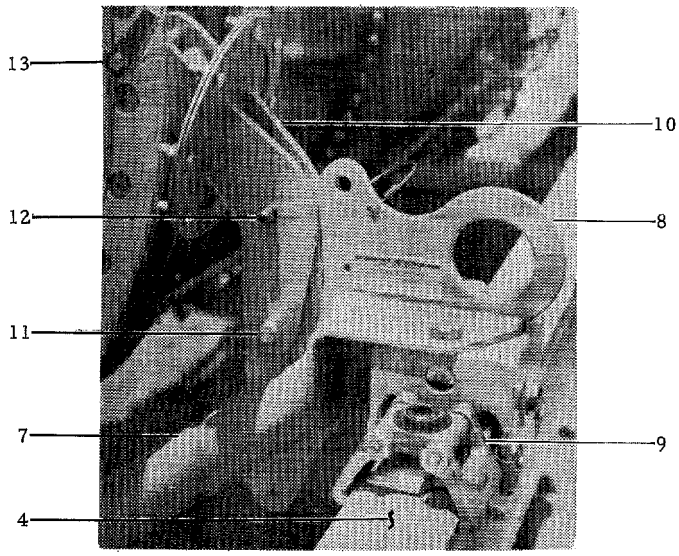
(12) ROTATE AFT ENGINE MOUNT AND EYEBOLT (3) TO DOWN POSITION

(13) DISCONNECT LEFT AND RIGHT TRUNNIONS FROM FUSELAGE STRUCTURE.

(14) MOVE ENGINE BACK APPROXIMATELY THREE- INCHES AND REMOVE TRUNNIONS FROM ENGINE.

Figure 1-43. Removal of Engine from Airplane (Sheet 1)





VIEW A
(RIGHT SIDE SHOWN LEFT SIDE SIMILAR)

(15) PREPARE INSTALLATION TRAILER (4) BY PERFORMING THE FOLLOWING STEPS:

(a) MAKE CERTAIN THAT TRAILER IS IN SERVICEABLE CONDITION.

(b) PLACE LATERAL AND HORIZONTAL ADJUSTMENTS IN CENTER POSITION.

NOTE

FORE AND AFT RED LINES ON BOTTOM OF TRAILER MUST LINE UP (13).

(c) PUSH INSTALLATION TRAILER (4) IN SO THAT FORWARD ENDS OF RAILS ARE 10 TO 12 - INCHES PAST AFT END OF FUSELAGE STATION 555 BULKHEAD. APPLY ROLLER ADAPTER BRAKES. (SEE SHEET 4.)

(d) PLACE INSTALLATION TRAILER JACKS FIRMLY ON FLOOR.

(e) RAISE TRAILER RAILS TO APPROXIMATE HEIGHT.

CAUTION

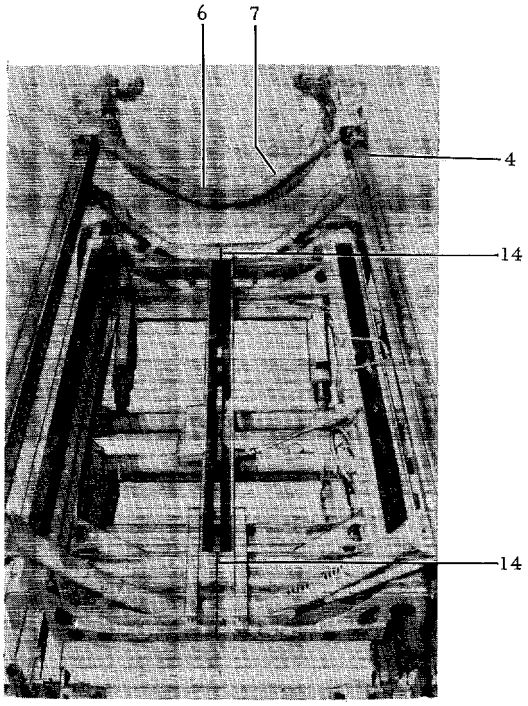
STATION MEN AT VARIOUS POINTS SO THAT CLEARANCE OF ENGINE WITH FUSELAGE CAN BE OBSERVED AT ALL TIMES.

(16) ROLL ENGINE AFT APPROXIMATELY FOUR AND ONE-HALF FEET SO THAT AFT ENGINE MOUNT FITTINGS (10) MAY BE ATTACHED TO EXHAUST CASE OF ENGINE. (SEE SHEET 1.)

(17) LOWER OR RAISE TRAILER AND ATTACH AFT ENGINE MOUNT FITTINGS TO AFT ADAPTER RING (7) WITH PIP PINS. (12).

(18) RAISE TRAILER RAILS UP UNDER AFT ROLLER ADAPTERS (8) UNTIL ENGINE WEIGHT IS ON AFT ADAPTERS.

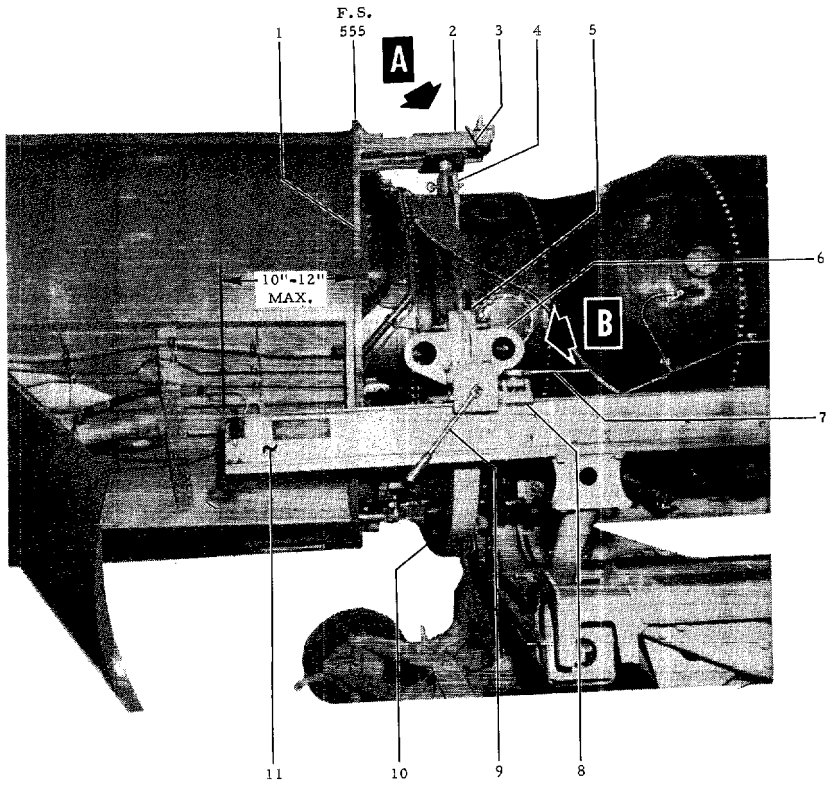
(19) REMOVE AFT ENGINE CRADLE ASSEMBLY AND YOKE ASSEMBLY FROM ENGINE INSTALLATION/REMOVAL TRACK (2). (SEE VIEW A SHEET 1.)



VIEW B
TRAILER ALIGNMENT

1 AFT TOP ENGINE MOUNT FITTING
2 INSTALLATION/REMOVAL TRACK
3 TRACK SUPPORT
4 INSTALLATION TRAILER
5 FWD ROLLER ADAPTER
6 FWD ADAPTER RING
7 AFT ADAPTER RING
8 AFT ROLLER ADAPTER
9 AFT ADAPTER BRAKE
10 AFT ENGINE MOUNT FITTING
11 AFT ADAPTER ATTACHMENT BOLT
12 AFT ADAPTER ATTACHMENT PIP PIN
13 AFT ENGINE MOUNT FITTING PIP PIN
14 TRAILER ALIGNMENT MARKS

Figure 1-43. Removal of Engine from Airplane (Sheet 2)



(20) CONTINUE TO ROLL ENGINE AFT AND ADJUST ENGINE VERTICALLY AND HORIZONTALLY AS NECESSARY.

NOTE

CHECK CLEARANCE BETWEEN ENGINE AND FUSELAGE AT ALL POINTS.

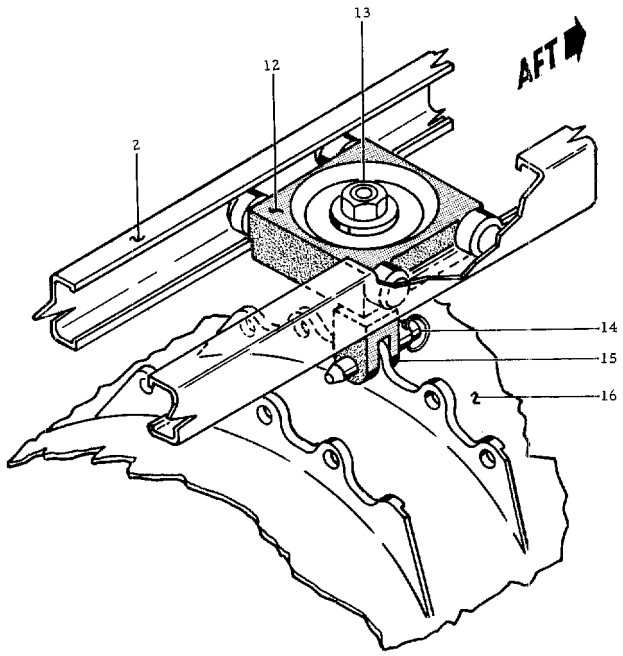
(21) ROLL ENGINE AFT UNTIL AFT PORTION OF OIL TANK SHOWS ABOUT THREE INCHES BEYOND FUSELAGE STATION 555 BREAKPOINT.

(22) ATTACH FORWARD ENGINE MOUNT FITTINGS (5) TO COMPRESSOR INTERMEDIATE CASE OF ENGINE.

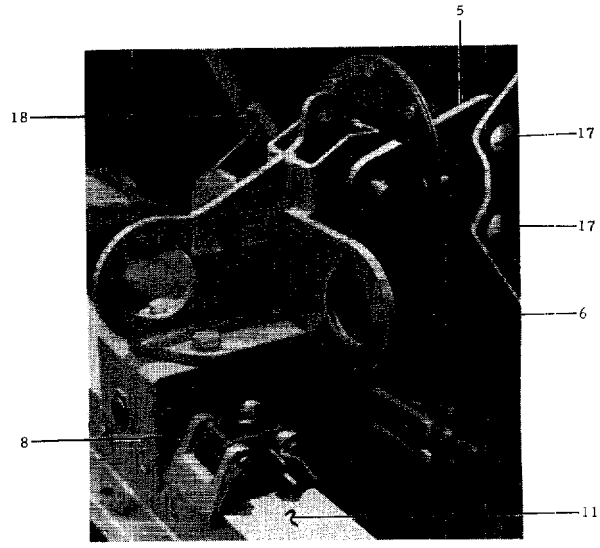
(23) LOWER OR RAISE TRAILER AS REQUIRED AND ATTACH ROLLER ENGINE MOUNT FITTINGS (5) TO FORWARD ADAPTER (6) USING PIP PINS (18).

(24) LIFT TRAILER RAILS UP UNDER ROLLER ADAPTERS (6) UNTIL ENGINE WEIGHT IS ENTIRELY UPON ROLLER ADAPTERS.

1 TRACK SUPPORT
2 INSTALLATION/REMOVAL TRACK
3 TRACK SAFETY PIN
4 TOP FWD ENGINE-TO-TRACK INSTALLATION
5 FWD ENGINE MOUNT FITTING
6 FWD ROLLER ADAPTER
7 1/2-INCH DRIVE RATCHET HANDLE
8 FWD ADAPTER BRAKE
9 1/2-INCH DRIVE SWING HANDLE
10 FWD ADAPTER RING
11 INSTALLATION TRAILER
12 FWD CARRIAGE CRADLE ASSY
13 FWD CARRIAGE ADJUSTING NUT
FWD CARRIAGE SPHERICAL WASHER
14 FWD CLEVIS PIP PIN
15 FWD CARRIAGE CLEVIS (INSTALLED AT TOP FWD ENGINE MOUNT AFT RING)
16 ENGINE COMPRESSOR SECTION
17 FWD ENGINE MOUNT FITTING ATTACHMENT BOLT
18 FWD ROLLER ADAPTER ATTACHMENT PIP PIN

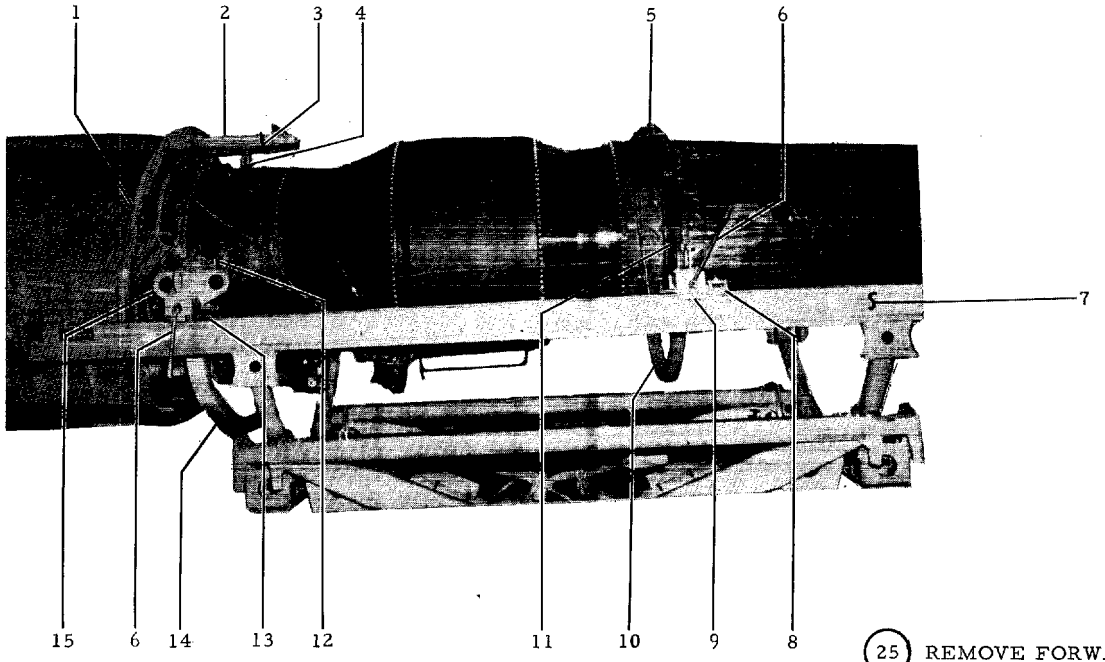


VIEW A
TOP FWD ENGINE-TO-TRACK INSTALLATION



VIEW B
(LEFT SIDE SHOWN RIGHT SIDE SIMILAR)

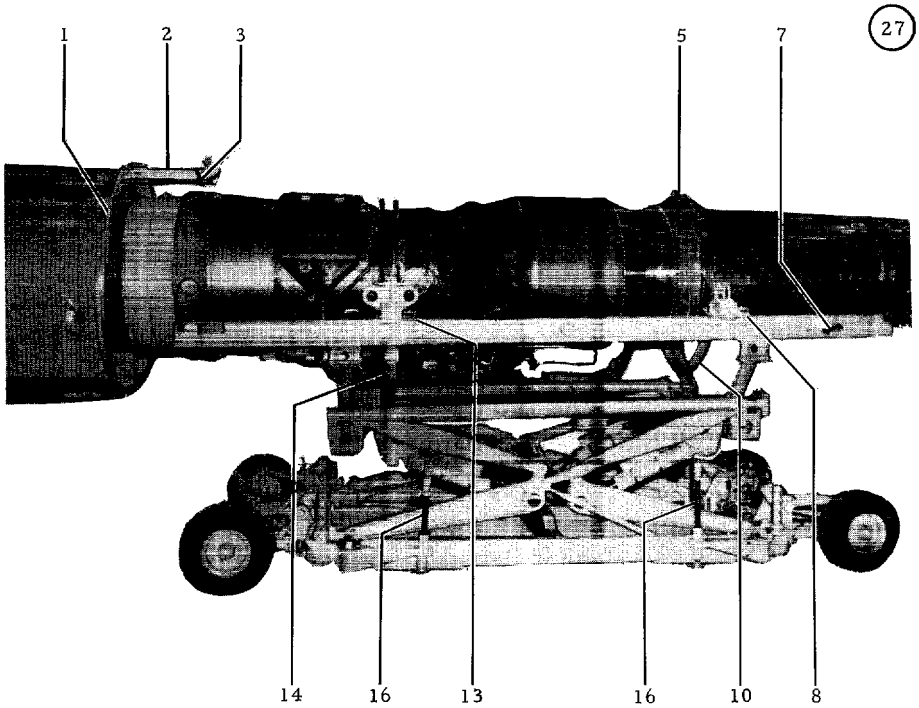
Figure 1-[illegible] (Sheet 3)



(25) REMOVE FORWARD TOP MOUNT (4) AND ROLL ENGINE AFT TO CLEAR AIRPLANE. APPLY ROLLER ADAPTER BRAKES (8, 13).

(26) RAISE TRAILER JACKS (16). ROLL TRAILER AND ENGINE AWAY FROM AIRPLANE.

(27) REMOVE INSTALLATION/ REMOVAL TRACK (2) SUPPORT ASSEMBLY (1) FROM AIRPLANE.



1 TRACK SUPPORT
2 INSTALLATION/REMOVAL TRACK
3 TRACK SAFETY PIN
4 TOP FWD ENGINE-TO-TRACK INSTALLATION (SEE SHEET 3)
5 TOP AFT ENGINE MOUNT
6 1/2-INCH DRIVE HANDLE
7 INSTALLATION TRAILER
8 AFT ADAPTER BRAKE
9 AFT ROLLER ADAPTER
10 AFT ADAPTER RING
11 AFT ENGINE MOUNT FITTING
12 FWD ENGINE MOUNT FITTING
13 FWD ADAPTER BRAKE
14 FWD ADAPTER RING
15 FWD ROLLER ADAPTER
16 INSTALLATION TRAILER JACKS

Figure 1-43. Removal of Engine from Airplane (Sheet 4)

1-410. INSTALLATION OF ENGINE IN AIRPLANE.

1-411. PROCEDURE. The following installation procedure is with the use of Installation Trailer (Air Logistics Corp., Model 4160C or Model 4160D) and Adapter Kit (Air Logistics Corp. Part No. 106315-501.). See figure 1-44.

Note

Adapter Kit consists of forward left and right engine fittings, Part No. 106315-61 and 106315-62, respectively; rear left and right engine fittings, Part No. 106315-75; flexible container attaching plates, Part No. 106315-67; forward adapter ring, Part No. 106315-5, and rear adapter ring, Part No. 106315-9.

Airplane has been previously placed on ground handling cart, Part No. 75GH56, with pin in middle hole position, W/L100.

CAUTION

Before engine installation, it is essential that the exterior of engine and interior of engine compartment be inspected for loose tags, labels, wires, components, nuts, bolts, washers and any foreign matter. Areas within the engine compartment where work has been done, must be thoroughly cleaned and inspected for loose articles or foreign matter before closing compartment.

a. Attach support assembly, Part No. 75GH118 to airframe at fuselage station 555 breakpoint. Use aft section attach bolts to secure support to fuselage bulkhead.

b. Install engine installation/removal track, Part No. 75GH104-1 L/R to upper part of fuselage.

c. Prepare trailer by performing the following steps:

(1) Place lateral and horizontal adjustments in center position.

Note

Fore and aft red lines on bottom center of trailer must line up.

(2) Raise installation trailer so that bottom of front engine adapter assembly is approximately 50-inches above floor of hangar.

(3) Line up center of trailer with centerline of airplane. Push installation trailer in so that front of engine is approximately 12 inches from fuselage.

(4) Raise installation trailer and align engine mount (by sighting) with installation track.

d. Place airplane ground handling cart jacks (rear) on floor for stability. Airplane should be in level attitude.

e. Push installation trailer to within 2 or 3 inches of fuselage station 555 bulkhead.

CAUTION

Station men at various points so that clearance of engine with fuselage can be observed at all points at all times.

f. Continue to push installation trailer in so that forward ends of trailer rails are 10 to 12 inches past aft end of fuselage station 555 bulkhead. Apply trailer rail brakes. (See figure 1-44.)

g. Place installation trailer jacks firmly on floor.

h. Raise engine to approximately installation height.

i. Unlock trailer roller adapters so that engine may roll forward. (Use 1/2-inch drive swing handle at each roller assembly. See figure 1-44.)

j. Roll engine forward until aft portion of oil tank shows about three inches beyond fuselage station 555 breakpoint. Tilt end of trailer rails as needed.

k. Install forward cradle assembly, Part No. 75GH32-500 on track and clevis assembly, Part No. 75GH116-1, to top forward engine mount.

Note

Check clearance between engine and fuselage at all points.

l. Unload forward left and right engine-to-trailer adapters by tightening up on forward cradle track roller mount until clevis protrudes above nut approximately one thread. Remove forward left and right engine-to-trailer adapters.

m. Slowly roll engine forward with aft installation trailer rollers. Check engine clearance and adjust vertically and horizontally as necessary.

n. Install aft cradle assembly, Part No. 75GH71, on tracks and install safety pin, Part No. 75GH115-1. (See figure 1-44.)

o. Install yoke assembly, Part No. 75GH70, at top rear engine mount.

p. Roll engine forward until aft portion of engine is within 16 inches (approximately) of fuselage station 555 breakpoint.

q. Raise aft portion of engine and attach aft yoke assembly to aft cradle assembly to take up engine load. Remove aft left and right engine-to-trailer adapters.

r. Raise installation trailer jacks, lower trailer rails and roll trailer aft, away from airplane.

s. Push engine in on forward and aft engine track roller mounts. Raise or lower engine as necessary.

t. Install left and right trunnions (ball bats) on engine when engine is lined up with left and right side engine mount access doors.

u. Tighten the 3/4-16 bolts through left and right spherical sockets (on engine).

Note

The 3/4-16 bolt is tightened sufficiently to create enough friction to support weight of trunnion at any position to which it is swung manually. No specific torque is required.

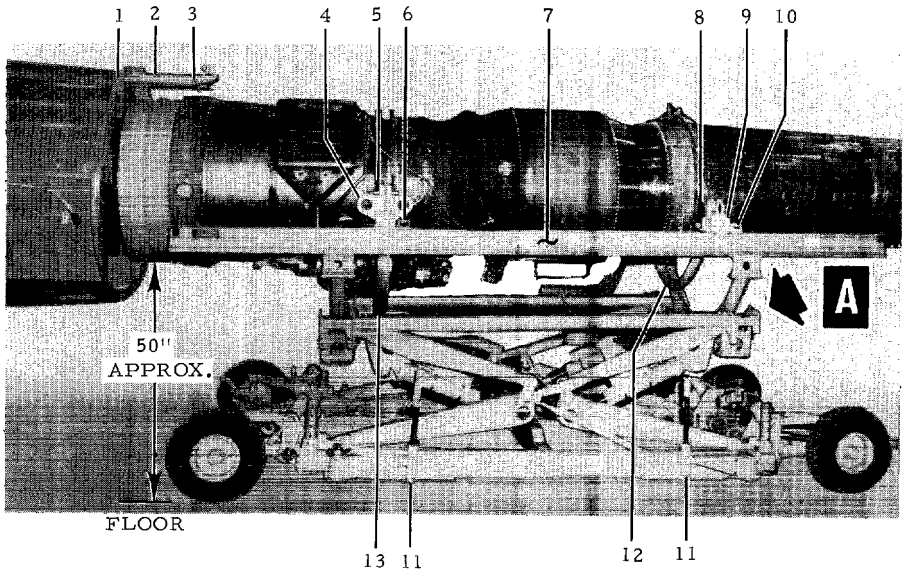
v. Route alternator wire harness through engine seal at front end of engine before moving engine into ball bat position.

w. Push engine in position while holding trunnions in line with their respective sockets.

x. Install left and right-hand trunnions in sockets (outboard end) and clamp in place.

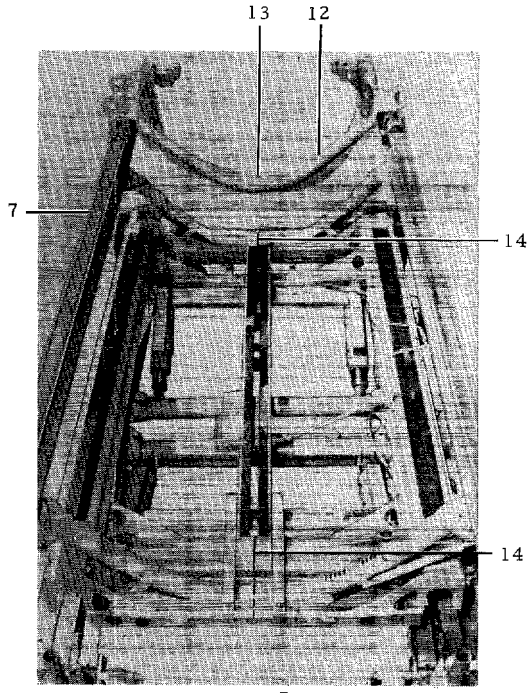
y. Secure top rear mount and raise or lower engine to provide alignment between adapter ring at front of engine and fuselage air inlet duct.

z. Take engine weight off forward and aft cradle assembly, then remove both cradle assemblies through top front mount access door.



NOTE

THE INSTALLATION PROCEDURE COVERED IS WITH THE USE OF INSTALLATION TRAILER (AIR LOGISTICS CORP., MODEL 4160C OR 4160D) AND ADAPTER KIT (AIR LOGISTICS CORP., PART NO. 106315-501).



VIEW A

1. TRACK SUPPORT
2. INSTALLATION/REMOVAL TRACK
3. TRACK SAFETY PIN
4. FWD ROLLER ADAPTER
5. FWD ENGINE MOUNT FITTING
6. FWD ADAPTER BRAKE
7. INSTALLATION TRAILER
8. AFT ENGINE MOUNT FITTING
9. AFT ROLLER ADAPTER
10. AFT ADAPTER BRAKE
11. INSTALLATION TRAILER JACK
12. AFT ADAPTER RING
13. FWD ADAPTER RING
14. TRAILER ALIGNMENT MARKS

(1) ATTACH TRACK SUPPORT (1) TO AIRFRAME AT FUSELAGE STATION 555 BULKHEAD.

NOTE

AIRPLANE HAS BEEN PREVIOUSLY PLACED ON GROUND HANDLING CART, PART NO. 75GH56, WITH PIN IN MIDDLE HOLE POSITION (W/L 100).

(2) INSTALL ENGINE INSTALLATION/REMOVAL TRACK (2) TO UPPER PART OF ENGINE COMPARTMENT.

(3) PREPARE TRAILER (7) BY PERFORMING THE FOLLOWING STEPS:

CAUTION

MAKE CERTAIN THAT LOCKS ON ROLLER ADAPTERS (6, 10) AT RAILS ARE ENGAGED, LOCKING THE ENGINE ON THE TRAILER.

(a) PLACE LATERAL AND HORIZONTAL ADJUSTMENTS IN CENTER POSITION.

NOTE

FORE AND AFT RED LINES (14) ON BOTTOM OF TRAILER MUST LINE UP. (SEE VIEW A.)

(b) RAISE TRAILER SO THAT BOTTOM OF FRONT ENGINE ADAPTER ASSEMBLY IS APPROXIMATELY 50-INCHES ABOVE FLOOR OF HANGAR.

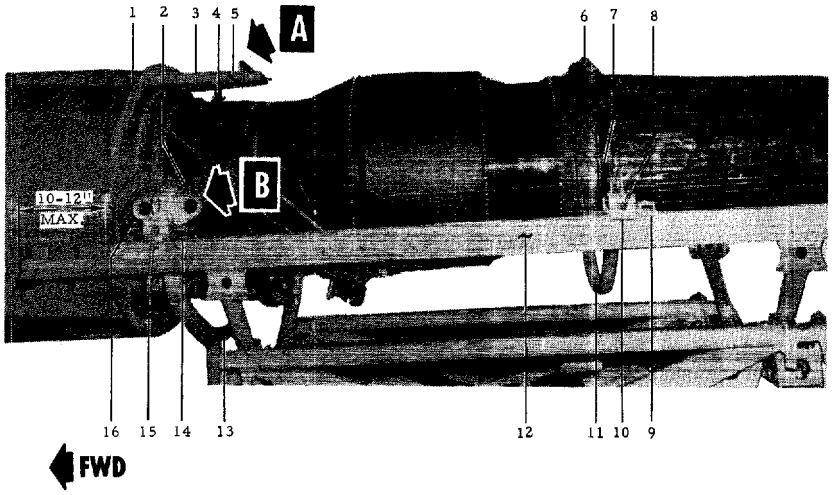
(4) PLACE AIRPLANE GROUND HANDLING CART JACKS ON FLOOR FOR STABILITY. AIRPLANE SHOULD BE IN LEVEL ATTITUDE.

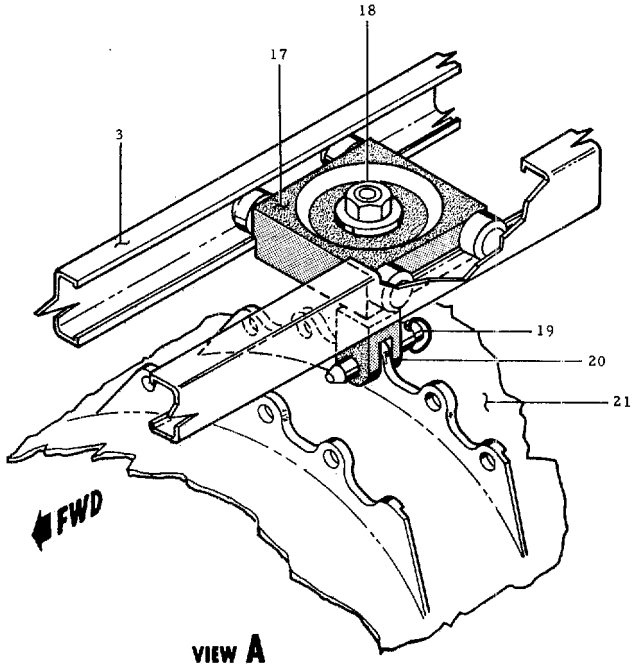
(5) PUSH INSTALLATION TRAILER (7) TO WITHIN 2 OR 3 INCHES OF FUSELAGE STATION 555 BULKHEAD.

CAUTION

STATION MEN AT VARIOUS POINTS SO THAT CLEARANCE OF ENGINE WITH FUSELAGE CAN BE OBSERVED AT ALL POINTS AT ALL TIMES.

Figure 1-44. Installation of Engine in Airplane (Sheet 1)





VIEW A
FWD ENGINE-TO-TRACK INSTALLATION

(6) RAISE ENGINE TO INSTALLATION HEIGHT.

(7) CONTINUE TO PUSH INSTALLATION TRAILER (12) IN SO THAT FORWARD ENDS OF TRAILER RAILS ARE 10 TO 12-INCHES PAST AFT END OF FUSELAGE STATION 555 BULKHEAD. APPLY TRAILER ADAPTER BRAKES (9, 14). PLACE INSTALLATION TRAILER JACKS FIRMLY ON FLOOR.

(8) UNLOCK ROLLER ADAPTER BRAKES (9, 14) SO THAT ENGINE MAY ROLL FORWARD. (USE 1/2-INCH DRIVE SWING HANDLE (15) AT EACH ROLLER ADAPTER.

(9) ROLL ENGINE FORWARD UNTIL AFT PORTION OF OIL TANK SHOWS ABOUT THREE INCHES BEYOND FUSELAGE STATION 555 BREAKPOINT. TILT END OF TRAILER RAILS AS REQUIRED.

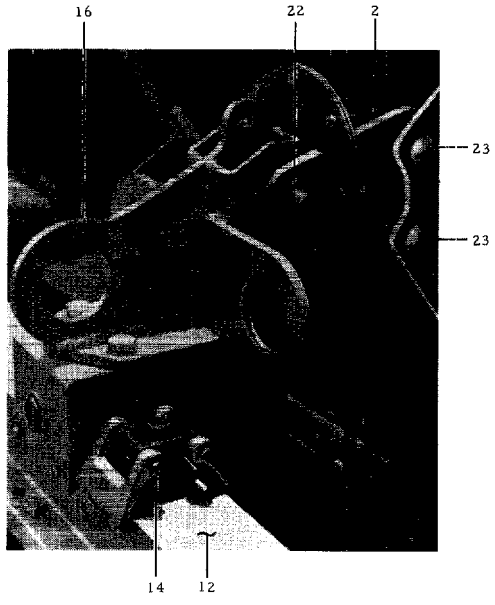
(10) INSTALL FORWARD CRADLE ASSEMBLY (17) ON INSTALLATION TRACK, CLEVIS ASSEMBLY (20) AND PIP PIN (19) TO ENGINE COMPRESSOR SECTION (21).

NOTE

CHECK CLEARANCE BETWEEN ENGINE AT ALL POINTS.

(11) UNLOAD FORWARD LEFT AND RIGHT ENGINE TO-TRAILER ADAPTERS (16) BY TIGHTENING UP ON FORWARD CARRIAGE ADJUSTING NUT (18) UNTIL CLEVIS PROTRUDES ABOVE NUT APPROXIMATELY ONE THREAD. REMOVE FORWARD LEFT AND RIGHT ENGINE-TO-MOUNT FITTINGS (2).

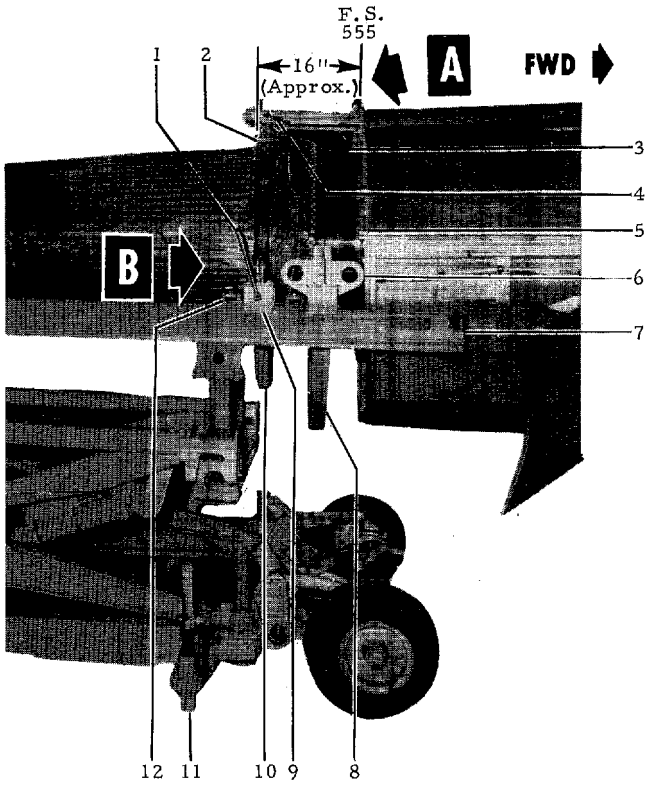
(12) SLOWLY ROLL ENGINE FORWARD WITH AFT ROLLER ADAPTERS (10). CHECK ENGINE CLEARANCE AND ADJUST VERTICALLY AND HORIZONTALLY AS NECESSARY. (SEE SHEET 3.)



VIEW B
LEFT SIDE SHOWN
RIGHT SIDE SIMILAR

1 TRACK SUPPORT
2 LEFT FWD ENGINE MOUNT FITTING
3 INSTALLATION/REMOVAL TRACK
4 TOP FWD ENGINE-TO-TRACK MOUNT
5 TRACK SAFETY PIN
6 TOP AFT ENGINE MOUNT
7 AFT ENGINE MOUNT FITTING
8 1/2-INCH DRIVE SWING HANDLE
9 LEFT AFT ADAPTER BRAKE
10 LEFT AFT ROLLER ADAPTER
11 AFT ADAPTER RING
12 INSTALLATION TRAILER
13 FWD ADAPTER RING
14 LEFT FWD ADAPTER BRAKE
15 1/2-INCH DRIVE SWING HANDLE
16 LEFT FWD ROLLER ADAPTER
17 FWD CARRIAGE CRADLE ASSY
18 FWD CARRIAGE ADJUSTING NUT
FWD CARRIAGE SPHERICAL WASHER
19 FWD CLEVIS PIP PIN
20 FWD CARRIAGE CLEVIS
21 ENGINE COMPRESSOR SECTION
22 LEFT FWD ADAPTER PIP PIN
23 ENGINE MOUNT FITTING BOLT

Figure 1-44. Installation of Engine in Airplane (Sheet 2)

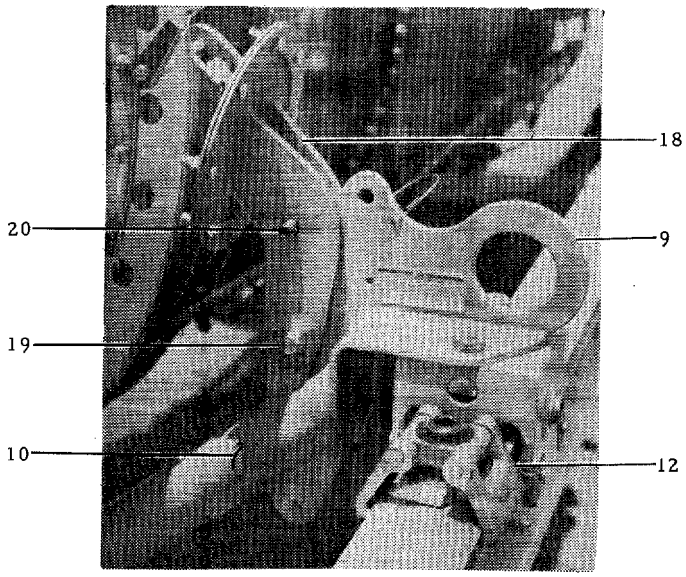


(13) INSTALL AFT CARRIAGE CRADLE ASSEMBLY (13) ON TRACKS AND INSTALL TRACK SAFETY PIN (4).

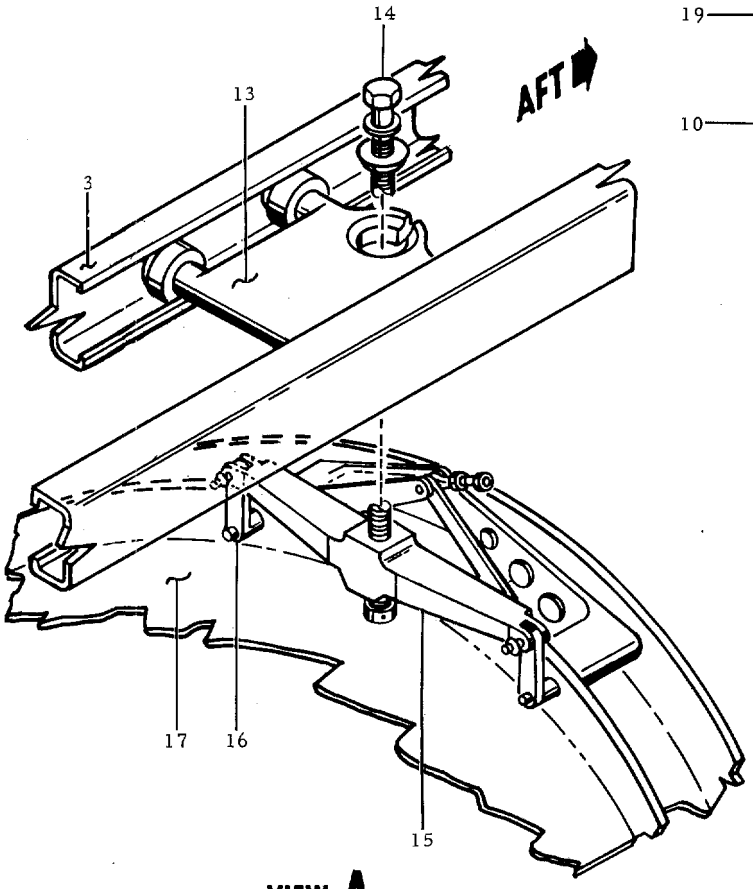
(14) INSTALL YOKE ASSEMBLY (15) AT TOP AFT ENGINE MOUNT LOCATION.

(15) ROLL ENGINE FORWARD UNTIL AFT PORTION OF ENGINE IS WITHIN 16 INCHES (APPROXIMATELY) OF FUSELAGE STATION 555 BREAKPOINT.

(16) RAISE AFT PORTION OF ENGINE AND ATTACH AFT YOKE ASSEMBLY (15) TO AFT CARRIAGE CRADLE ASSEMBLY (13) TO TAKE UP ENGINE LOAD. REMOVE AFT LEFT AND RIGHT ENGINE MOUNT FITTINGS (18).



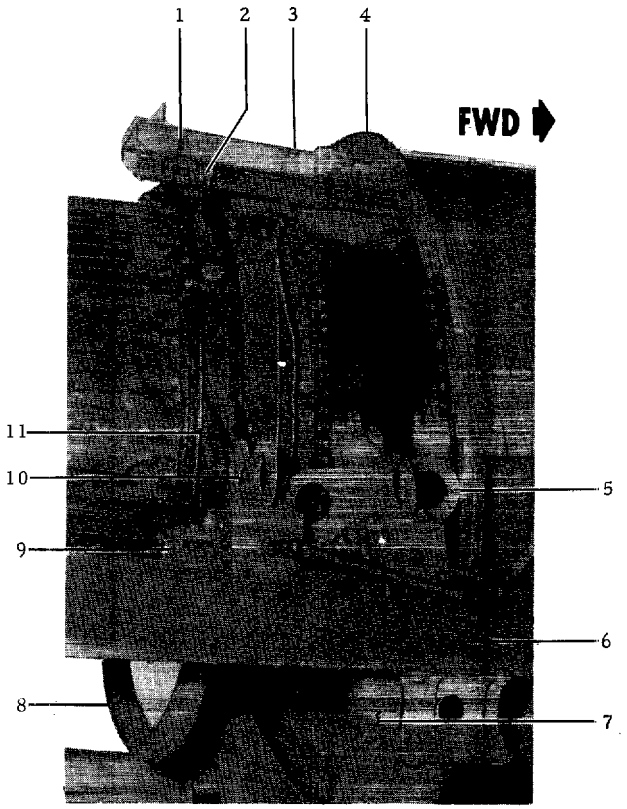
VIEW B
(RIGHT SIDE SHOWN LEFT SIDE SIMILAR)



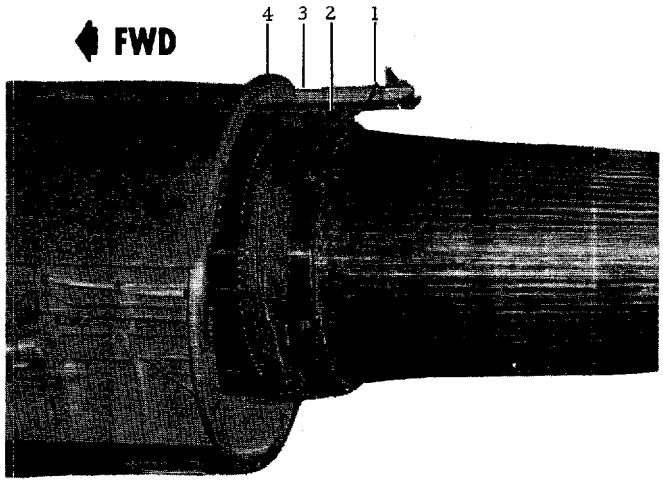
VIEW A
TOP AFT ENGINE-TO-TRACK INSTALLATION

1 1/2-INCH DRIVE SWING HANDLE
2 AFT ENGINE MOUNT FITTING
3 INSTALLATION/REMOVAL TRACK
4 TRACK SAFETY PIN
5 TRACK SUPPORT
6 FWD ROLLER ADAPTER
7 INSTALLATION TRAILER
8 FWD ADAPTER RING
9 AFT ROLLER ADAPTER
10 AFT ADAPTER RING
11 INSTALLATION TRAILER JACK
12 AFT ADAPTER BRAKE
13 AFT CARRIAGE CRADLE ASSEMBLY
14 AFT CRADLE BOLT
AFT CRADLE WASHER
AFT CONE WASHER
15 AFT CARRIAGE YOKE ASSEMBLY
16 LIFTING LINK (TYPICAL-2 PLACES)
17 ENGINE TURBINE EXHAUST CASE
18 AFT ENGINE MOUNT FITTING
19 AFT ENGINE MOUNT FITTING ATTACHMENT BOLT
20 AFT ROLLER ADAPTER ATTACHMENT PIP PIN

Figure 1-44. Installation of Engine in Airplane (Sheet 3)



VIEW OF ENGINE EXHAUST SECTION (RIGHT-HAND SIDE)



VIEW OF ENGINE EXHAUST SECTION (LEFT-HAND SIDE)

1 TRACK SAFETY PIN
2 AFT CARRIAGE CRADLE AND YOKE ASSEMBLY
3 INSTALLATION/REMOVAL TRACKS
4 TRACK SUPPORT
5 FWD ROLLER ADAPTER
6 INSTALLATION TRAILER
7 FWD ADAPTER RING
8 AFT ADAPTER RING
9 AFT ADAPTER BRAKE
10 AFT ROLLER ADAPTER
11 AFT ENGINE MOUNT FITTING

(17) RAISE INSTALLATION TRAILER JACKS, LOWER TRAILER RAILS AND ROLL TRAILER AFT, AWAY FROM AIRPLANE.

(18) PUSH ENGINE IN ON FORWARD AND AFT ENGINE INSTALLATION TRAILER ROLLER ADAPTERS. RAISE OR LOWER ENGINE AS NECESSARY.

(19) INSTALL LEFT AND RIGHT TRUNNIONS (BALL BATS) ON ENGINE WHEN ENGINE IS LINED UP WITH LEFT AND RIGHT SIDE ENGINE MOUNT ACCESS DOORS. (SEE FIGURE 1-11)

(20) TIGHTEN THE 3/4-16 BILTS THROUGH LEFT AND RIGHT SPHERICAL SOCKETS (ON ENGINE).

CAUTION

THE 3/4-16 BOLT IS TIGHTENED SUFFICIENTLY TO CREATE ENOUGH FRICTION TO SUPPORT WEIGHT OF TRUNNION AT ANY POSITION TO WHICH IT IS SWUNG MANUALLY. NO SPECIFIC TORQUE REQUIRED.

(21) ROUTE AC GENERATOR WIRE HARNESS THROUGH ENGINE SEAL AT FRONT END OF ENGINE BEFORE MOVING ENGINE INTO TRUNNION (BALL BAT) POSITION.

(22) PUSH ENGINE INTO POSITION WHILE HOLDING TRUNNIONS IN LINE WITH THEIR RESPECTIVE SOCKETS.

(23) INSTALL LEFT AND RIGHT-HAND TRUNNIONS IN SOCKETS (OUTBOARD END) AND CLAMP IN PLACE.

(24) SECURE TOP AFT ENGINE MOUNT AND RAISE OR LOWER ENGINE TO PROVIDE ALIGNMENT BETWEEN ADAPTER RING AT FRONT OF ENGINE AND FUSELAGE AIR INLET DUCT. (SEE SHEETS 2 AND 3.)

(25) TAKE ENGINE WEIGHT OFF FORWARD AND AFT CRADLE ASSEMBLY; THEN REMOVE CRADLE ASSEMBLIES THROUGH TOP FRONT MOUNT ACCESS DOOR. (SEE SHEETS 2 AND 3.)

(26) REMOVE ENGINE INSTALLATION/REMOVAL TRACK (3).

(27) REMOVE AFT MOUNT YOKE ASSEMBLY (2) THROUGH TOP AFT MOUNT ACCESS DOOR. (SEE VIEW A, SHEETS 2 AND 3.)

(28) LOCKWIRE TOP AFT MOUNT NUT AND INSTALL TOP AFT MOUNT HEAT SHIELD.

(29) AFTER FINAL ALIGNMENT IS MADE, TORQUE ENGINE TRUNNION CAP BOLTS TO FOLLOWING VALUES:

LEFT BOLTS - 150 LB IN.
RIGHT BOLTS - 75 LB IN.

(30) MAKE ENGINE CONNECTIONS TO DISCONNECTS SHOWN IN FIGURE 1-42.

(31) REINSTALL FUSELAGE AFT SECTION IN ACCORDANCE WITH INSTRUCTIONS IN -2-1 MAINTENANCE MANUAL.

NOTE

FOR FINAL ADJUSTMENT OF TAILPIPE ROLLERS, ACCESS IS PROVIDED ON LEFT AND RIGHT SIDE OF FUSELAGE AFT SECTION AT FUSELAGE STATION 635.

Figure 1-44. Installation of Engine in Airplane (Sheet 4)

aa. Remove both track assemblies, Part No. 75GH104-1 L/R.

ab. Remove aft mount yoke assembly, Part No. 75GH70, through aft mount access door.

ac. Lockwire top rear mount nut, Part No. P23. (See figure 1-44.)

ad. Install top rear mount heat shield.

ae. After final alignment is made, torque engine trunnion cap bolts to the following values:

Left bolts - 150 lb in.

Right bolts - 75 lb in.

af. Reinstall fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

Note

For final adjustment of tailpipe rollers, access is provided on left and right side of fuselage aft section at fuselage station 635.

1-412. PREPARING REMOVED ENGINE FOR PACKING.

1-413. The following parts must be removed along with the associated plumbing and electrical wiring:

a. Remove tailpipe assembly from engine.

b. Remove engine pressure ratio plumbing from lower left and right sides of engine.

c. Remove fuel flow totalizing transmitter from lower right side of engine.

d. Remove bleed air manifold from right side of engine.

e. Remove ac generator from front accessory section (N_1).

f. Remove dc generator and adapter from forward left side of oil pump and accessory drive gearbox (N_2).

g. Remove starter from forward side of N_2 gearbox.

h. Remove left and right trunnions from engine.

i. Remove hydraulic pump from forward right side of N_2 gearbox.

j. Remove tachometer generator from aft left side of N_2 gearbox.

k. Remove engine seal and duct assembly from N_1 accessory section.

l. Remove rear mount assembly from aft top side of engine.

m. Remove fuel pressure transmitter from right side of engine.

n. Remove oil pressure transmitter from left side of engine.

1-414. Before installing an engine in the shipping container the following preparatory work should be accomplished:

a. Install gasket and cover on breather pressurizing valve connection located on forward side of N_2 gearbox.

b. Coat starter jaw and adapter pad on forward side of N_2 gearbox with corrosion preventative compound, and install gasket and cover.

c. On bottom side of N_2 gearbox, install plug in oil drain opening and lockwire plug.

d. Install plug in fuel pump and fuel control seal drain connector located on bottom flange of component cowl.

e. Install plug in fuel pressurizing and dump valve overboard drain connector opening.

f. Install gasket and cover on fuel inlet adapter opening located at right side facing engine from rear.

g. Install caps on electrical receptacle threaded bosses.

h. Install gaskets and covers on any instrumentation openings.

i. Install shipping cover on tachometer mounting pad located at aft left side of N_2 gearbox.

j. Install a cover on oil temperature probe boss located at forward right side of N_2 gearbox.

k. Install shipping cover on rear of turbine exhaust case.

l. Install a shipping spacer on each end of power control shaft.

m. Install shipping cover on front support face.

n. Use lockwire to secure all external movable parts, such as power control lever, to prevent damage during storage and shipment.

o. Pack all connector cables, and engine parts to be shipped with engine in boxes and secure to bottom of metal shipping container.

Note

Check to make certain all openings have been covered with protective covers, caps, or plugs prior to installing the engine in the shipping container.

1-415. ENGINE DEPRESERVATION AND PRESERVATION.

1-416. For complete procedure on J75 engine preservation refer to T. O. 2J-1-18.

1-417. INSTALLATION OF ENGINE IN METAL SHIPPING CONTAINER.

1-418. After the engine has been properly prepared for installation in the container, proceed as follows:

a. With engine mounted in engine stand, install front mount brackets, using bolts provided for each bracket. Lockwire the bolts.

b. Install semicircular yoke to turbine exhaust case and secure with bolts and cotterpins.

c. Inspect interior of container making certain that it is free of all dirt, water, and oil. If necessary a vacuum cleaner should be used to remove dirt from interior of container.

d. Check mating faces of container bolt flanges for distortion, mutilation, or other unserviceable conditions that might affect the air-tight sealing of the flange joint.

e. On engine hoist assembly, Part No. GH48-75, install forward cradle assembly, Part No. 75GH32-500 and clevis assembly, Part No. 75GH116-1; rear cradle assembly, Part No. 75GH71 and yoke assembly, Part No. 75GH70 and two safety pins, Part No. GH48-12.

Note

Check to see that cone washers, 75GH116-5 and 75GH70-4 are not cocked.

f. Lift engine hoist assembly, Part No. GH48-75, with regent hoist or A-frame and position above engine.

Note

Hoist or A-frame capacity must be sufficient to handle a load of 6500 pounds to lift the engine and 11,000 pounds to lift the loaded container.

g. Attach forward cradle clevis assembly to top engine lug on intermediate case and rear cradle assembly to engine lifting links on turbine exhaust case.

h. Take up slack on engine hoist assembly and raise engine.

i. Carefully lower engine into bottom section of container lining up holes in front mounting brackets with those in side rails of container.

Note

The front of the engine should be at the end of the container with the desiccant basket and access port.

j. Bolt engine front mounting brackets to side rails. Lockwire the bolts.

k. At aft end of engine secure side rails to semicircular yoke using two bolts on each side with washers under bolt heads. Torque bolts to 1500 to 1700 pound-inches. Lockwire the bolts.

l. Check lockwire in heads of eight bolts holding side rails to rubber mounts. If lockwire is broken, bolts should be torqued to 700 to 1000 pound-inches and lockwired.

m. Open desiccant port cover and insert 45 bags (720 units) of desiccant conforming to Specification MIL-D-3464, in desiccant basket. Secure cover of basket with lockwire.

CAUTION

Care must be used to prevent excessive exposure of the desiccant to the atmosphere while packing the engine. Opening of the desiccant storage container for longer periods than necessary should be avoided. Also the interval between the removal of the desiccant from the sealed storage container and the sealing of the shipping container must be held to a minimum. It is important that the desiccant have no direct contact with water. The effectiveness of the desiccant as a drying agent is materially reduced as its moisture content is increased. Therefore, every reasonable precaution must be taken to assure that the desiccant is dry when it is installed.

n. Lockwire fasten humidity indicator to inside of container at end of humidity indicator tube.

Note

The condition of the atmosphere within the container is determined by the humidity indicator. The indicator contains a chemical which changes color from dark blue to light pink as it absorbs moisture.

o. After detaching engine hoist assembly, Part No. GH48-75 from engine, attach a suitable sling to lifting eyes on top section of shipping container and lower top section onto bottom section.

Note

Make certain that the rubber seal ring is in place.

p. Install closure flange bolts, nuts, and washers and tighten evenly all around container. Coat bolts with a preservative compound, Specification MIL-C-6708 Type I.

q. Remove filler valve protector cap from air valve and install a suitable adapter.

r. Introduce clean dry (nitrogen) air into container through air filler valve until a pressure of five psi is reached.

s. Remove adapter.

t. Screw protector cap tightly on air valve stem and check for possible air leakage from any of the closures using soap suds solution.

u. Roll log book, log sheets, and any other pertinent papers required to be shipped with engine in moisture resistant envelope and secure with clean stripping, pressure sensitive adhesive tape. Insert roll of material into record receptacle.

v. Secure cover with bolts and lockwire. Lead seal the lockwire.

w. Stencil necessary information on container in space provided.

x. Coat threads of inspection port pipe plugs with a non-hardening sealing compound conforming to Specification MIL-C-16173 Grade II.

1-419. INSTALLATION OF FLEXIBLE PRESERVATION CONTAINER ON ENGINE WHILE MOUNTED ON TRANSPORTATION TRAILER.

1-420. PROCEDURE. (See figure 1-45.) The following installation procedure is with the use of Engine Transportation Trailer, Part No. 75GH109-1 (Air Logistics Corp., Model 3060J) and Flexible Preservation Container, (Navan Products Inc., Part No. VK193-0429).

Note

Prior to installation of flexible container, install 75P6 tailpipe adapter or 75GH135-1 tailpipe adapter (dummy) and 75P2 engine extension duct assembly or 75GH136-1 engine extension duct assembly (dummy) on engine.

a. On engine hoist assembly, Part No. GH48-75, install forward cradle assembly, Part No. 75GH32-500 and clevis assembly, Part No. 75GH116-1; rear cradle assembly, Part No. 75GH71 and yoke assembly, Part No. 75GH70 and (2) safety pins Part No. GH48-12.

Note

Check to see that cone washers, Part No. 75GH116-5 and 75GH70-4, are not cocked.

b. Lift engine hoist assembly, Part No. GH48-75, with Regent hoist or A-frame and position above engine.

c. Attach forward cradle clevis assembly to top engine lug on compressor intermediate case and rear cradle assembly to engine lifting links on turbine exhaust case.

Note

Take up engine load by tightening up on forward cradle clevis bolt until thread is even with top of cradle clevis nut.

d. Take up slack on engine hoist assembly.

e. Loosen roller adapters on transportation trailer.

f. Raise engine (approximately 12-inches) and remove quick disconnect pins, attaching roller adapters to engine mount fittings. Place trailer adapter rings on trailer rails and remove trailer from work area.

g. Remove (4) container attaching plates and screws.

h. Place protective padding over ac generator air tube, top rear engine mount fitting and aft end of tailpipe adapter.

i. Place flexible container alongside of engine and spread container out as necessary to get proper orientation. If zipper is kinked or creased from storage, work kinks out by flexing.

j. Place flexible container under engine and lift container carefully over trailer engine mount fittings.

k. Reinstall (4) container attaching plates over flexible container cutouts and engine mount fittings using screws provided.

l. Install quick disconnect pins through engine mount fittings and trailer roller adapters.

m. Push trailer under engine and lower engine down on trailer rails. Set roller adapter brakes.

n. Remove Regent hoist or A-frame with engine hoist assembly attached.

o. Insert 30 bags (480 units) of desiccant, conforming to Specification MIL-D-3464, in desiccant pockets provided in lower left side of flexible container.

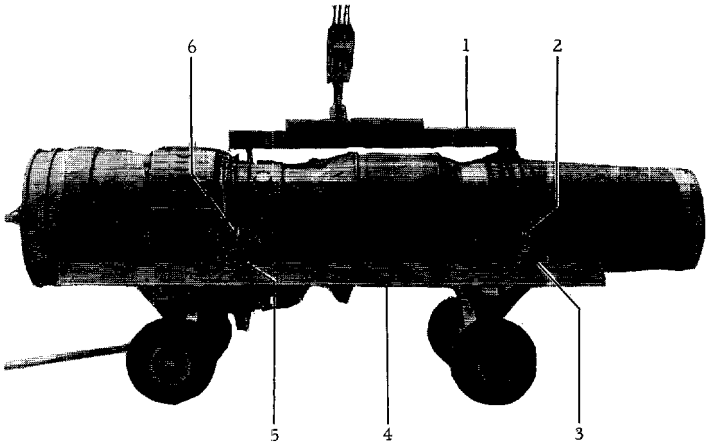
p. Place all pertinent papers in record holder receptacle.

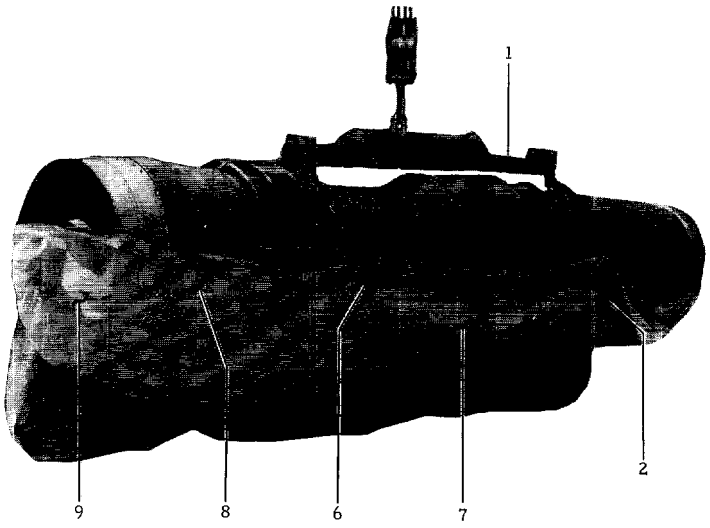
q. Lift flexible container over engine and hold zipper tracks together.

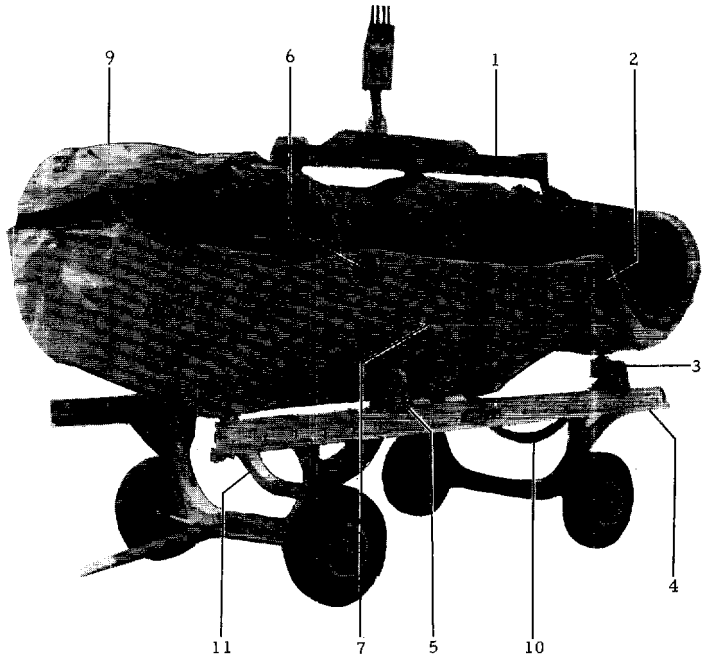
r. Install zipper slider at end of zipper track and pull slider to close flexible container. If necessary, run zipper slider a second time over zipper track to be sure it is properly fastened. See View A for opening and closing of zipper slider.

s. Remove zipper slider from track and place in slider pocket provided on forward side of flexible container.

t. Lace security wire through upper and lower container flap eyelets beginning at either end.







1 ENGINE HOIST ASSEMBLY
2 AFT ENGINE MOUNT FITTING
3 AFT ROLLER ADAPTER
4 TRANSPORTATION TRAILER
5 FWD ROLLER ADAPTER
6 FWD ENGINE MOUNT FITTING
7 DESICCANT POCKETS (INSIDE CONTAINER)
8 RECORD HOLDER RECEPTACLE
9 FLEXIBLE PRESERVATION CONTAINER
10 AFT ADAPTER RING
11 FWD ADAPTER RING

NOTE

THE INSTALLATION PROCEDURE COVERED IS WITH THE USE OF ENGINE TRANSPORTATION TRAILER, PART NO. 75GH109-1 (AIR LOGISTICS CORP., MODEL 3060J) AND FLEXIBLE PRESERVATION CONTAINER, (NAVAN PRODUCTS INC., PART NO. VK193-0429).

(1) LIFT ENGINE HOIST ASSEMBLY (1) WITH REGENT HOIST OR A-FRAME AND POSITION ABOVE ENGINE.

NOTE

PRIOR TO INSTALLATION OF FLEXIBLE CONTAINER, INSTALL 75P6 TAILPIPE ADAPTER OR 75GH135-1 TAILPIPE ADAPTER (DUMMY) AND 75P2 ENGINE EXTENSION DUCT ASSEMBLY OR 75GH136-1 ENGINE EXTENSION DUCT ASSEMBLY (DUMMY) ON ENGINE.

(2) ATTACH FORWARD CRADLE CLEVIS ASSEMBLY (PART OF ENGINE HOIST ASSEMBLY (1) TO TOP ENGINE LUG ON COMPRESSOR INTERMEDIATE CASE AND REAR CRADLE ASSEMBLY TO ENGINE LINKS ON TURBINE EXHAUST CASE.

NOTE

TAKE UP ENGINE LOAD ON FWD CRADLE CLEVIS BOLT UNTIL THREAD IS EVEN WITH TOP OF CLEVIS NUT.

(3) TAKE UP SLACK ON ENGINE HOIST ASSEMBLY AND LOOSEN ROLLER ADAPTER BRAKES (16, 21). (SEE VIEWS B AND C SHEET 2).

(4) RAISE ENGINE ABOUT 10-INCHES, REMOVE QUICK DISCONNECT PINS ATTACHING ROLLER ADAPTERS TO ENGINE MOUNT FITTINGS AND SET ADAPTER RINGS ON TRAILER RAILS. REMOVE TRAILER FROM WORK AREA. (SEE VIEWS B AND C SHEET 2).

(5) PLACE PROTECTIVE PADDING OVER AC GENERATOR AIR TUBE AND AFT END OF TAILPIPE ADAPTER.

(6) REMOVE (FOUR) CONTAINER ATTACHING PLATES (12). (SEE SHEET 2)

(7) PLACE FLEXIBLE CONTAINER (9) UNDER ENGINE AND LIFT OVER ENGINE MOUNT FITTINGS. INSTALL (FOUR) CONTAINER PLATES OVER CONTAINER CUTOUTS.

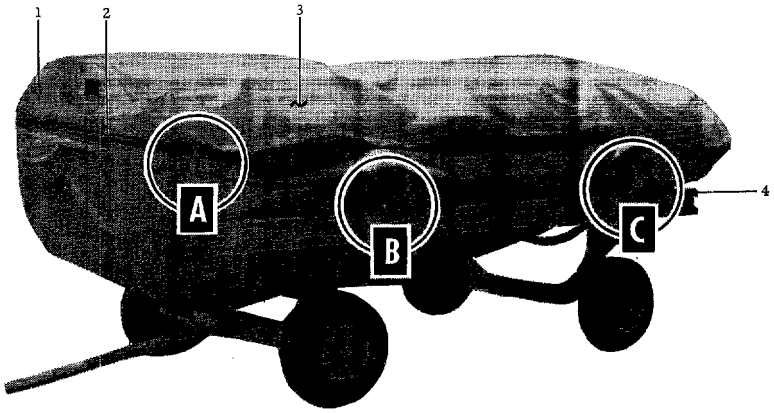
(8) PUSH TRAILER UNDER ENGINE, LIFT ADAPTER RINGS AND INSTALL QUICK DISCONNECT PINS (13, 18) THROUGH ENGINE MOUNT FITTINGS AND ROLLER ADAPTERS. (SEE VIEWS B AND C SHEET 2)

(9) LOWER ENGINE ONTO TRAILER RAILS AND SET ROLLER ADAPTER BRAKES.

NOTE

HOLD CONTAINER UP AT BOTH ENDS WHEN LOWERING ENGINE ONTO TRAILER RAILS.

Figure 1-45. Installation Of Flexible Preservation Container On Engine While Mounted On Transportation Trailer (Sheet 1)



(10) REMOVE REGENT HOIST OR A-FRAME WITH ENGINE HOIST ASSEMBLY ATTACHED. PLACE PROTECTIVE PADDING OVER TOP REAR ENGINE MOUNT.

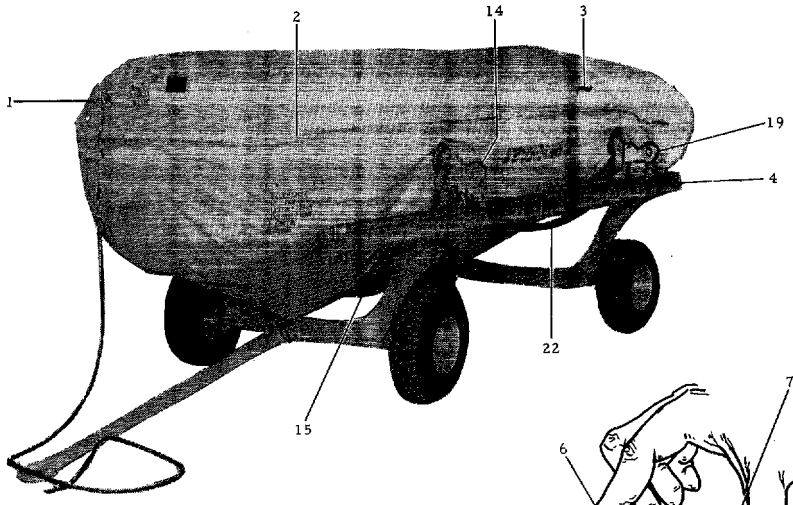
(11) INSERT 30 BAGS (480 UNITS) OF DESICCANT, CONFORMING TO SPECIFICATION MIL-D-3464 IN DESICCANT POCKETS (7) IN LOWER LEFT SIDE OF CONTAINER. (SEE SHEET 1)

(12) PLACE ALL PERTINENT PAPERS IN RECORD HOLDER RECEPTACLE AND LIFT CONTAINER OVER ENGINE.

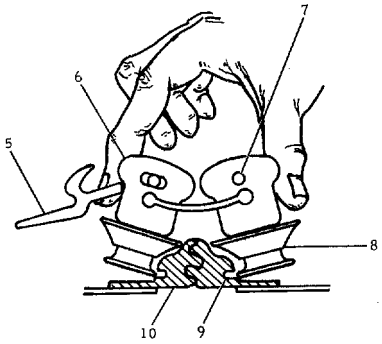
(13) HOLD ZIPPER TRACKS TOGETHER, INSTALL ZIPPER SLIDER AT END OF ZIPPER TRACK AND PULL SLIDER TO CLOSE CONTAINER. SEE VIEW A. RUN SLIDER AROUND ZIPPER A SECOND TIME.

(14) LACE SECURITY WIRE THROUGH UPPER AND LOWER CONTAINER FLAP EYELETS (2). (WIRE IN REPAIR KIT POCKET)

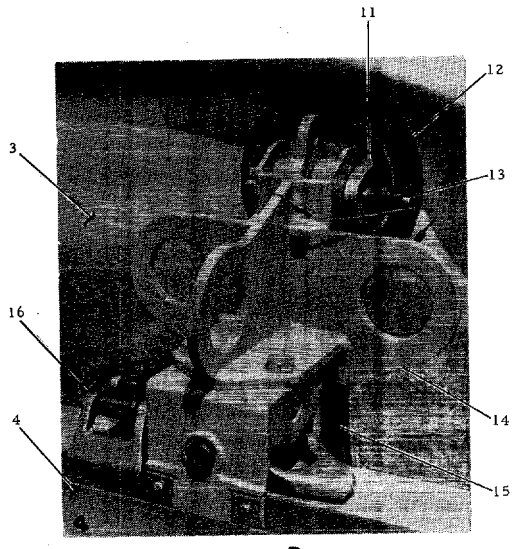
(15) APPLY 1/4-PSI NITROGEN GAS TO AIR VALVE (1) ON FRONT OF CONTAINER.



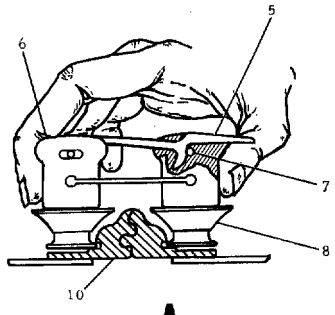
1 AIR VALVE
2 ZIPPER TRACK AND FLAPS
3 FLEXIBLE PRESERVATION CONTAINER
4 TRANSPORTATION TRAILER
5 FINGER TAB
6 HANDLES
7 HOLDING BAR
8 WHEEL
9 ZIPPER GROOVE
10 ZIPPER
11 FWD ENGINE MOUNT FITTING
12 CONTAINER ATTACHING PLATE
13 FWD QUICK DISCONNECT PIN
14 FWD ROLLER ADAPTER
15 FWD ADAPTER RING
16 FWD ADAPTER BRAKE
17 AFT ENGINE MOUNT FITTING
18 AFT QUICK DISCONNECT PIN
19 AFT ROLLER ADAPTER
20 AFT ROLLER BOLT
21 AFT ADAPTER BRAKE
22 AFT ADAPTER RING



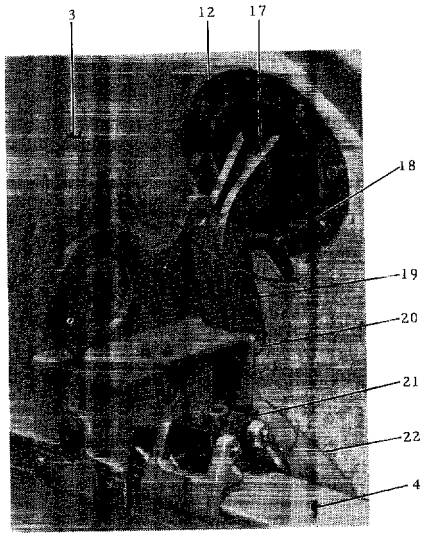
VIEW A
SLIDER OPEN



VIEW B
FWD ROLLER ADAPTER INSTALLATION



VIEW A
SLIDER CLOSED



VIEW C
AFT ROLLER ADAPTER INSTALLATION

Figure 45. Installation Of Flexible Preservation Container On Engine While Mounted On Transportation Trailer (Sheet 2)

u. Apply 1/4-psi nitrogen gas to air valve on front of container.

Note

If container is found to leak, use repair kit located at aft left side, following container Manufacturer's instructions.

1-421. ENGINE PRESSURE RATIO SYSTEM.

1-422. ENGINE PRESSURE RATIO TRANSMITTER.

1-423. The engine pressure ratio transmitter is mounted on the upper right-hand side of the main wheel well between fuselage stations 328 and 338.

1-424. REMOVAL.

a. Remove protective canvas cover from forward side of transmitter container.

b. Remove fiberglass cover from bottom side of container.

c. Disconnect inlet and exhaust engine pressure lines from forward side of container.

d. Disconnect electrical plug on forward side of container.

e. Remove (4) screws attaching container to main wheel well structure.

f. Remove transmitter from container.

1-425. INSTALLATION.

a. Place transmitter in container.

b. Place transmitter container in position on mounting channels and install (4) mounting screws.

c. Connect inlet and outlet exhaust engine pressure lines to forward side of container.

d. Connect electrical plug to forward side of container.

e. Install fiberglass cover on bottom side of container.

f. Install protective canvas cover to forward side of transmitter container.

CAUTION

Engine exhaust pressure (P_{t7}) plumbing lines may be pressure tested individually when testing compressor inlet pressure (P_{t2}). Exhaust pressure lines should be pressurized first to ensure that compressor inlet pressure is never higher than exhaust pressure in order to prevent internal damage to transmitter.

1-426. ENGINE STARTING SYSTEM.

1-427. Only qualified maintenance personnel should be allowed to install and service the starter. Extreme care must be exercised to prevent installation debris or any other foreign material from entering the starter inlet port.

WARNING

Starter failure, which may be induced by foreign material entering with the supply air, may be sufficiently violent to damage the equipment and endanger nearby personnel.

1-428. The engine starter is located on the lower center part of the N_2 gearbox.

1-429. REMOVAL.

a. Remove lower engine access door.

b. Remove air start hose adapter.

c. Remove six washers and nuts attaching starter to N_2 accessory gearbox.

1-430. INSTALLATION.

a. Apply liberal coating of lubricant, Specification MIL-G-3545 or Lube-Plastic NR3 Class 9156 (FSN9150-223-4003), to starter drive splines.

b. Install starter on N_2 accessory case using washers and nuts.

c. Install air start hose adapter to starter.

d. Check for adequate clearance of fuel lines. (See figure 1-46.)

Note

If interference exists, loosen clamp and rotate about starter to clear fuel lines.

e. Install lower engine access door.

1-431. SERVICING.

a. The starter incorporates a self-contained lubrication system and requires oil conforming to Specification MIL-L-23699A or MIL-L-7808.

b. The oil capacity is approximately 600 cubic centimeters and should be checked after every 50 starts.

c. After every 100 starts the oil should be drained and replaced with new oil as follows:

CAUTION

The oil, Specification MIL-L-23699A or MIL-L-7808, used to service the starter, is harmful to some substances. Be careful not to spill oil on electrical wiring, painted areas, rubber parts, and other units. Synthetic oil spilled on painted surfaces or on rubber components must be wiped off at once. Use a clean cloth saturated with aliphatic naphtha, Federal Specification TT-N-95. All containers should be clearly marked to prevent contamination and mixing of the oil with other fluids. Containers and hoses used for petroleum oils must not be used for handling synthetic oil.

WARNING

Prolonged contact with the oil is very irritating to the skin. Avoid getting oil in eyes. Wash hands with soap and water before touching food.

(1) Remove drain plug at bottom of starter and drain oil for at least five minutes.

(2) Replace drain plug and lockwire.

(3) Remove oil level filler plug.

(4) Fill starter with synthetic oil, Specification MIL-L-23699A or MIL-L-7808 to level of filler hole.

Note

Starter capacity is approximately 600 cubic centimeters. Starter must be in installed position if removed from engine.

(5) Replace oil filler plug and lockwire.

Note

Refer to TMOM -6-1 for replacement schedule.

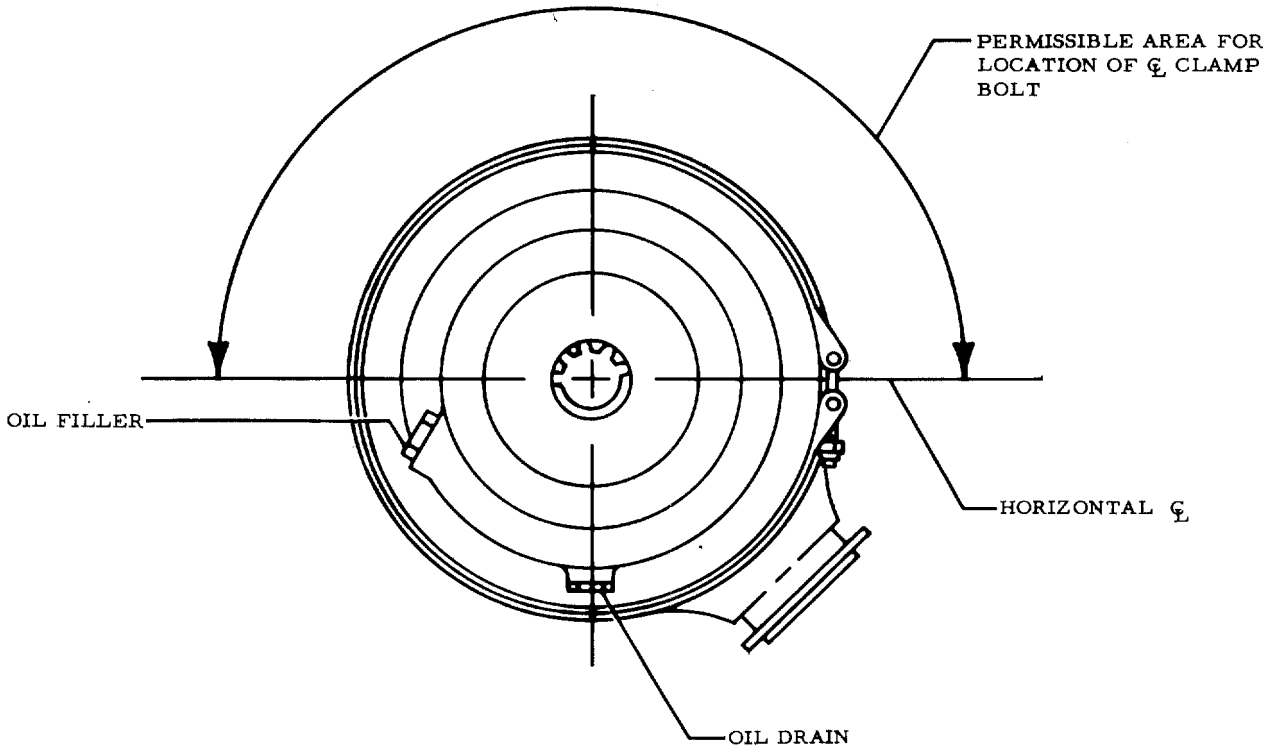


Figure 1-46. Inspection of Starter

1-432. THROTTLE CONTROL SYSTEM.

1-433. THROTTLE QUADRANT.

1-434. The throttle lever quadrant is located at the forward end of the left-hand console.

1-435. REMOVAL.

a. Make certain that external electrical power source is removed from airplane.

b. Remove lockwire on turnbarrels in engine compartment forward of pulley and disconnect cables.

c. Disconnect cables at quick disconnect (forward end) in equipment bay.

Note

Attach nylon twine, Specification MIL-T-713A, Type P, Class 2 to ball fittings for removal and installation of aileron cables.

d. Remove lockwire from one quick disconnect of aileron cable in left wing just outboard of fuselage.

e. Relieve tension on aileron cable using GH156 aileron disconnect cable puller.

Note

It is necessary to relieve tension from cable prior to removing cable seal at fuselage station 252.

f. Remove cable seal at fuselage station 252 bulkhead on left-hand side and remove cables.

g. Remove left-hand side instrument panel.

h. Disconnect throttle wiring below and aft of quadrant at fuselage station 221 terminal strip.

i. Remove screws attaching throttle quadrant to airplane structure.

j. Pull cables forward with nylon twine attached until cables are free of pulleys.

Note

Tie free end of nylon twine to airplane structure so it can be used to reinstall the cables.

k. Remove assembly from airplane.

1-436. INSTALLATION. Reverse the removal procedure.

1-437. THROTTLE LEVER.

1-438. The throttle lever is located in the throttle quadrant on the left side of the cockpit.

1-439. REMOVAL.

a. Remove throttle quadrant (refer to paragraph 1-433.)

b. Separate wires that lead to lever from quadrant wire bundle by untying bundle cords.

c. Remove cotter pin from castellated nut on attaching point of throttle housing.

d. Tap bolt from throttle lever and remove lever from quadrant.

1-440. INSTALLATION. Reverse the removal procedure.

1-441. RIGGING OF THROTTLE CONTROL SYSTEM.

Note

Fuel control lever should be set to proper degree before installation of engine in airplane.

a. Connect pushrod to fuel control lever.

b. Place throttle lever in cockpit to OFF position and apply friction lock.

c. Adjust 75C8-4 rod assembly to obtain one-eighth to three-sixteenths inch spring-back on throttle lever in cockpit.

d. Move throttle lever slowly forward until rig pin can be engaged in IDLE position on fuel control.

Note

Use pin or No. 43 (0.090) drill.

e. Loosen IDLE stop on quadrant in cockpit to stop lever at this point. Retighten stop screws.

f. Cycle throttle lever in cockpit about two times and return to IDLE position.

g. Recheck rig pin alignment at fuel control for correct IDLE setting.

h. Readjust stop on throttle quadrant if necessary to obtain correct alignment of rig pin on fuel control in IDLE position.

i. Push throttle lever forward to obtain full power pin position (or beyond) on fuel control.

1-442. FUEL SYSTEM.

1-443. GENERAL.

Note

Identify mating parts, which must be disconnected in the removal of an accessory, to assure proper assembly. All fuel, oil, and air lines disconnected shall be drained and sealed with metal caps, or other approved seals, to prevent the introduction of foreign material into the system.

1-444. ENGINE FUEL PUMP.

1-445. The engine fuel pump is located on a pad on the aft right side of the oil pump and accessory drive gearbox (N_2).

1-446. REMOVAL.

a. Remove lower engine access doors.

b. Remove fuel totalizing transmitter from engine.

c. Remove fuel pressure transmitter and snubber from fuel pump inlet.

d. Remove fuel pump overboard drain tube from adapter by loosening nut on fuel pump connector.

e. Remove fuel pump outlet (main discharge) tube by loosening three locknuts on each elbow of tube.

f. Remove fuel pump inlet (main return) tube by loosening three locknuts on each elbow of tube.

g. Remove fuel control-to-fuel pump (low return) tube by loosening nuts at elbow on fuel pump and fuel control.

h. Remove six locknuts and pull fuel pump free of its gearbox mounting pad studs.

CAUTION

Care should be taken when attempting to remove the fuel pump. Do not allow to hang on its spline drive gear when loosened, as drive gear shaft may be damaged.

1-447. INSTALLATION.

Note

Lubricate new seals with engine oil before installing. Tighten the nuts to the proper torque and lockwire as required.

a. Place a seal on pump mounting flange and coat splines with lubricant Specification MIL-G-3545.

b. Install pump on oil pump and accessory drive gearbox pad (N_2) using six washers and locknuts.

c. Connect fuel control-to-fuel pump (low return) tube coupling nuts to elbows on fuel control and fuel pump. Tighten and lockwire tube coupling nuts.

d. Place seal over each end of fuel pump inlet (main return) tube and insert into elbows. Place seal under each elbow and secure each elbow with (3) locknuts.

e. Place seal over each end of fuel pump outlet (main return) tube and insert into elbows. Place seal under each elbow and secure each elbow with (3) locknuts.

f. Place seal over end of fuel pump overboard drain tube and insert into adapter. Attach nut to connector on fuel pump. Tighten nut and lockwire.

g. Install fuel snubber and fuel pressure transmitter in fuel pump inlet.

h. Install fuel totalizing transmitter on engine.

1-448. FUEL CONTROL.

1-449. The fuel control is located on a pad on the aft left side of the oil pump and accessory drive gearbox (N_2).

1-450. REMOVAL.

Note

When removing the tubes establish the locations of the tube clips and clamps to facilitate installation. Discard the old seals and gaskets.

a. Remove lower engine access doors.

b. Remove fuel control tubes using the following procedure:

(1) Overboard seal drain tube. Loosen nut at fuel control and pull tube from adapter.

(2) Fuel pump outlet (main discharge). Loosen locknuts on each elbow and remove tube.

(3) Fuel pump inlet (main return). Loosen locknuts on each elbow and remove tube.

(4) Compressor inlet-to-fuel control. Loosen coupling nuts on fuel control and at elbow on compressor inlet case.

(5) Fuel control-to-fuel totalizing transmitter. Loosen locknuts securing tube flange to fuel control and nut at fuel totalizing transmitter.

(6) Compressor discharge-to-fuel control. Loosen bolt securing 90-degree universal elbow on diffuser case and nut on fuel control connector.

(7) Fuel control-to-dump valve. Loosen coupling nut to elbow on fuel control and nut to connector on dump valve.

(8) Fuel control-to-pump (low return). Loosen nut at elbow on fuel pump and at fuel control. Remove tube.

c. Loosen locknuts securing control to N_2 accessory gearbox. Remove fuel control.

CAUTION

Care should be taken when removing the control unit. Do not damage spline drive gear by allowing unit to hang up by this gear. Once the unit is loosened, pull it rearward and free from its position immediately.

d. Install lower engine access doors.

1-451. INSTALLATION.

Note

Lubricate new seals and gaskets with engine oil before installing. Torque bolts and nuts to proper torque before lockwiring.

a. Place seal on fuel control mounting flange and coat splines with lubricant Specification MIL-G-3545.

b. Push control on over studs. Secure control with washers and locknuts.

c. Install fuel control connecting tubes using the following procedure:

(1) Fuel control-to-dump valve. Attach coupling nut to elbow on fuel control, and other nut to connector on dump valve. Lockwire the nuts.

(2) Compressor discharge-to-fuel control. Place a gasket between universal elbow and its boss on diffuser case, and a gasket between elbow and securing bolt. Install bolt and coupling nut to connector on fuel control. Lockwire the nut and bolt.

(3) Fuel control-to-fuel totalizing transmitter. Place seal over flange end of tube and attach flange to fuel control boss with locknuts. Attach coupling nut to fuel totalizing transmitter.

(4) Compressor inlet-to-fuel control. Attach coupling nut to fuel control connector and elbow on pad at lower left of inlet case shroud.

(5) Fuel pump inlet (main return). Place a seal over each end of tube and push tube into elbow. Place seals between elbows and mounting bosses, and secure each elbow with its locknuts.

(6) Fuel pump outlet (main discharge). Place a seal over each end of tube and pull tube into elbow. Place seals between elbows and mounting bosses, and secure each with its locknuts.

(7) Overboard seal drain tube. Place a seal over adapter end of tube and insert tube into adapter. Attach coupling nut to drain connector on fuel control drive housing and lockwire.

(8) Fuel control-to-fuel pump (low return). Connect tube coupling nuts to elbows on fuel control and fuel pump.

Note

After installation lockwire coupling nuts.

1-452. FUEL TOTALIZING TRANSMITTER.

1-453. The fuel totalizing transmitter is located on the lower right-hand side of the engine diffuser case.

1-454. REMOVAL.

a. Remove lower aft engine access door.

b. Disconnect transmitter inlet and outlet tubes at transmitter.

c. Disconnect electrical lead at transmitter.

d. Remove retaining nuts attaching transmitter to support bracket. Remove transmitter.

1-455. INSTALLATION.

a. Secure fuel totalizing transmitter to support bracket with retaining nuts.

b. Connect fuel inlet and outlet tubes at transmitter. Tighten and torque nuts to recommended limits.

c. Connect electrical lead at transmitter.

d. Install lower aft engine access door.

Note

After installation lockwire coupling nuts.

1-456. FUEL PRESSURIZING AND DUMP VALVE.

1-457. The fuel pressurizing and dump valve is located on the outside of the engine diffuser case at its rear bottom center.

1-458. REMOVAL.

a. Remove lower aft engine access door.

b. Disconnect overboard drain tube at dump valve.

c. Disconnect fuel control to dump valve sensing tube at dump valve.

d. Disconnect fuel totalizing transmitter to dump valve tube at dump valve.

e. Loosen retaining bolts and remove dump valve from adapter on diffuser case.

1-459. INSTALLATION.

a. Install two new seals, Pratt & Whitney Part No. 219278 and 219279, in dump valve mounting adapter on diffuser case.

b. Install dump valve on adapter using bolts and washers.

c. Connect fuel totalizer transmitter to dump valve tube at dump valve.

d. Connect fuel control to dump valve sensing tube at dump valve.

e. Connect overboard drain tube to dump valve.

Note

After installation, lockwire dump valve bolts and tube nuts.

f. Install lower aft engine access door.

1-460. IGNITION SYSTEM.

WARNING

Because the voltage of the sparkigniters is dangerously high, the ignition switch must be in the OFF position before removal of any of the ignition system components. A sufficient period of time (at least 2 minutes) should elapse between the operation of the ignition system and the removal of components to ensure the complete dissipation of energy from the ignition system.

1-461. IGNITION EXCITERS.

1-462. The ignition exciters are mounted on the upper right side of the compressor front case.

1-463. REMOVAL.

a. Disconnect electrical leads to ignition exciters.

b. Remove bolts and locknuts securing ignition exciters to vibration isolators, and lift off ignition exciters.

c. Separate ignition exciters from their mount brackets by removing attaching bolts.

Note

Ignition exciters are sealed units. Do not attempt to break the seal.

1-464. INSTALLATION.

a. Secure ignition exciters to their mount brackets with attaching bolts.

b. Mount exciters to four vibration isolators with bolts and locknuts.

c. Attach electrical leads to their respective connectors. Tighten and lockwire nuts.

1-465. SPARKIGNITERS.

1-466. The sparkigniters are mounted in the No. 4 and No. 5 combustion chamber holes in the lower rear of the diffuser case.

1-467. REMOVAL.

a. Disconnect sparkigniter lead nuts from sparkigniters and carefully pull terminal sleeve assembly from sparkigniter.

Note

Avoid damaging the wire, terminal sleeve or barrel insulator.

b. Install protective caps on sparkigniter connector leads immediately upon removal.

c. Remove sparkigniters from combustion chamber case.

d. Wrap igniters in wax paper and place in a suitable carton.

1-468. INSTALLATION.

Note

The sparkigniter should be checked to make certain it has not been damaged in handling and that the gap is within tolerances. See figure 1-47.

a. Chase threads, if necessary, using 1.000 inch - 20NEF-3 die for barrel threads, and 15/16 inch - 16NS die for shell threads.

b. Inspect sparkigniters for erosion in accordance with the following limits.

(1) Maximum outer shell ID erosion (a, figure 1-47.) is allowable if center electrode erosion is negligible.

(2) Maximum center electrode depth (b) is allowable if outer shell ID erosion is negligible.

(3) When both outer shell ID and center electrode erosion is evident, maximum gap limit (c) between nearest surface of outer shell ID and center electrode must be measured. If maximum gap limit is exceeded, replace sparkigniter.

c. Apply antisieze compound conforming to Specification MIL-T-5544 sparingly on sparkigniter shell threads.

Note

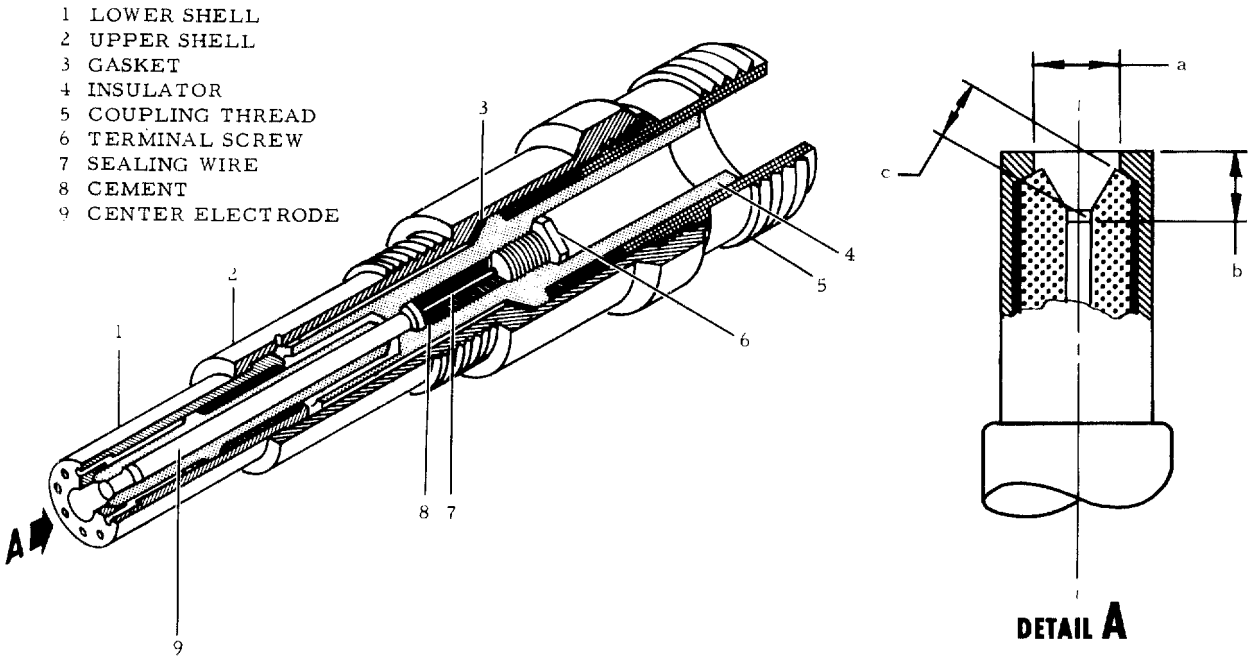
Do not apply compound to the first thread as the material may run down onto the electrode when hot.

d. Using a new gasket, install sparkigniters in No. 4 and No. 5 combustion chamber holes and torque to 300 to 360 pound-inches.

e. Apply Molykote powder type Z, Specification MIL-M-7886A on sparkigniter lead coupling nut threads. Connect sparkigniter leads to sparkigniters.

Note

Clean the lead connectors with solvent (Federal Specification P-S-661). Make certain the lead is properly positioned as the coupling nut is tightened.



EROSION LIMITS:

a. 0.312 INCH ID MAXIMUM OUTER SHELL EROSION WITH NEGLIGIBLE CENTER ELECTRODE EROSION.

b. 0.350 INCH MAXIMUM CENTER ELECTRODE DEPTH MEASURED FROM OUTSIDE SURFACE OF OUTER SHELL TO TIP OF CENTER ELECTRODE. OUTER SHELL (ID) EROSION SHALL BE NEGLIGIBLE. MAJOR EROSION CRITERIA:

c. 0.260 INCH MAXIMUM GAP BETWEEN NEAREST SURFACE OF CENTER ELECTRODE AND OUTER SHELL MUST BE CONSIDERED WHEN BOTH CENTER ELECTRODE AND OUTER SHELL EROSION IS EVIDENT.

Figure 1-47. Inspection of Sparkigniter

1-469. EXHAUST SYSTEM.

1-470. TAILPIPE ADAPTER AND TAILPIPE ASSEMBLY.

1-471. The tailpipe adapter and tailpipe assembly are mounted on the turbine section of the engine.

Note

If it is suspected that water is in the blankets from improper storage or prolonged exposure to rain, it is recommended that the blankets be removed and placed in an oven at 400°F for approximately one hour. In the event no facility exists for this operation, the blanket lacing may be loosened so that the blanket will gap four or five inches. The engine should then be run at idle for five minutes.

CAUTION

If the above procedure is not followed it is possible for entrapped water to turn to steam, building up sufficient pressure to collapse the tailpipe, when making an initial full power run. As a precautionary measure, it is recommended that the first engine run after the installation of new blankets, the engine be run at idle for two or three minutes before making a full power run.

Extreme care should be exercised when handling the tailpipe to prevent damage to the blankets. The outer covering is .002 thick stainless steel foil and can be damaged easily. Blankets which are damaged excessively should be replaced and the damaged blankets sent for repair.

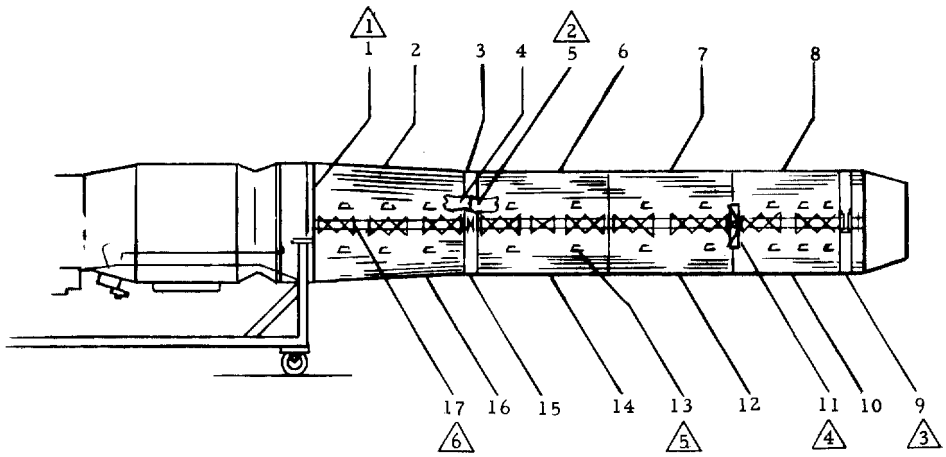
1-472. REMOVAL. (See figure 1-48.)

a. Remove fuselage aft section in accordance with -2-1 Maintenance Manual.

b. Remove engine with tailpipe attached in accordance with instructions under Removal of Engine in Airplane.

Note

The tailpipe assembly may also be removed by disconnecting engine mounts and all plumbing and electrical connections to the engine and pulling the aft portion of the engine out to fuselage station 555 breakpoint.



NOTE

1. APPLY ANTI-SIEZE COMPOUND, SPEC MIL-M-7866, TO BOLT THREADS. TORQUE BOLTS TO 80-90 LB. IN. (REMOVE GANG CHANNEL NUTS FROM ENGINE)
2. APPLY ANTI-SIEZE COMPOUND, SPEC MIL-M-7866, BETWEEN TAILPIPE ADAPTER AND TAILPIPE ASSEMBLY.
3. INSTALL STRAP UNDER BLANKET LACING.
4. LOCKWIRE BLANKETS TO TAILPIPE SUPPORTS.
5. BLANKETS INSTALLED WITH VENT OPENINGS DOWN.
6. LACE HOOKS ON BLANKETS IN GROUPS OF 3 OR 4.

1 NAS1005-6 BOLT - 42 PLACES
MS20500-524 NUT - 42 PLACES
AN960C516 WASHER - 42 PLACES
2 45-22972-3 BLANKET
3 45-22972-7 BLANKET
4 75P6 TAILPIPE ADAPTER
75P6-7 STIFFENER - 2 PLACES
75P6-8 STIFFENER - 2 PLACES
5 75P17 TAILPIPE ASSEMBLY
6 45-22972-11 BLANKET
7 45-22972-15 BLANKET
8 45-22972-19 BLANKET
9 75P84 STRAP ASSEMBLY
MS20500-428 NUT - 1 PLACE
10 45-22972-21 BLANKET
11 P4 TRACK INSTALLATION
12 45-22972-17 BLANKET
13 BREATHER VENT OPENING
14 45-22972-13 BLANKET
15 45-22972-9 BLANKET
75P19 CLAMP ASSEMBLY
MS20500-428 NUT - 1 PLACE
16 45-22972-5 BLANKET
17 .032-302 STAINLESS STEEL WIRE

Figure 1-48. Tailpipe Installation

c. Remove insulation blankets from tailpipe adapter and tailpipe assembly.

d. Remove aft tailpipe assembly, tailpipe clamp assembly and tailpipe adapter from turbine section of engine.

1-473. INSTALLATION.

a. Install tailpipe adapter on turbine section of engine.

Note

Antisieze compound, Specification MIL-M-7866, should be applied to the engine attaching bolts and a torque value of 80-90 pound inches put on nuts.

b. Install tailpipe assembly and tailpipe clamp assembly on tailpipe adapter.

Note

Antisieze compound, Specification MIL-M-7866, should be applied between the tailpipe adapter and tailpipe assembly. The clamp assembly should be tightened only to the point where it cannot slip when in place.

CAUTION

Do not overtighten clamp assembly.

c. Install insulation blankets.

(1) When installing blankets, make sure that breather vent openings are pointing down. This will prevent water from running into the inside of the blankets.

(2) Lace hooks on blankets in groups of three or four using .032-302 stainless steel lockwire.

(3) Lace and lockwire last blanket to track roller assembly.

d. Install strap assembly under lacing of tailpipe blankets.

e. Reinstall engine in accordance with instructions under Installation of Engine in Airplane.

f. Reinstall fuselage aft section in accordance with -2-1 Maintenance Manual.

1-474. LUBRICATION, SCAVENGE, AND BREATHER SYSTEM.

CAUTION

The synthetic engine oil used in the J75P-13 engines is harmful to some substances. Be careful not to spill oil on electrical wiring, painted areas, rubber parts or other units. Synthetic oil spilled on painted surfaces or on rubber components must be wiped off at once. Use a clean cloth saturated with aliphatic naphtha (Federal Specification TT-N-95). All containers should be clearly marked to prevent contamination and mixing of the oil with other fluids. Containers and hoses used for petroleum oils must not be used for handling synthetic oil.

WARNING

Prolonged contact with engine oil is very irritating to the skin. Avoid getting oil in eyes. Wash hands with soap and water before touching food.

1-475. OIL TANK.

1-476. The oil tank is located on the forward upper left-hand side of the engine.

1-477. REMOVAL.

a. Remove fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

b. Remove engine in accordance with instructions under Removal of Engine from Airplane.

c. Open drain valve at end of drain tube and allow oil to drain to a slow drip. Close drain valve and proceed with removal of attaching tubes.

d. Disconnect breather line on top right side of tank.

e. Disconnect static oil antisiphon tube from flange at top rear of tank.

f. Disconnect oil return-to-tank tube located at lower rear section of tank.

g. Disconnect outlet tube located on bottom of tank.

h. Disconnect oil scupper drain at aft side of tank.

i. Loosen locknuts holding oil tank straps and remove tank.

1-478. INSTALLATION.

a. Place oil tank in position on upper left side of front compressor rear case.

Note

Make sure cushions are in place.

b. Secure tank straps in place with washers and locknuts.

c. Place seal over end of tank-to-pump tube and secure flange with bolts and locknuts.

d. Place seal over end of oil return-to-tank tube located at lower rear section of tank, and secure tube flange to tank flange.

e. Place gasket over flange of static oil antisiphon tube, and secure tube to tank flange.

f. Place seal over end of ferrule of breather line, and secure breather line flange to breather boss located on top right side of tank.

g. Attach scupper drain tube to its connector. Tighten and lockwire nut.

h. Fill tank to correct level with proper grade of oil.

i. Reinstall engine in airplane in accordance with instructions under Installation of Engine in Airplane.

j. Reinstall fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

1-479. SERVICING.

a. The engine oil tank capacity is 5.5 gallons for the J75P-13 engine.

b. The recommended procedure for checking the oil level on the J75 engine is as follows:

a. Fill tank with oil to level indicated in figure 1-49. The oil level can be seen through the filler opening.

Note

The engine must be serviced as soon after shutdown as possible in order to prevent overfilling and to reflect true consumption data.

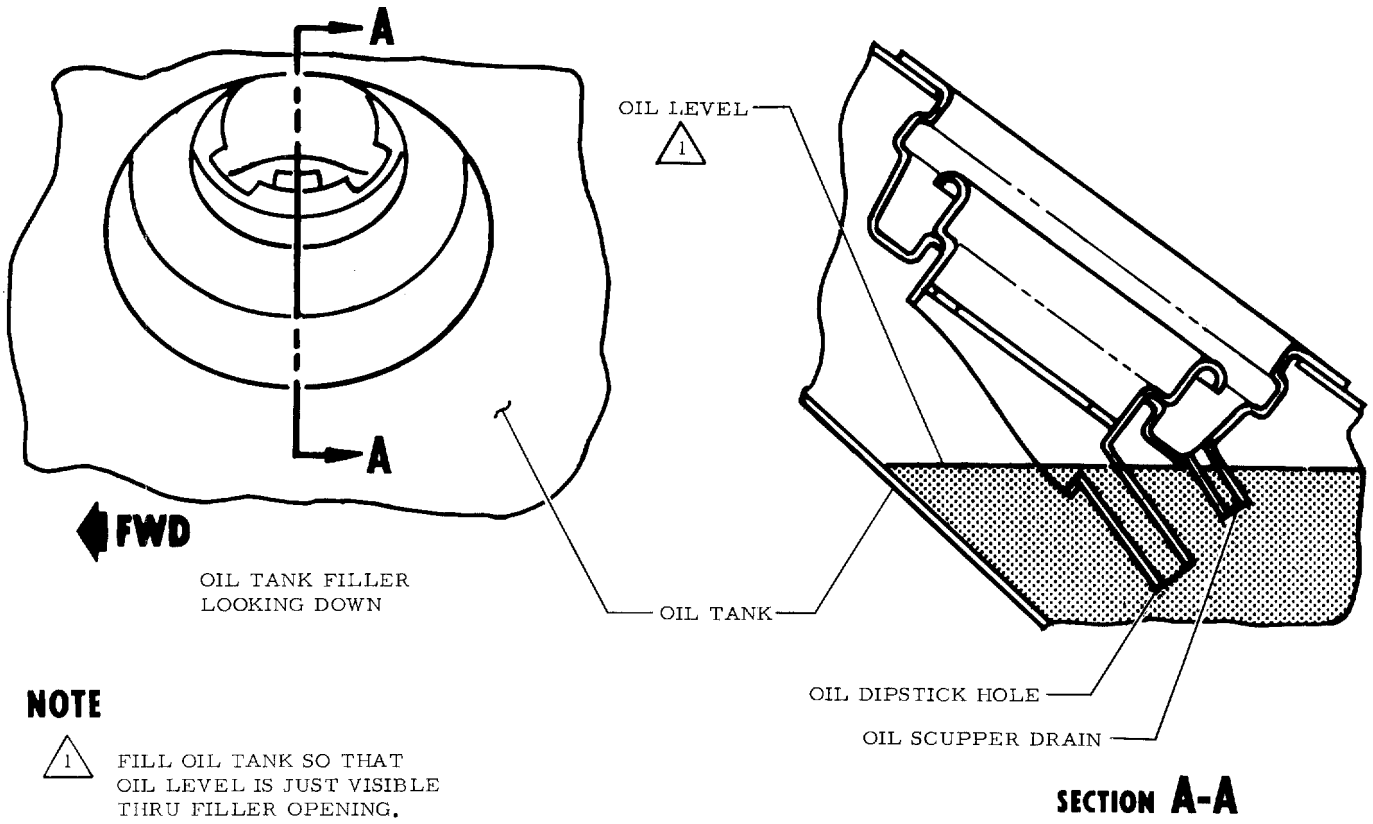


Figure 1-49. Servicing of Oil Tank

CAUTION

Do not reservice the oil system after engine has been shutdown for any period longer than one hour unless the engine is first run for a short time to ensure scavenging of the accessory section.

b. After a cool-down period at idle rpm, scavenge run the engine at 75 percent for 2 minutes immediately prior to shutdown. A scavenge run is necessary to assure that oil in sumps has been returned to tank to prevent over-servicing the oil system.

CAUTION

Up to two gallons of oil may be in the scavenge sections; therefore, oil should not be added to the tank until the scavenge sections are cleared with a scavenge run or the accessory section drained. If this procedure is not followed excessive oil may be added which will result in a buildup of sufficient internal pressure to rupture the tank during engine operation, or cause oil to leak from the No. 1 carbon seal into the compressor section.

c. Drain and refill oil tank with new oil, Specification MIL-L-23699A, after every 200 hours of engine operation.

Note

MIL-L-23699A is the primary oil for all operational areas with one exception, where ground temperatures fall below minus 20°F. The following commercial oils are considered acceptable alternates for MIL-L-23699A.

Commercial ESSO Turbo Oil 5251
Commercial ENCO Turbo Oil 5251
Commercial Mobil Oil Jet 11

MIL-L-7808 is an acceptable oil in those cases where MIL-L-23699A or alternate oils are not available and in areas of low ground temperatures (below minus 20°F).

CAUTION

Consult T.O. 42B2-1- ( ) series for possible restrictions on batches of oil in stock which might contain additives harmful to J75 engine seals.

The specified engine oils should NOT be intermixed when addition of oil between changes is required. If for some reason a different brand of oil is to be used other than the brand already in the engine system, the oil tank and accessory gearbox must be drained and flushed.

d. Flush aircraft oil system with engine installed as follows:

Note

This procedure is to allow flow and flushing of oil through engine and cooler cores. Only one flushing of engine and coolers is necessary during change over of oil of one specification to another.

(1) Drain engine oil tank and N_2 accessory gearbox.

(2) Secure drains and service oil tank with five (5) gallons of specified oil.

(3) Run engines sufficiently to bring oil temperature to normal.

Note

Set brakes and run engine at 75% rpm until oil temperature reaches approximately 80°C and hold for five (5) minutes.

(4) Drain engine oil tank and N_2 accessory gearbox.

(5) Secure drains and service oil tank to proper level.

(6) Make entry of type oil (Specification) used in aircraft oil system on Engine Historical Record Form DD829.

1-480. MAIN OIL PUMP.

1-481. The main oil pump is located on the left side of the oil pump and accessory drive gearbox (N_2).

1-482. REMOVAL.

a. Remove lower engine access door.

b. Drain oil from engine oil tank.

Note

Place a suitable container under the main oil pump to catch the residual oil when disconnecting the tubes from the oil pump and removing the pump from the gearbox.

c. Disconnect oil tank to main oil pump tube.

d. Disconnect main oil pressure pump outlet tube.

e. Disconnect oil pump sensing tube.

f. Unfasten oil pump retaining nuts and position puller, Pratt & Whitney Part No. 10332, so that fixed jaws engage lugs on pump body. Engage and secure adjustable jaw to pump body. Use knocker action to remove oil pump from N_2 gearbox.

1-483. INSTALLATION.

a. Place two O-ring seals in grooves in pump housing bore and O-ring seal in groove of pump mounting pad.

b. Install pump on gearbox and secure with (5) washers and locknuts.

c. Connect oil tank to main oil pump tube.

d. Connect main oil pressure pump outlet tube.

e. Connect oil pump sensing tube.

f. Fill oil tank to correct level.

1-484. MAIN OIL STRAINER.

1-485. The main oil strainer is located on the right bottom side of the oil pump and accessory drive gearbox (N_2).

1-486. REMOVAL.

a. Remove lower engine access door.

b. Provide a suitable receptacle for collecting drain oil.

c. Remove four nuts securing main oil strainer cover to accessory drive housing and carefully withdraw cover, coil spring, and two-piece oil strainer assembly. Discard old seal.

1-487. CLEANING. (See figure 1-50.)

Note

Measure height of strainer elements prior to disassembly so that on assembly they will conform to same dimension.

a. Disassemble inner oil strainer element as follows:

(1) Position holder, Pratt & Whitney Part No. 11407, in vise.

(2) Set strainer element into recess in holder and tighten set screw.

(3) Position wrench, Pratt & Whitney Part No. 11408, over hub of spacer support with dowels in holes in support.

(4) Carefully remove strainer spacer support and remove screens and spacers, keeping them in their proper order on a suitable rod.

Note

Rod should be such as to prevent parts from sliding off during cleaning operation.

(5) Separate screens and spacers by sliding parts along rod examining them for presence of foreign matter which would indicate an unsatisfactory condition in engine.

(6) Immerse screens and spacers in an approved carbon remover, at room temperature, for a few minutes.

(7) Rinse in degreaser fluid or cleaning solvent, Specification No. P-S-661, and blow dry with air.

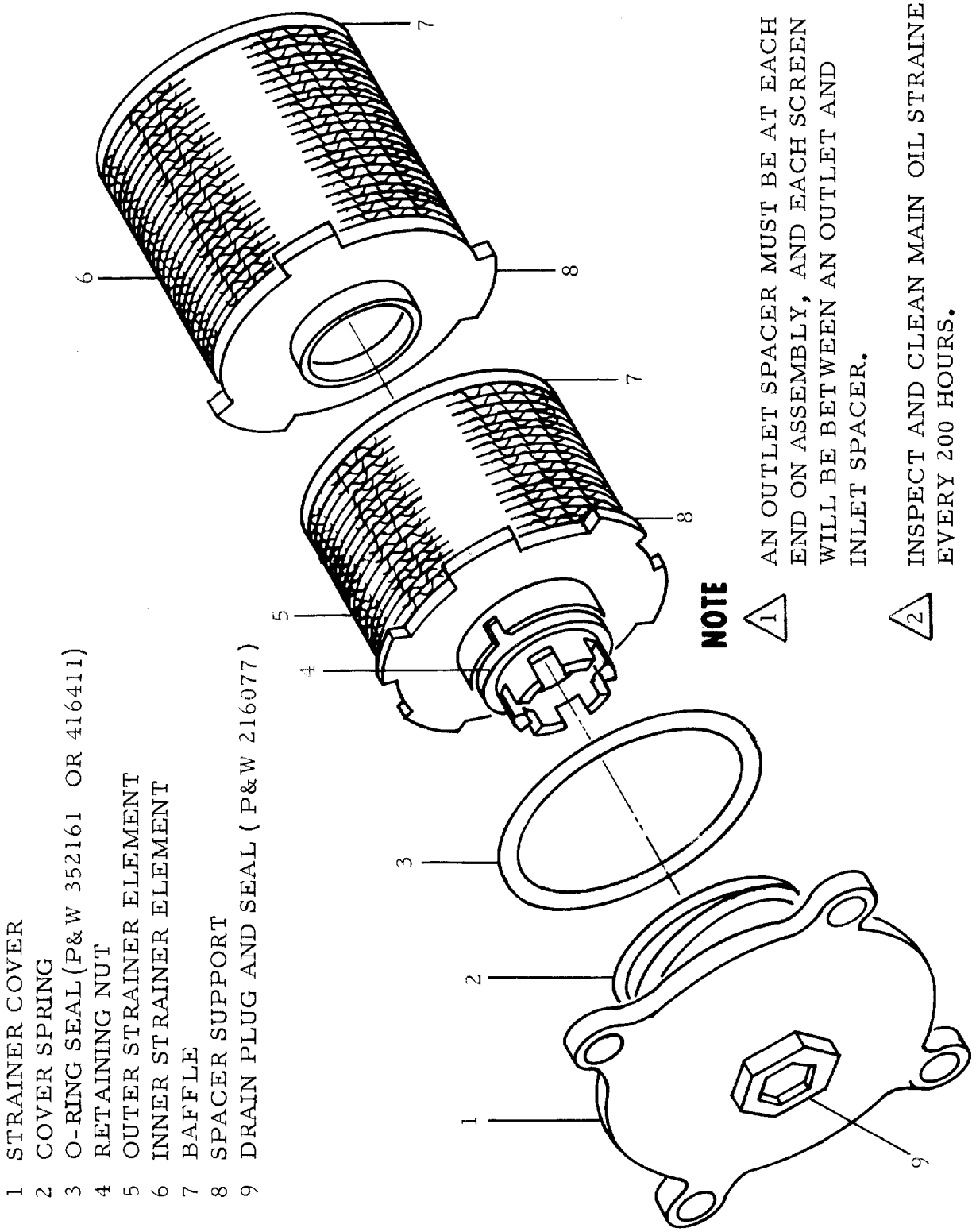


Figure 1-50. Cleaning of Main Oil Strainer

b. Reassemble inner oil strainer element in reverse order using holder, Pratt & Whitney Part No. 11407, and wrench, Pratt & Whitney Part No. 11408.

c. Disassemble outer oil strainer element as follows:

(1) Position adapter, Pratt & Whitney Part No. 11406 over locator of fixture, Pratt & Whitney Part No. 10347.

(2) Install outer strainer element on adapter, Pratt & Whitney Part No. 11406, and secure in place with plate of fixture, Pratt & Whitney Part No. 10347.

(3) Remove retaining nut using wrench, Pratt & Whitney Part No. 10014.

(4) Repeat steps a. (4) through a. (7) preceding for cleaning of outer strainer element screens.

d. Reassemble outer oil strainer element in reverse order using adapter, Pratt & Whitney Part No. 11406, fixture Part No. 10347, and wrench, Pratt & Whitney Part No. 10014.

1-488. INSTALLATION.

a. Moisten O-ring seal with engine oil and place it on oil strainer cover.

b. Carefully insert two-piece oil strainer assembly into opening in accessory drive housing over oil filter valve until cover is installed on retaining studs.

c. Insert oil strainer assembly further into opening until O-ring contacts housing.

d. Install strainer cover nuts fingertight.

e. Tighten nuts alternately until required torque is obtained.

1-489. OIL PRESSURE RELIEF VALVE.

1-490. The oil pressure relief valve is located on the left side of the oil pump and accessory drive gearbox.

1-491. REMOVAL. (See figure 1-51.)

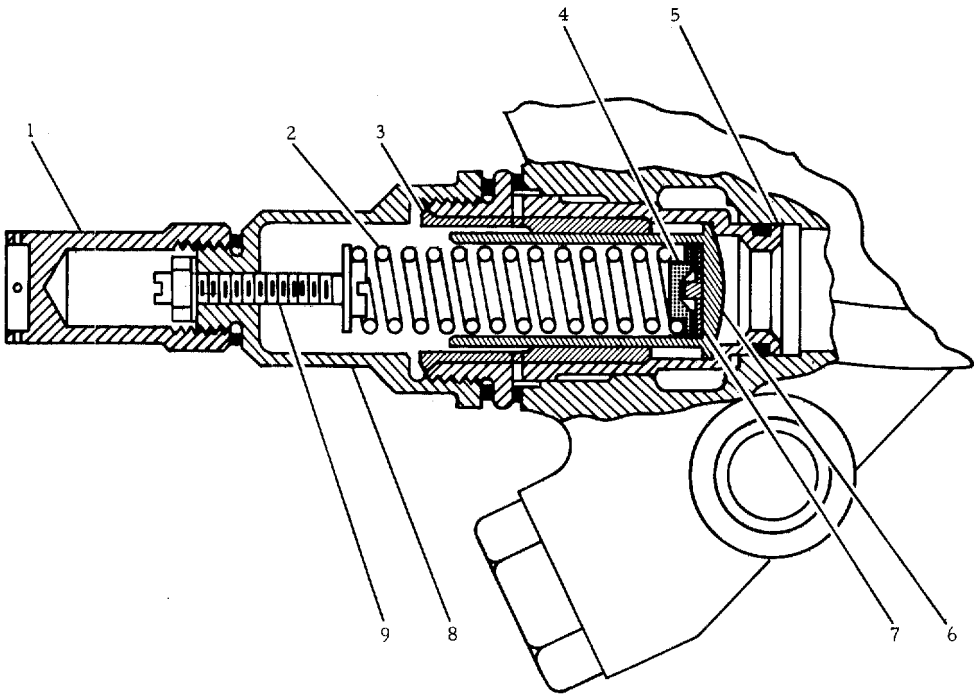
Engage hex of valve body with a wrench and remove relief valve assembly from N_2 accessory gearbox.

1-492. INSTALLATION.

a. Place seal in groove in body end, and gasket under body flange.

b. Install relief valve in N_2 accessory gearbox.

c. Engage hex portion of valve body with a wrench and tighten body.



1. CAP
2. SPRING
3. LINER
4. SPRING SEAT
5. BODY
6. PISTON
7. POSITIONING PLATE
8. ADJUSTING SCREW SUPPORT
9. ADJUSTING SCREW

Figure 1-51. Oil Pressure Relief Valve

1-493. ADJUSTMENT.

a. Remove cap and loosen adjusting screw locknut.

b. Adjust relief valve to give an oil pressure of approximately 45 psi with engine running at idle speed. (Minimum oil pressure at idle is 35 psi.)

Note

Turn the adjusting screw clockwise to increase oil pressure and counterclockwise to decrease oil pressure.

c. Run engine at NORMAL RATED SPEED. Oil pressure should be 40 to 55 psi.

d. When desired adjustment is obtained, secure adjusting screw locknut.

e. Install gasket and cap. Lockwire cap.

1-494. AIR-OIL COOLER. (14-inch Diameter)

1-495. The 14-inch air-oil cooler is located on the left-hand side of the engine compartment at approximately fuselage station 475.

1-496. REMOVAL.

a. Remove fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

b. Remove engine in accordance with instructions under Removal of Engine from Airplane.

c. Disconnect inlet and outlet flexible hoses to thermostatic control valve located on oil cooler.

d. Loosen (2) strap bands holding oil cooler in place and remove oil cooler.

e. Remove rubber cork pads from strap bands, if deteriorated.

1-497. INSTALLATION.

a. Attach new rubber cork pads conforming to MIL-G-6183 (1/16-inch) on strap bands using General Purpose Chloroprene Cement, EC 1300L (Minnesota Mining and Manufacturing Company).

b. Place oil cooler in place and tighten strap bands.

c. Connect inlet and outlet flexible hoses to thermostatic control valve located on oil cooler.

d. Reinstall engine in accordance with instructions under Installation of Engine in Airplane.

e. Reinstall fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

1-498. AIR-OIL COOLER. (9-inch Diameter)

1-499. The 9-inch air-oil cooler is located on the right-hand side of the engine compartment at approximately fuselage station 485.

1-500. REMOVAL.

a. Remove fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

b. Remove engine in accordance with instructions under Removal of Engine from Airplane.

c. Disconnect inlet and outlet flexible hoses to oil cooler.

d. Loosen strap band holding oil cooler in place and remove oil cooler.

e. Remove rubber cork pads from strap bands, if deteriorated.

1-501. INSTALLATION.

a. Attach new rubber cork pad conforming to MIL-G-6183 (1/16") on strap band using General Purpose Chloroprene Cement, EC1300L (Minnesota Mining and Manufacturing Company).

b. Place oil cooler in place and tighten strap band.

c. Connect inlet and outlet flexible hoses to oil cooler.

d. Reinstall engine in accordance with instructions under Installation of Engine in Airplane.

e. Reinstall fuselage aft section in accordance with instructions in -2-1 Maintenance Manual.

1-502. FUEL-OIL COOLER.

1-503. The fuel-oil cooler is located on the right side of the engine compartment at approximately fuselage station 460.

1-504. REMOVAL.

a. Remove lower engine access door.

b. Disconnect fuel inlet tube at fuel-oil cooler from sump tank.

c. Disconnect fuel outlet line at fuel-oil cooler from engine.

d. Disconnect flexible oil lines at fuel-oil cooler from engine.

e. Disconnect fuel strainer drain line at fuselage skin.

f. Remove mounting bolts (4) at forward and aft ends of fuel-oil cooler and remove cooler.

1-505. INSTALLATION.

a. Install mounting bolts (4) at forward and aft ends of fuel-oil cooler. Lockwire bolts.

b. Connect fuel strainer drain line at fuselage skin.

c. Connect fuel outlet line and oil lines at fuel-oil cooler from engine.

d. Reinstall lower engine access door.

1-506. BREATHER PRESSURIZING VALVE.

1-507. The breather pressurizing valve is located on the upper right side of the oil pump and accessory drive gearbox (N_2).

1-508. REMOVAL.

a. Remove forward lower engine access door.

Note

When removing the breather tubes, discard the old seals and gaskets. Establish the position of the clips before removing the tubes.

b. Disconnect flange end of external breather front tube from mating flange at lower right side of inlet case.

c. Disconnect aft end of external breather front tube from front face of breather pressurizing valve connector.

d. Disconnect external breather front intermediate tube connector on diffuser case and pull tube from tee connection on breather pressurizing valve.

e. Disconnect external breather rear intermediate tube from coupling located at lower right side of diffuser case rear flange and internal coupling nut from connector on diffuser case.

f. Disconnect aft end of external breather rear tube at lower right side of turbine exhaust case and pull tube rearward from bracket at rear flange of diffuser case.

g. Disconnect oil tank breather tube from tee on breather pressurizing valve housing.

h. Remove (2) locknuts and bolts securing oil tank breather tube flange to oil tank breather tube.

i. Remove (4) bolts securing breather pressurizing valve to N_2 accessory gearbox, and remove valve.

j. Pull off transfer ferrule that connects breather pressurizing valve to cover of N_2 accessory gearbox.

Note

Cap the tube ends and engine openings to prevent entry of foreign material.

1-509. INSTALLATION.

Note

Install new seals and gaskets where required. Lubricate the seals with engine oil when installing. Loosely attach rigid tubing until assured the tubes and tube clips are properly positioned; then tighten the nuts and bolts to the required torque and lockwire.

a. Place an oil seal on breather pressurizing valve body ferrule in N_2 accessory gearbox housing.

b. Place two oil seals on breather pressurizing valve transfer ferrule and insert one end of ferrule in opening at upper right side of gearbox cover.

c. Install breather pressurizing valve in gearbox fitting and transfer valve into valve body. Secure valve with four washers and four bolts.

d. Place seal in groove of each of oil tank breather tube end ferrules and attach lower end of tube to tee connection on breather pressurizing valve housing. Position flange of tube over its boss on oil tank and secure it with bolts and locknuts.

e. Place seal over forward end of external breather front tube and attach flange of tube to its mating flange at lower right side of inlet case with bolts and locknuts. Attach tube end nut to connector on front face of breather valve.

f. Place seal in groove of ferrule on forward end of external breather front intermediate tube and insert forward end of tube into tee on breather valve. Attach coupling nut to connector on diffuser case.

g. Attach internal coupling nut on external breather rear intermediate tube to connector on diffuser case.

h. Attach nut on external breather rear intermediate tube to tube coupling at rear flange of diffuser case. Attach nut on aft end of tube to connector at lower right side of turbine exhaust case.

INDEX

Approved For Release 2001/08/28 : CIA-RDP75B00300R000100050001-7

ALPHABETICAL INDEX

* Denotes Illustration

-E-

* Denotes Illustration

* Denotes Illustration

* Denotes Illustration

Page

Exhaust System

-M-

* Denotes Illustration

Page

-O-

-P-

-Q-

* Denotes Illustration

* Denotes Illustration

* Denotes Illustration