

**FEDERAL
EXPRESS**

TECHNICAL TRAINING

FOR REFERENCE ONLY

727

**SYSTEMS
STUDY GUIDE**

ATA 71-80



AUGUST 1990



MAINTENANCE TECHNICAL TRAINING

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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE i

B-727
JT8D ENGINE
ATA 71-80

The material furnished here is to be used as a training aid only. Details, values and lengthy discussion of the aircraft systems and equipment have been purposely avoided. It is suggested that in order to achieve maximum training value from this material, that it be considered a supplement to classroom lecture and a general study guide for a student during formal maintenance training.

NOTE

NOTHING IN THIS STUDY GUIDE SHALL BE CONSTRUED AS AUTHORITY FOR DEVIATION FROM FEDERAL AVIATION REGULATIONS OR APPROVED AIRCRAFT OR COMPONENT MAINTENANCE AND OVERHAUL MANUAL INSTRUCTIONS.

NOTE

THE INFORMATION CONTAINED WILL APPLY TO ALL 727 AIRCRAFT UNLESS THE MODEL IS NOTED.

TABLE OF CONTENTS

CHAPTER	PAGE
1 INTRODUCTION	1
Powerplant Installation	3
2 Basic Engine	26
3 Fuel System	50
Fuel Deicing System	55
Fuel Flow Indicating System	73
4 Oil System	80
Oil Quantity Indicating System	92
5 Engine Pneumatic Systems	103
Compressor Bleed System	103
Generator Cooling System	114
6 Pneumatic Starter System	116
7 Ignition System (B727-100)	130
Ignition System (B727-200)	137
8 Thrust Reverser System	142
9 Indicating Systems	167
Engine Pressure Ratio System	163
Engine Tachometer System	170
Exhaust Gas Temperature (B727-100/200)	172
10 Engine Trim	182
Engine Run Forms	194



MAINTENANCE TECHNICAL TRAINING

FOR TRAINING PURPOSES ONLY

SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 1

CHAPTER 1

A. POWER PLANT INSTALLATION IN THE 727 AIRCRAFT

1. General Description

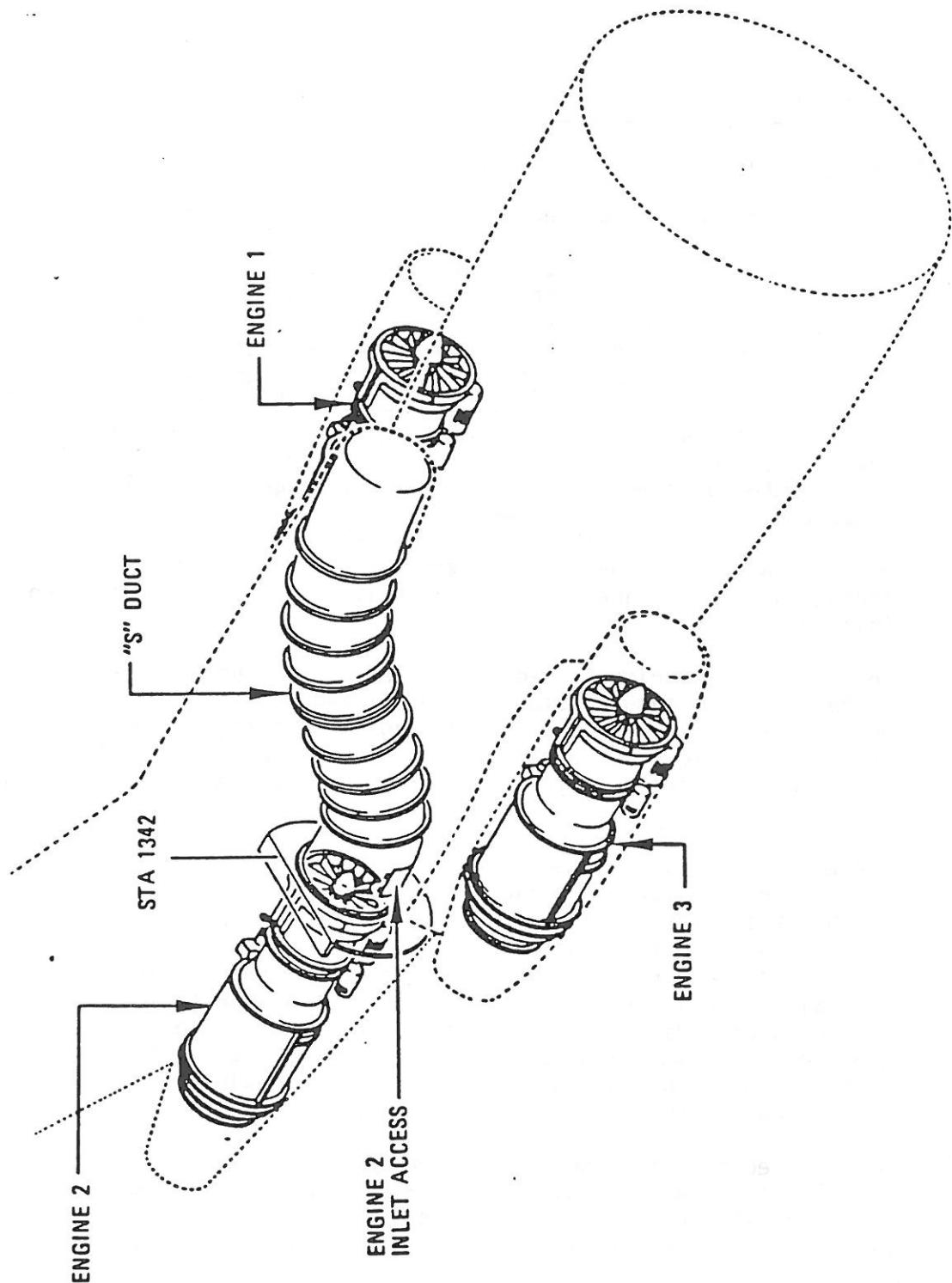
- a. The 727 airplane is powered by three JT8D turbofan engines mounted on the aft fuselage area. Two engines are strut mounted, in conventional nacelles, one on each side of the fuselage. A center engine is mounted aft of the fuselage structure. Air is ducted to this engine through an inlet forward of the vertical fin just above the fuselage. Each engine is secured to the engine mount fittings at three points. Two cone bolts, attached to a double flange at the fan discharge intermediate case, and one cone bolt attached to a double flange at the fan discharge turbine exhaust outer duct, secure the engines to the forward and rear mount fittings. Access to the side engine exterior components is provided by hinged removable upper and lower cowl panels which may be opened from either side. Center engine access is made through four hinged removable side cowl panels. Access to the center engine inlet and nose dome is gained through an access panel above the aft airstairs in the center engine inlet duct.
- b. The major accessories fitted to each engine include a constant speed drive unit, a pneumatic starter, and N1 and N2 tachometer generators. A generator is mounted on the constant speed drive unit. Hydraulic pumps are installed on engines No. 1 and 2. Fire detection and fire extinguishing systems are provided in each engine area.
- c. The engine starting system provides a means of rotating the N2 compressor to establish a flow of air through the engine. Rotation of the N2 compressor also drives the engine fuel pump and fuel control to meter fuel, under pressure, to the combustion chamber. An ignition system provides a high voltage discharge for ignition of the fuel/air mixture. Each engine is fitted with a self-contained oil system to provide cooling and lubrication of engine gears and bearings. Transmitting devices, installed on each engine, actuate warning lights and indicators in the control cabin to provide indications of engine performance.
- d. Air is bled from the low pressure and high pressure compressors and the fan discharge duct to operate various airplane systems. A thrust reverser, attached to the exhaust section of each engine provides a means of retarding the forward speed of the airplane after touchdown.



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 2



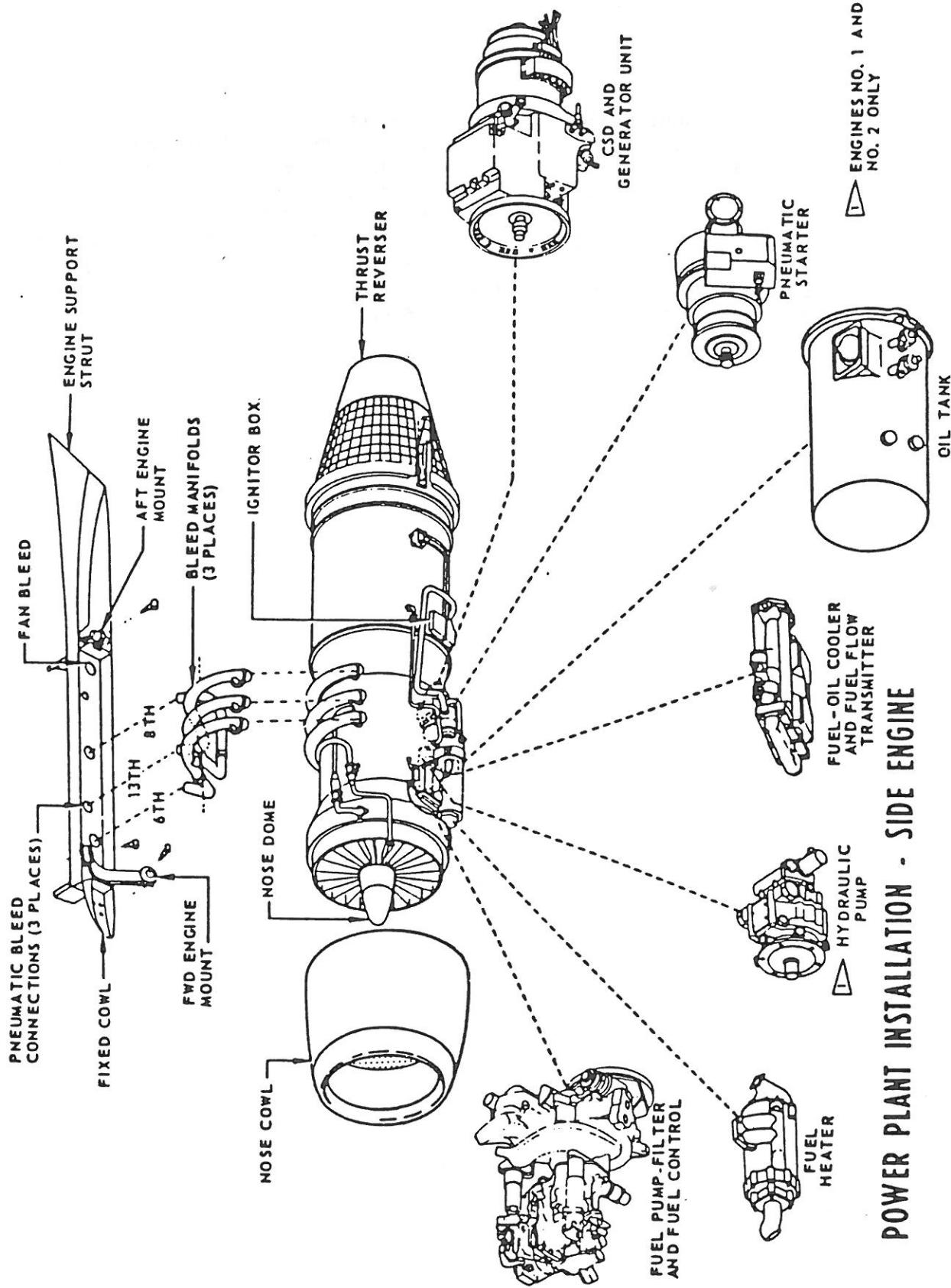
POWER PLANT LOCATION



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 3





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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 4

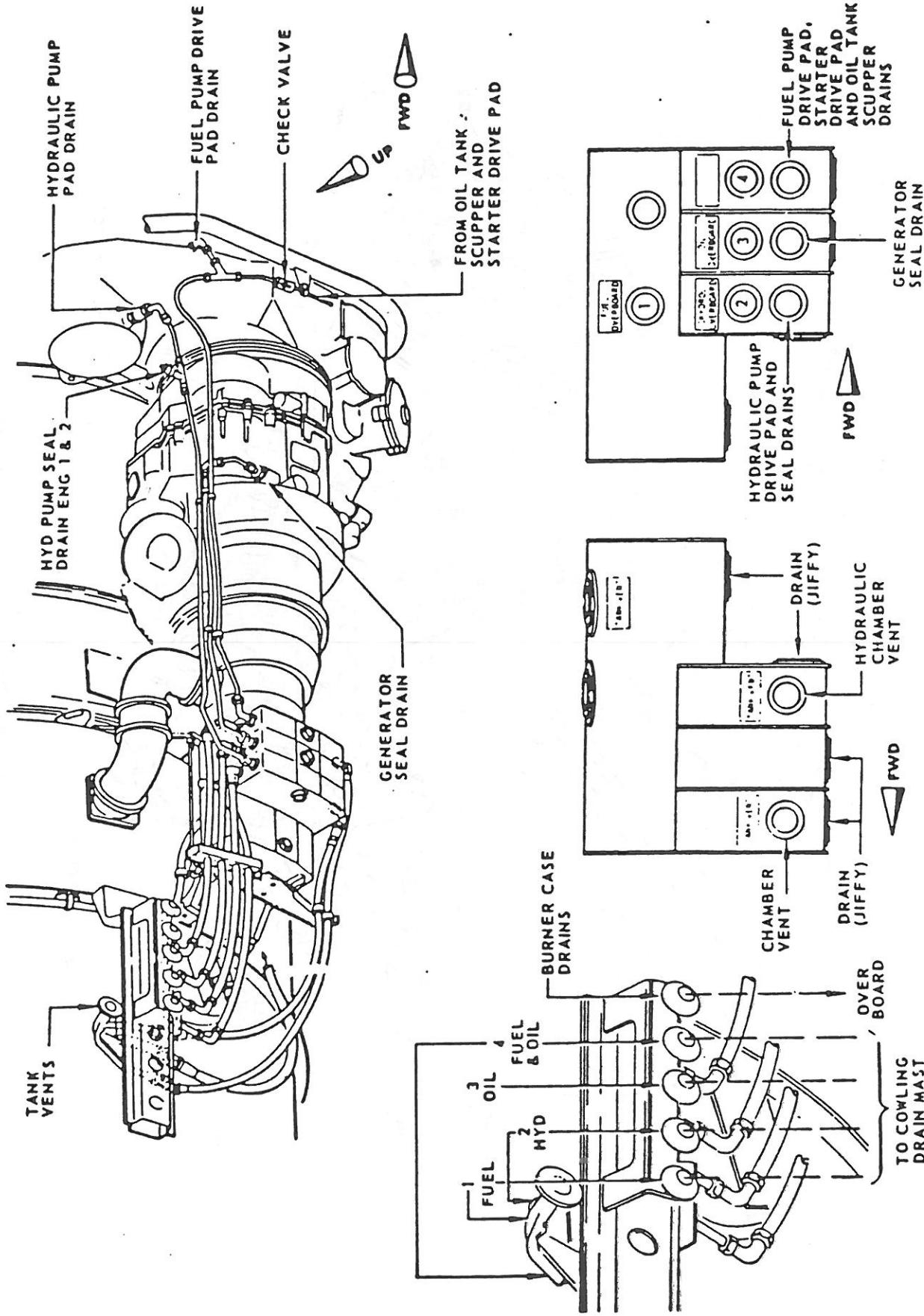
- e. A four component drain tank is mounted on the under side of each engine. Fluid leakage from the seals and drive pads of the engine accessories is drained, through tubing, to the tank. A drain line is also installed between the oil tank scupper and the drain tank, to collect oil spilled during servicing. In flight, air flowing past a drain mast, on the engine cowling, creates a negative pressure which sucks the fluids overboard through a discharge manifold. Jiffy drains are provided on the under side of each tank compartment to permit draining the tank while the airplane is on the ground.



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 5

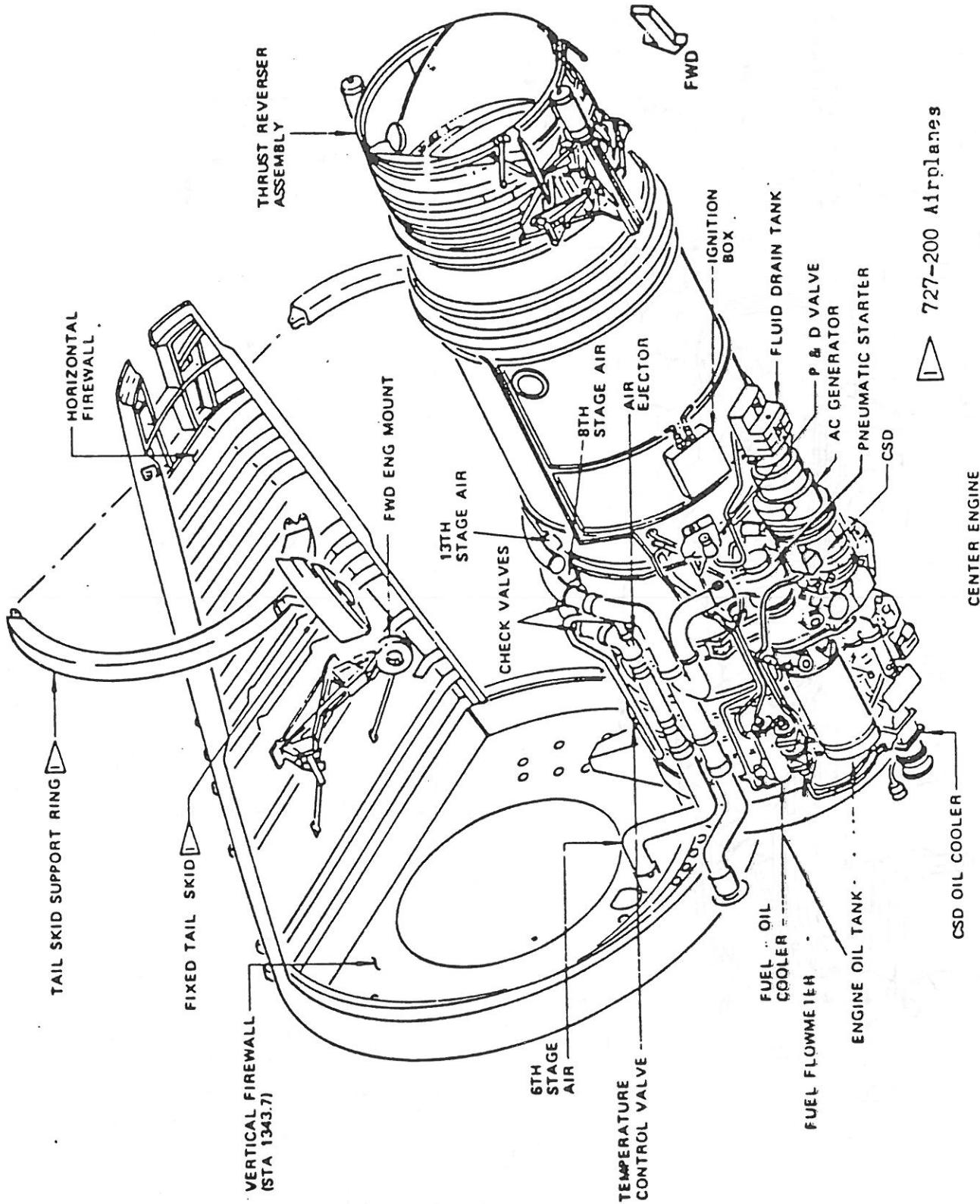




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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 6



No. 2 ENGINE INSTALLATION

CENTER ENGINE

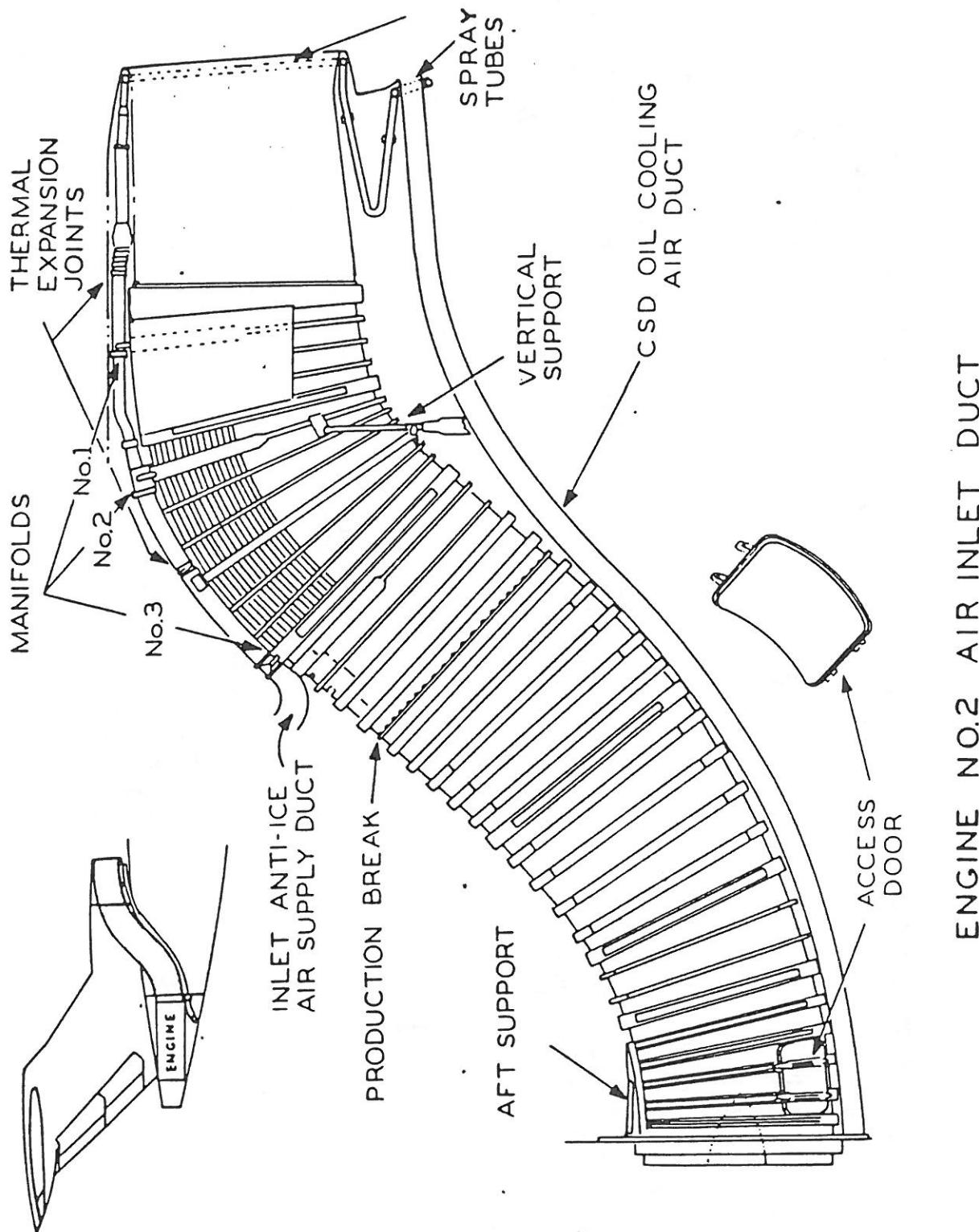
727-200 Airplanes



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 7

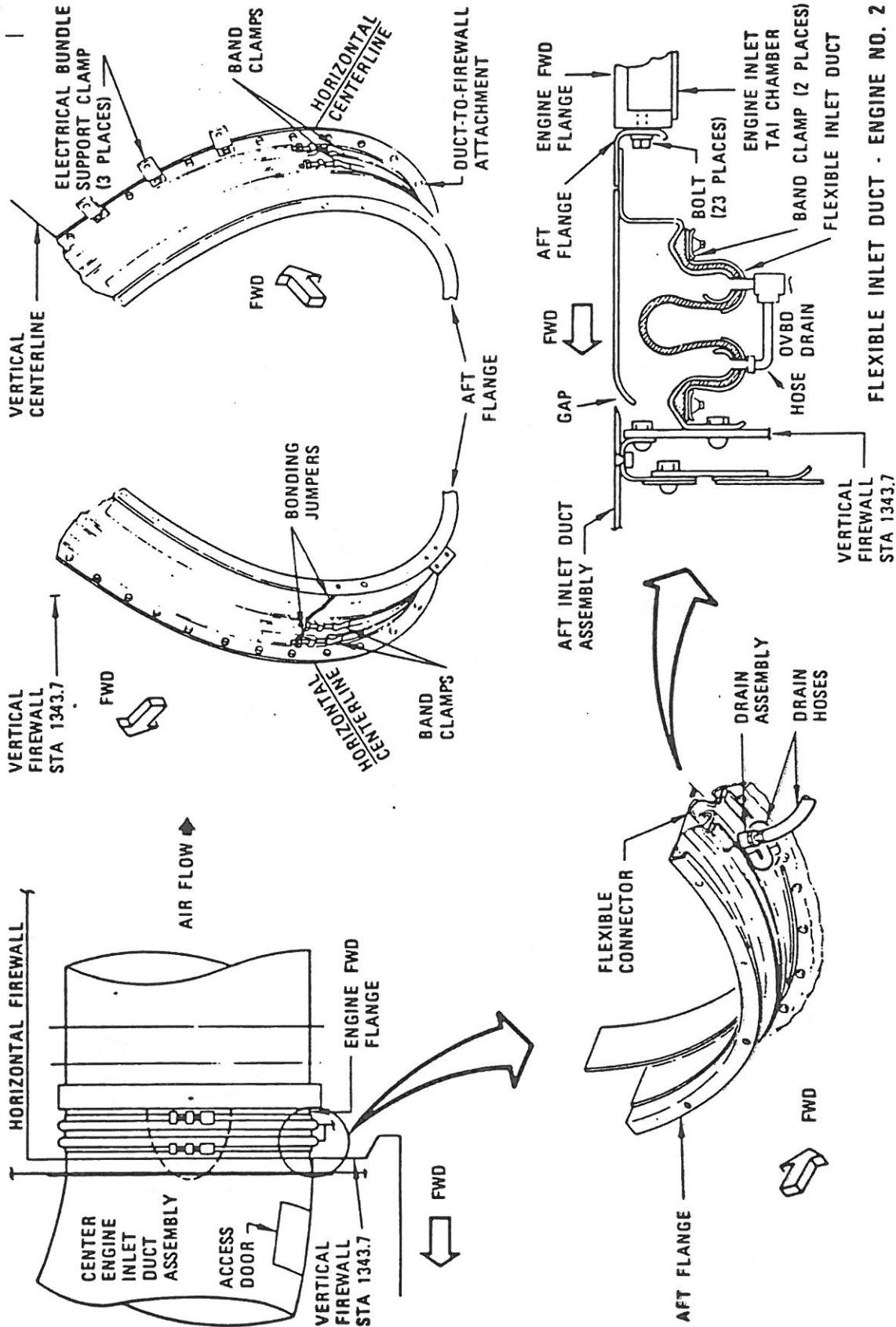




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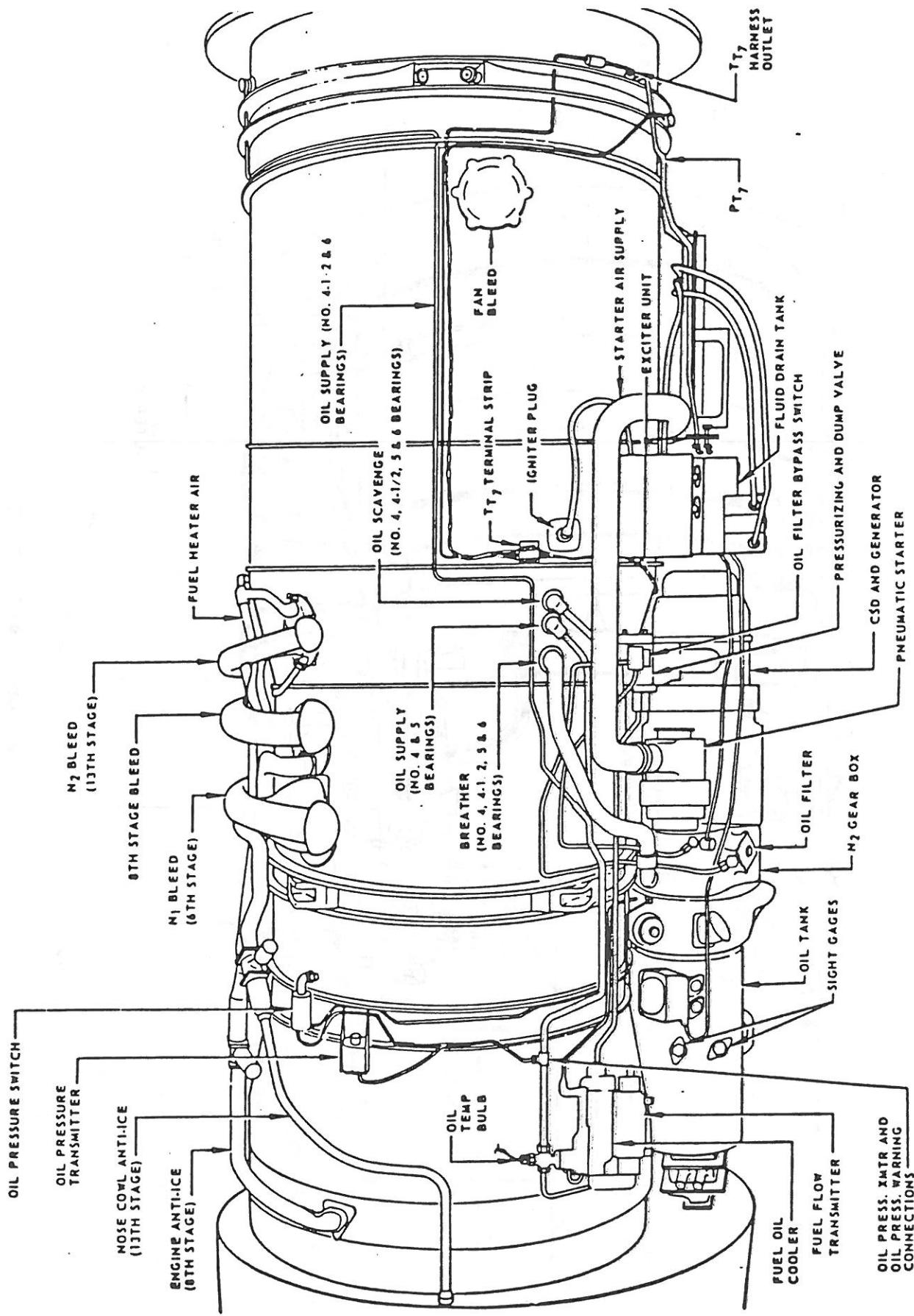




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FOR TRAINING PURPOSES ONLY

SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 9

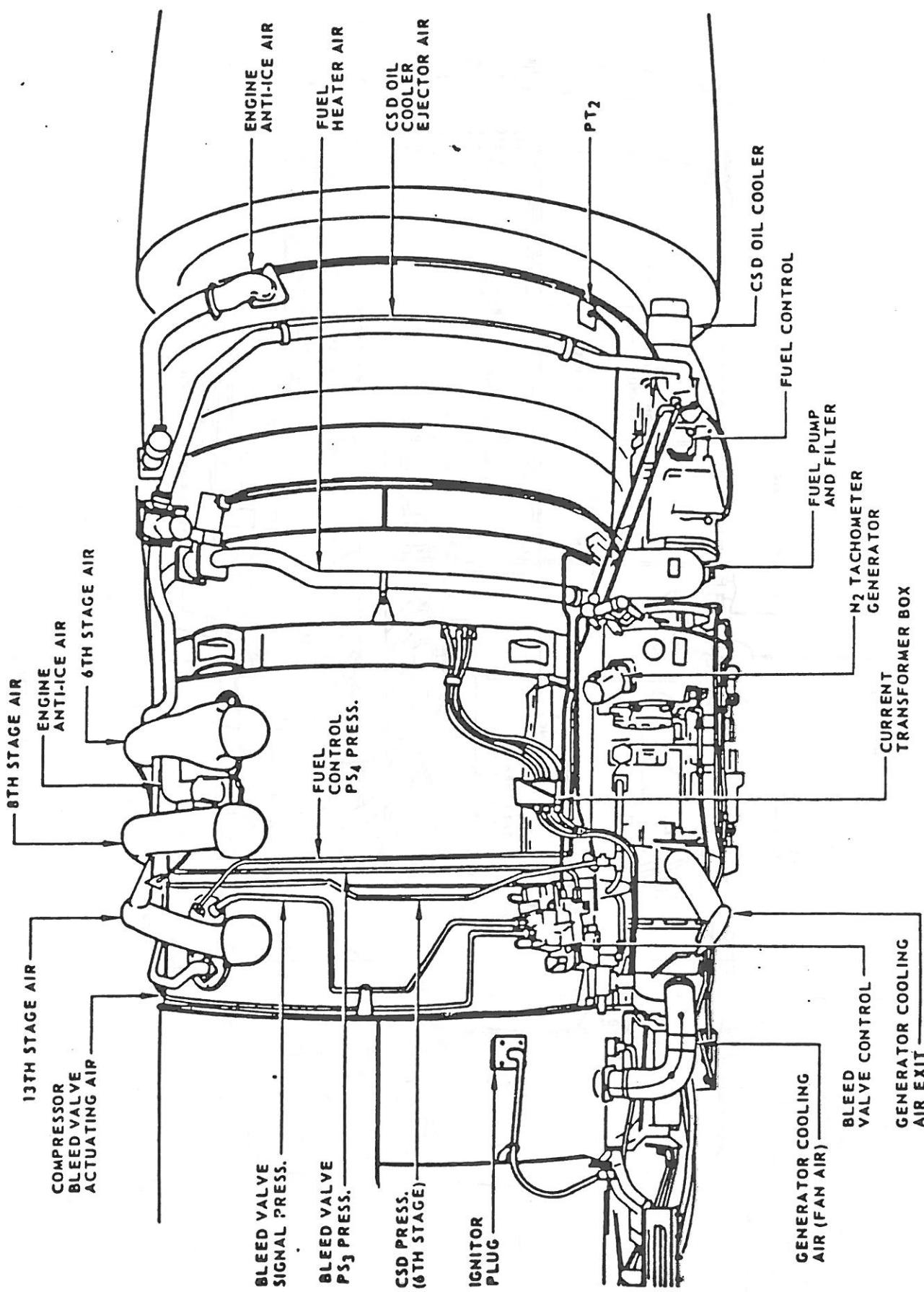


NO. 1 ENGINE - LEFT SIDE



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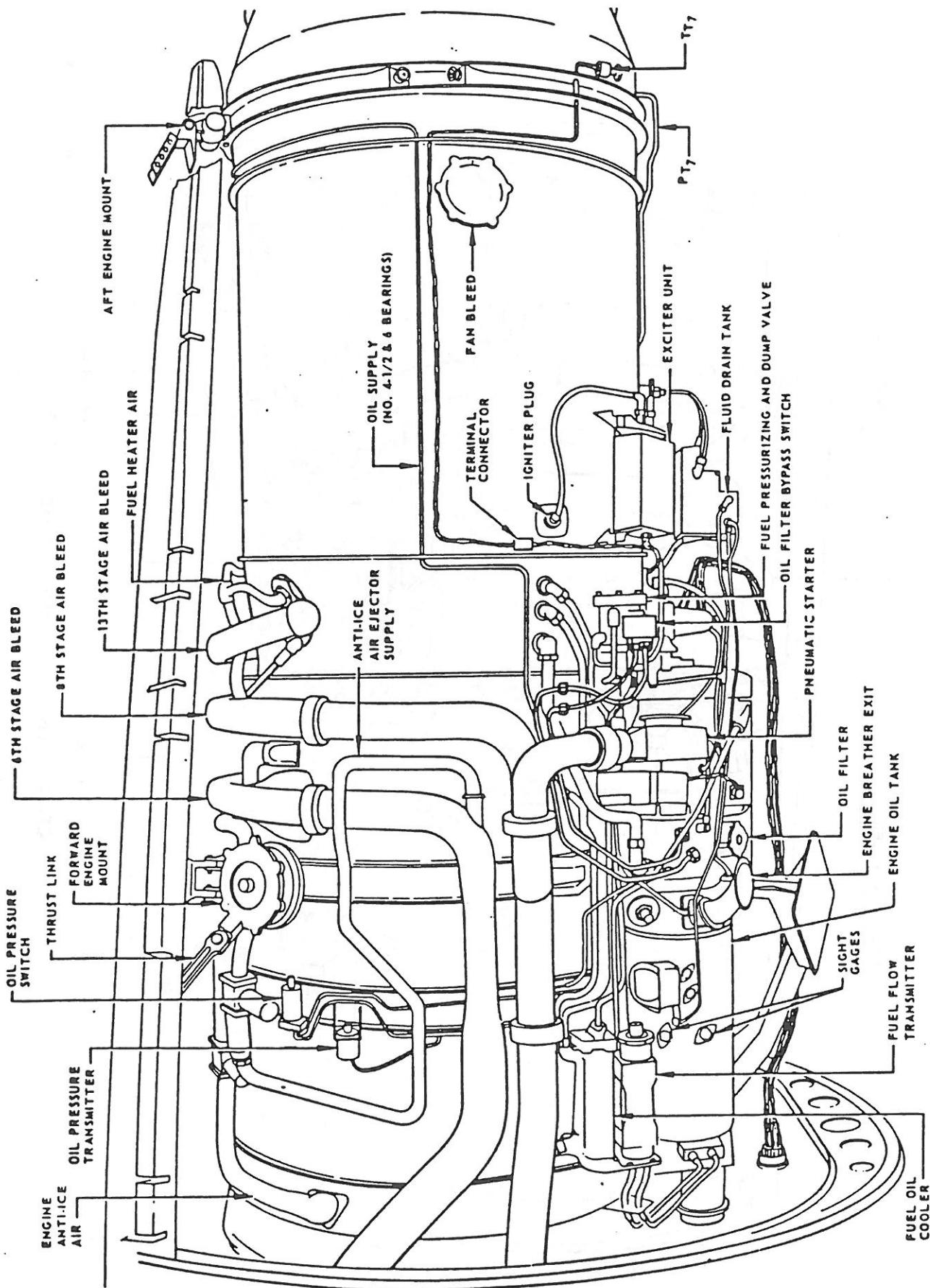
SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 10



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FOR TRAINING PURPOSES ONLY

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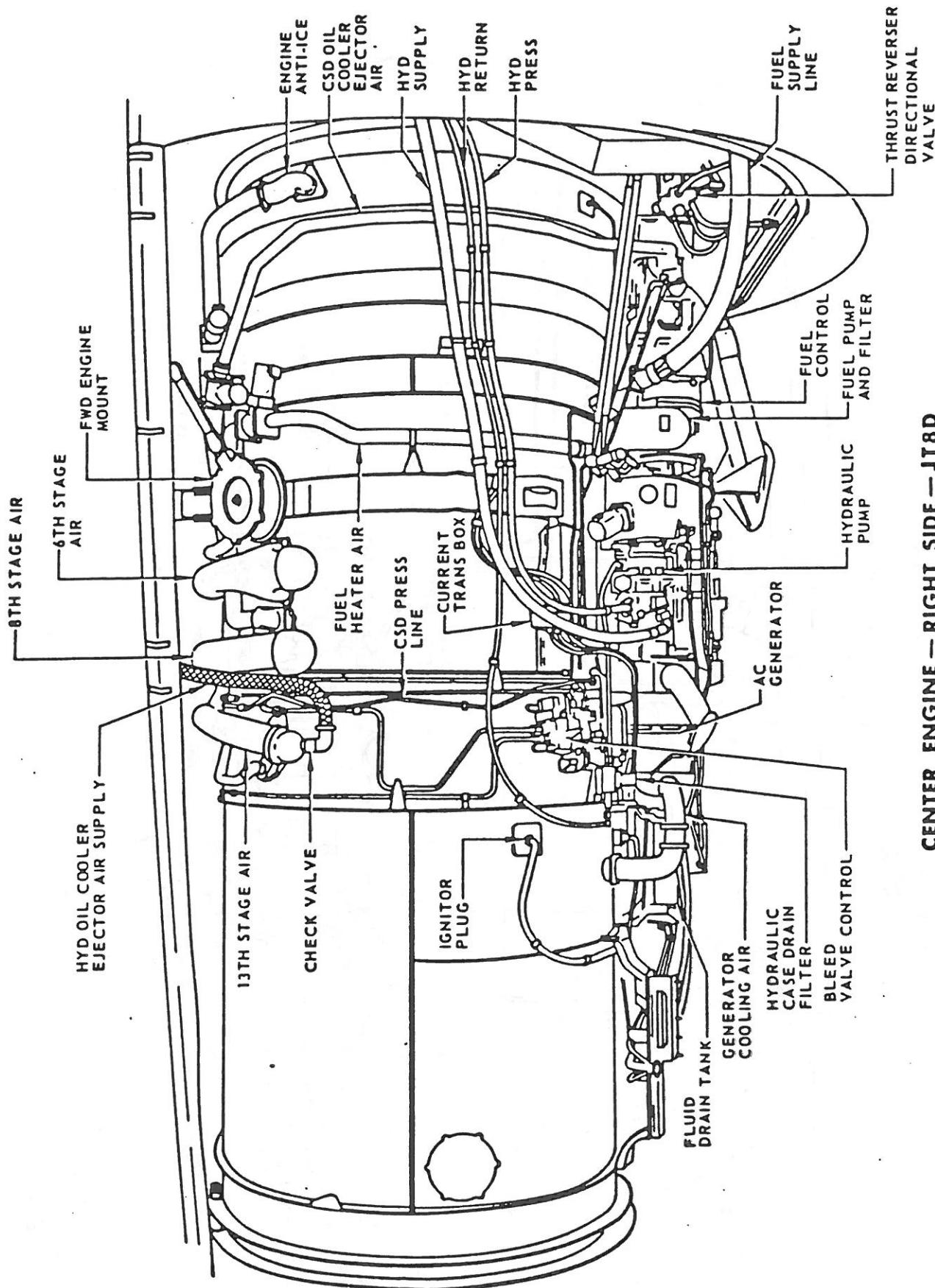
CENTER ENGINE, LEFT SIDE — JT8D



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 12



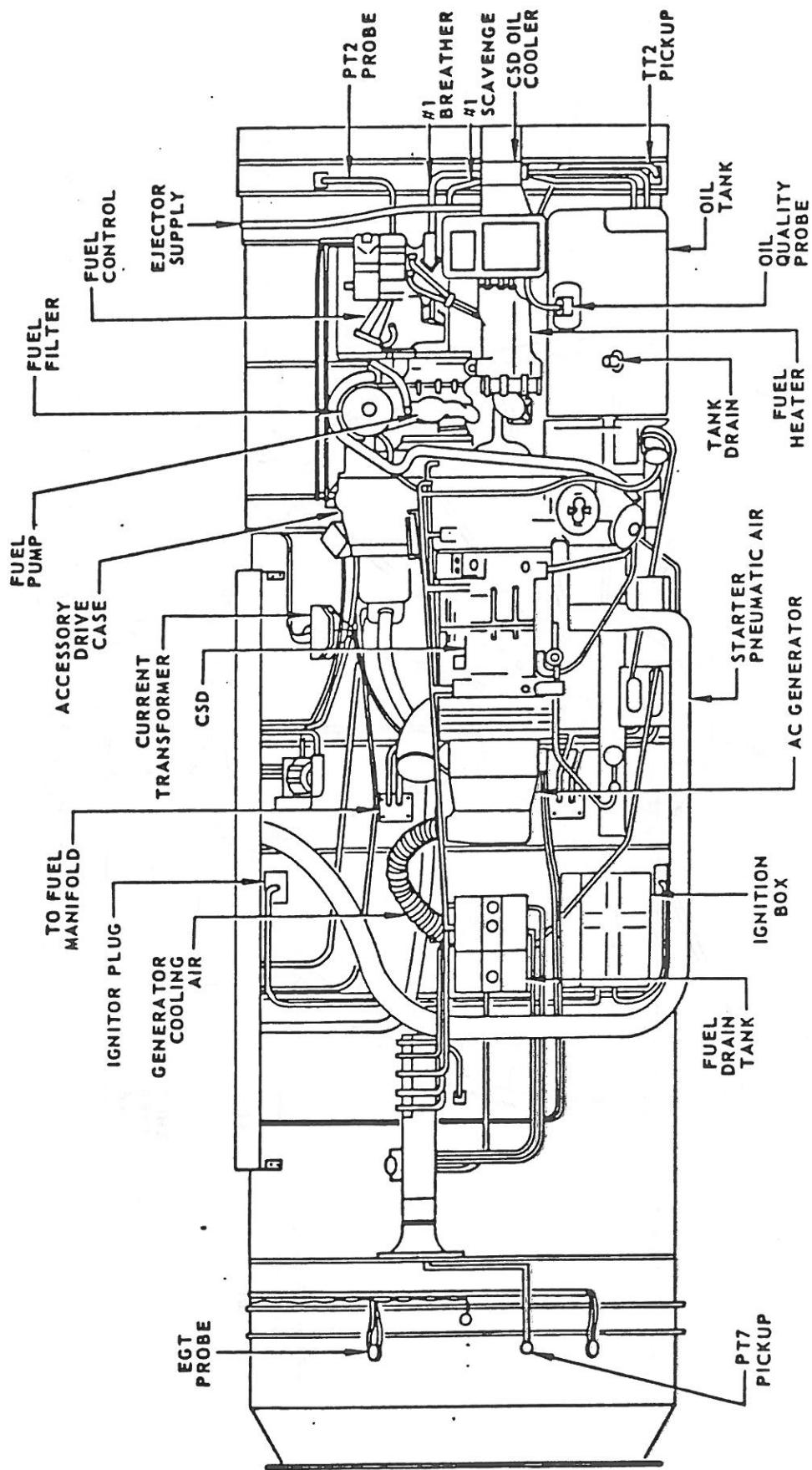
CENTER ENGINE — RIGHT SIDE — JT8D



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 13

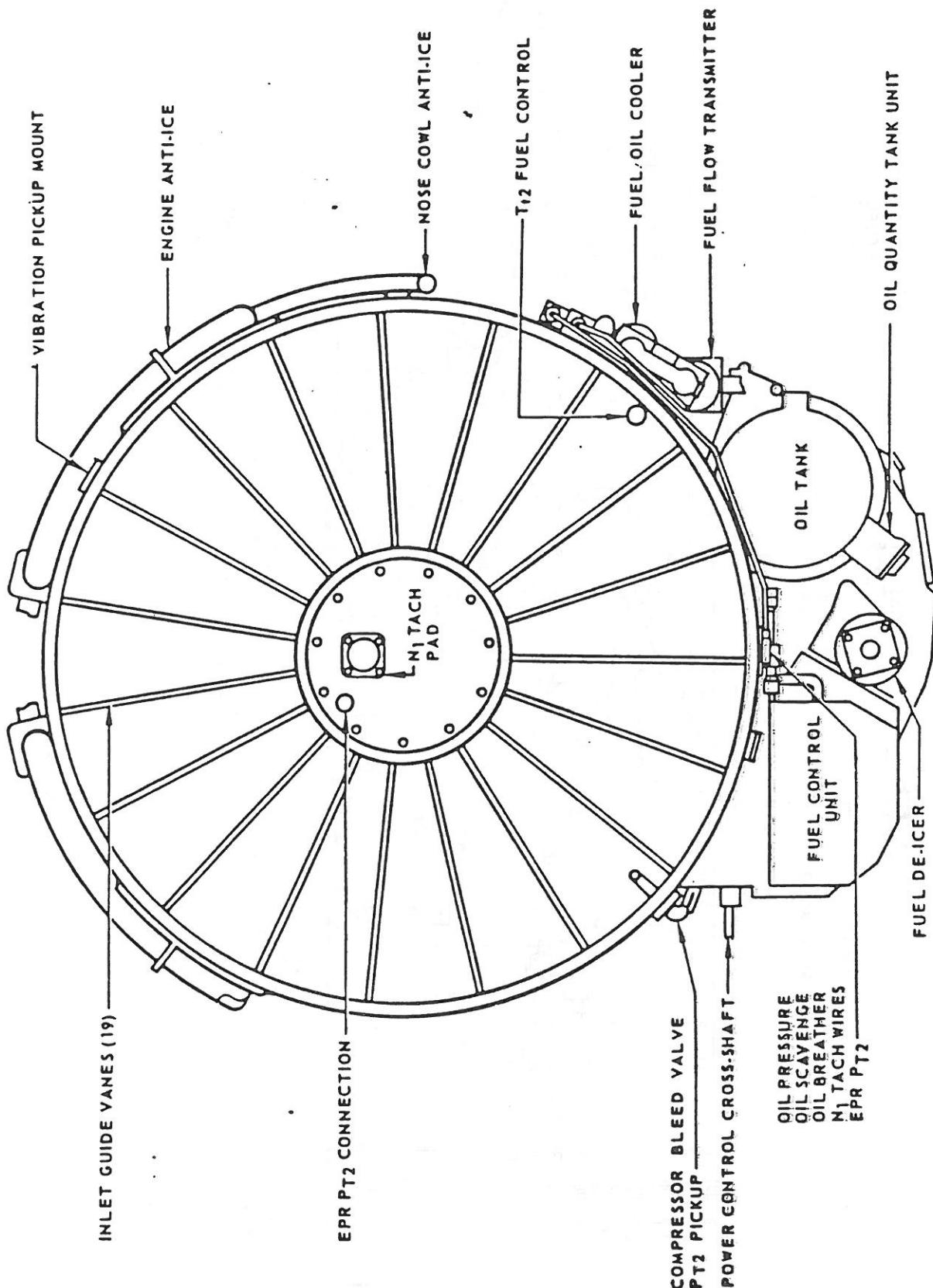


ENGINE BOTTOM VIEW



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 14

ENGINE FRONT VIEW—JT8D



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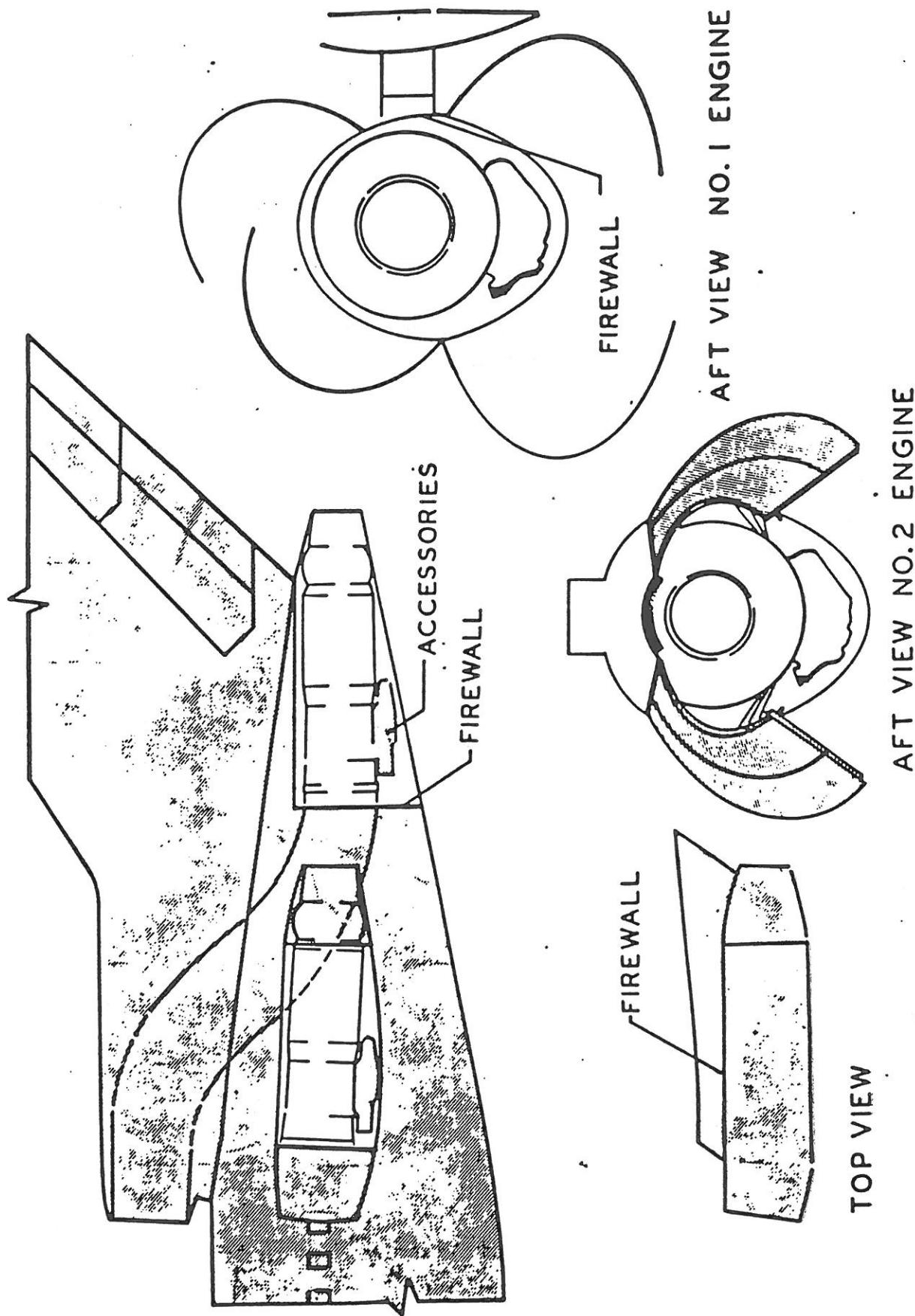
SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 15

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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 16

B-727 ENGINE COWLING



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 17

A ENGINE COWLING (ATA 71-10)

1. General Description

- a. The engines are covered by cowl panels to provide a smooth airflow over the engine and to protect exterior engine components from damage. The cowl panels for the side engines include a nose cowl, upper and lower hinged removable cowl panels, and a fixed cowl panel. The center engine is covered by four hinged removable side cowl panels. A nose dome is also fitted on each engine. Titanium and steel fireshields are bonded to the inside of the outer skin in areas in which a fire may occur. The cowl panels are designed to be drip-free. Drain holes and drain tubes in the lower surfaces of the cowl panels collect any engine leakage fluids in a drain manifold to be exhausted overboard in flight.

2. Center Engine Cowl Panels

- a. The center engine cowl panels form part of the aft fuselage contour. The forward left and right panels fair with aft fuselage skin. The aft panels fair with the thrust reverser shroud ring and the thrust reverser actuator fairing. Refer to Chapter 78, "Exhaust." Each panel is hinged at the top by fittings on the center engine support rib. Three hook latch fasteners join opposite panels at the under-side of the engine. Two safety latches at the top of each panel prevent an open cowl from being removed until the latches are depressed. The safety latches automatically trip into the locked position when the panels are closed. An indicator on each safety latch shows when the latch is in the locked or unlocked position. "Hold open" rods, installed in each panel, allow the panels to be propped in the open position. Safety pins are provided to lock the rods in either the open or stowed position.
- b. The left forward cowl panel is provided with an access door to facilitate servicing the engine oil tank. Exhaust ports are provided on the left aft cowl panel to accommodate engine gearcase breather air and on the left forward cowl panel, to exhaust fuel heater air and constant speed drive oil cooler air. An exhaust port on the right aft cowl panel is provided to exhaust generator cooling air. An overboard drain mast, installed on the right aft cowl panel, evacuates the engine fluid drain tank during flight. Three blowout doors, one on the right forward cowl panel and two on the right aft cowl panel, relieve excessive pressure which could develop within the cowling during a fire.

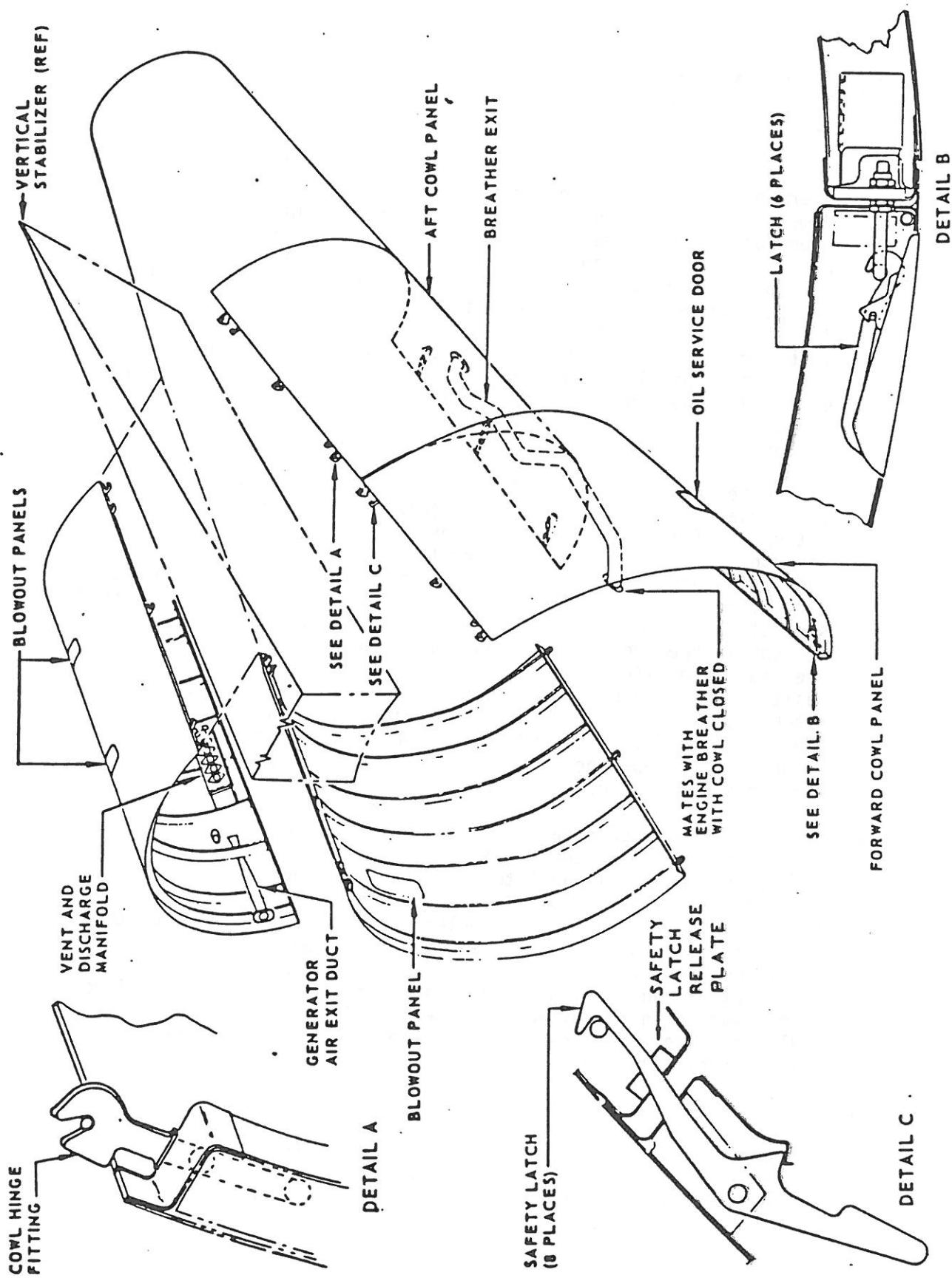
3. Side Engine Removable Cowl Panels

- a. The side engine upper and lower cowl panels fair with the engine nose cowl, with a fixed cowl panel attached to the inboard side of the engine, and with the thrust reverser shroud ring. Six hook



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SUBJECT: B727 ENGINES ATA 71-80DOC ID 1216EDATE 12/89PAGE 18

REMOVABLE COWLING NO. 2 ENGINE



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 19

latch fasteners attach the upper and lower cowl panels to the fixed cowl panel. Six other hook latch fasteners join the upper and lower cowl panels together. Three forward and three aft pin latches ensure positive attachment of the cowls and serve as hinges permitting each panel to be open from either side. "Hold open" rods for each panel are stowed on the engine, the nose cowl aft structure, and on each panel.

- b. Openings are provided in the lower cowl panel for the engine gearbox breather, the constant speed drive cooling air exhaust, the generator cooling air exhaust, and overboard drain mast, and an oil tank access panel. On some airplanes, a starter override and CSD access door is also fitted to the lower cowl panel. The upper cowl panel is fitted with a blowout door.

4. Side Engine Nose Cowl

- a. The nose cowl is bolted to the forward flange of the side engine inlet case. It is shaped to obtain a smooth airflow over the engine and to provide an optimum airflow to the engine compressor inlet. An anti-icing air inlet is located on the rear face of the nose cowl at approximately the 9 o'clock position. Three pin latches, two on the inboard side and one outboard, join the nose cowl to the upper and lower cowl panels. A constant speed drive cooling air scoop is located on the underside of the nose cowl. The nose cowl is anti-iced by engine bleed air. Refer to Chapter 30, Ice and Rain Protection.

5. Side Engine Fixed Cowl Panel

- a. A four piece fixed cowl panel, mounted on the inboard side of each side engine, fairs with the upper and lower cowl panels. The fixed cowl supports the side engine upper and lower cowl panels.

6. Nose Dome

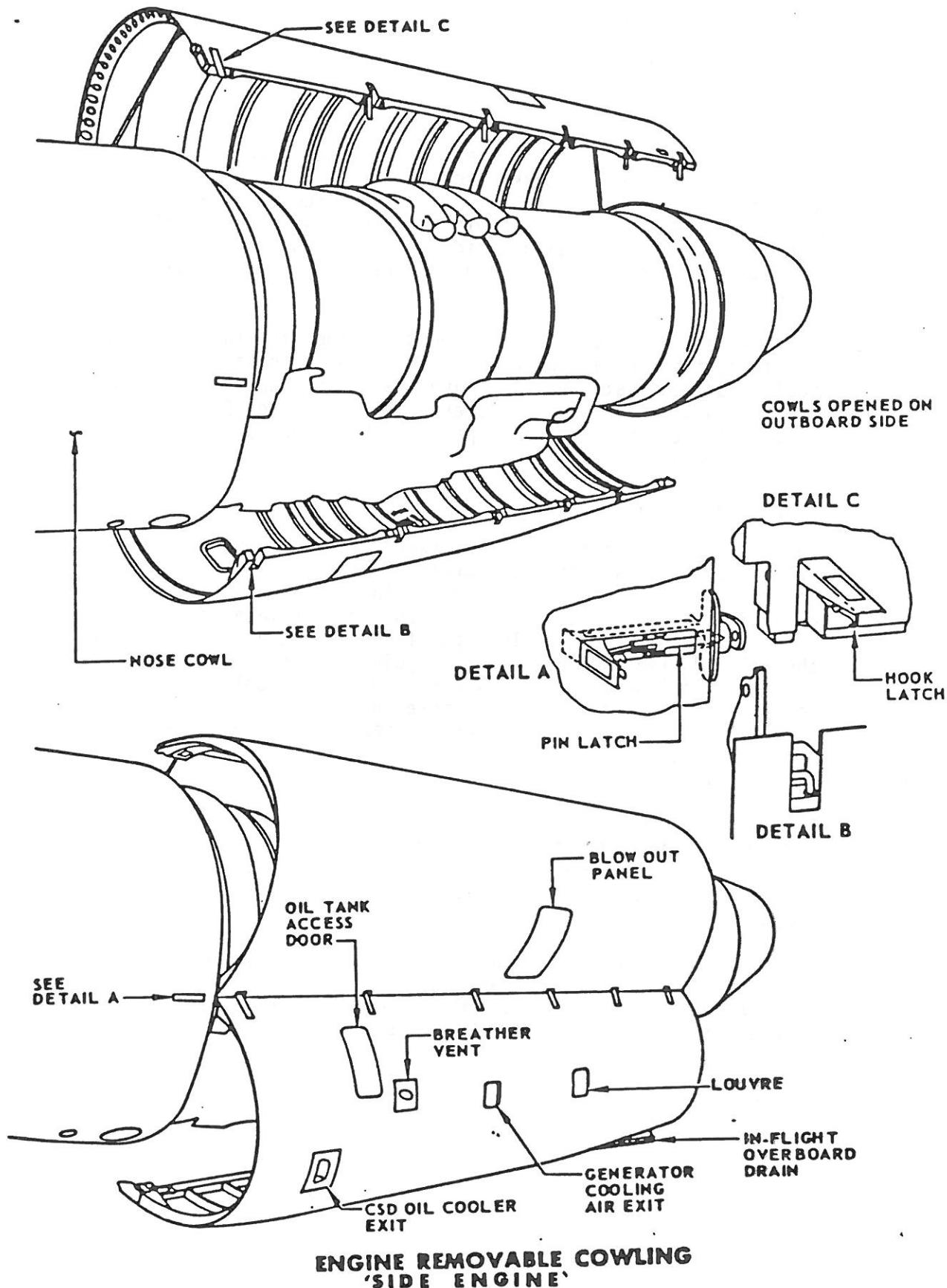
- a. A nose dome is mounted on each engine to provide a smooth airflow over the front accessory drive housing. The nose dome covers the N1 tachometer generator. An inlet pressure sensing probe (Pt2) is mounted in the center of the nose dome.



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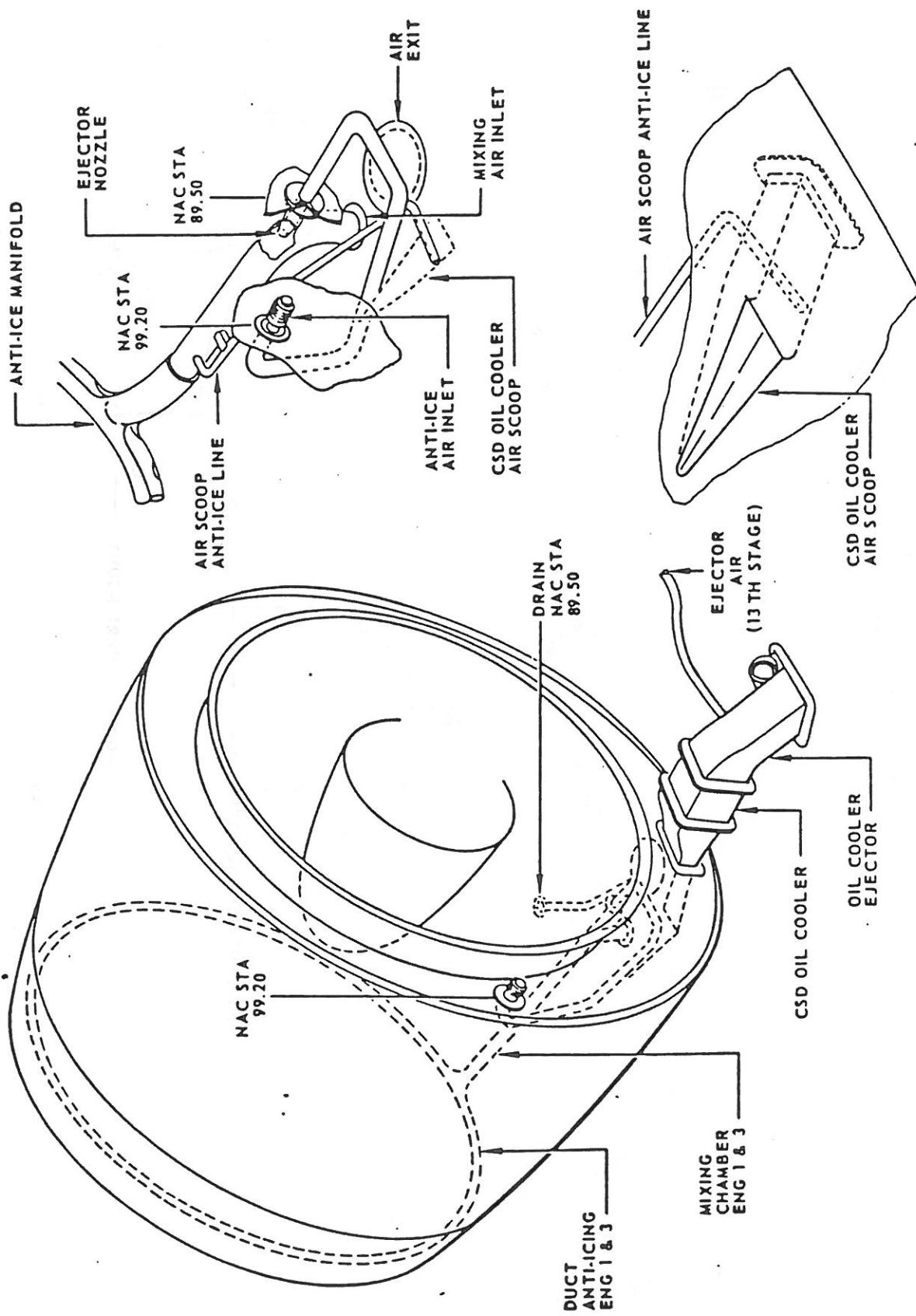
SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 20





MAINTENANCE TECHNICAL TRAINING

FOR TRAINING PURPOSES ONLY

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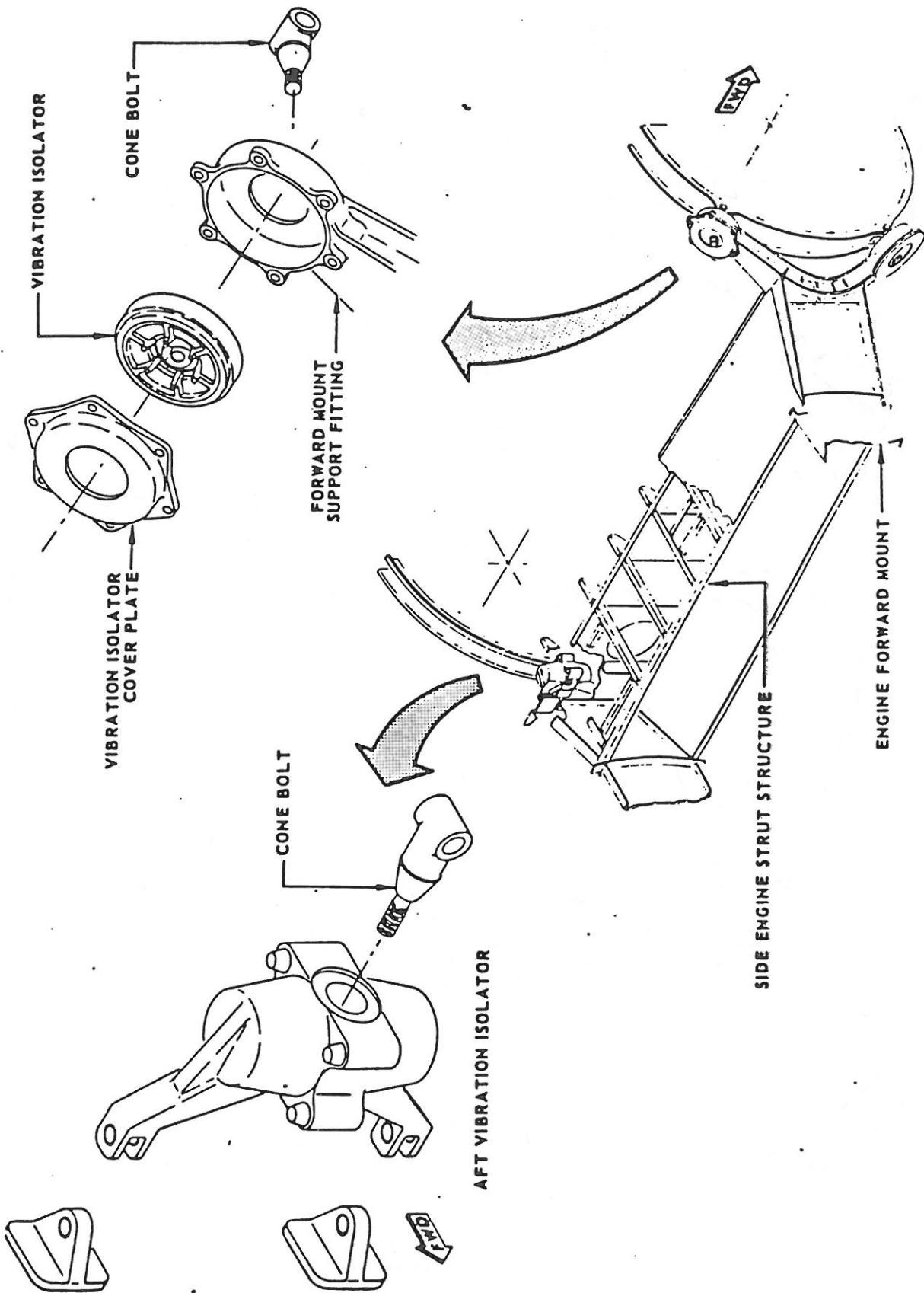
ENGINE NOSE COWL-1 AND 3 ENGINES



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 22



ENGINE MOUNT INSTALLATION — ENGINES 1 AND 3



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 23

A. VIBRATION ISOLATOR ENGINE MOUNTS (ATA 71-21-0)

1. General Description

- a. The vibration isolator engine mounts support the JT8D-1 power plants and isolate the airplane fuselage from adverse engine vibrations. Each power plant is supported by two forward vibration isolator mounts and a single aft mount. The two forward mounts are identical and may be used on the center engine or either side mounted engine. The aft mounts on the side mounted engines are also identical and may be used to support the aft end of either side engine. The center engine aft mount may only be used on the center engine.
- b. The forward vibration isolator engine mounts carry vertical, side, and axial (thrust) loads and allow for engine growth due to thermal expansion. The aft mounts take only vertical and side loads; however, they will also accommodate thermal expansion of the engine without applying axial loads on the engine flanges.
- c. Each vibration isolator engine mount consists of one vibration isolator and one cone bolt. A pair of vibration isolator fittings are used to support the vibration isolators on the center engine.

2. Vibration Isolators

- a. The vibration isolators consist of a resilient material permanently enclosed in a metal case. As an engine vibrates the resilient material deforms slightly, thereby dampening the vibrations before they reach the fuselage area. If complete failure or loss of the resilient material occurs, the isolators will continue to support the engine.
- b. Each forward vibration isolator for the center engine is installed in a vibration isolator fitting. The side engine forward vibration isolators are located in forward mount support fittings. A projection on each forward isolator mates with a hole in the fitting to provide positive orientation of the isolator. Vibration isolator cover plates retain the forward isolators in position.
- c. The center engine aft vibration isolator is bolted to the engine rear mount bracket. On side mounted engines, the aft vibration isolator is bolted to brackets on the engine rear mount support fitting.

3. Cone Bolts

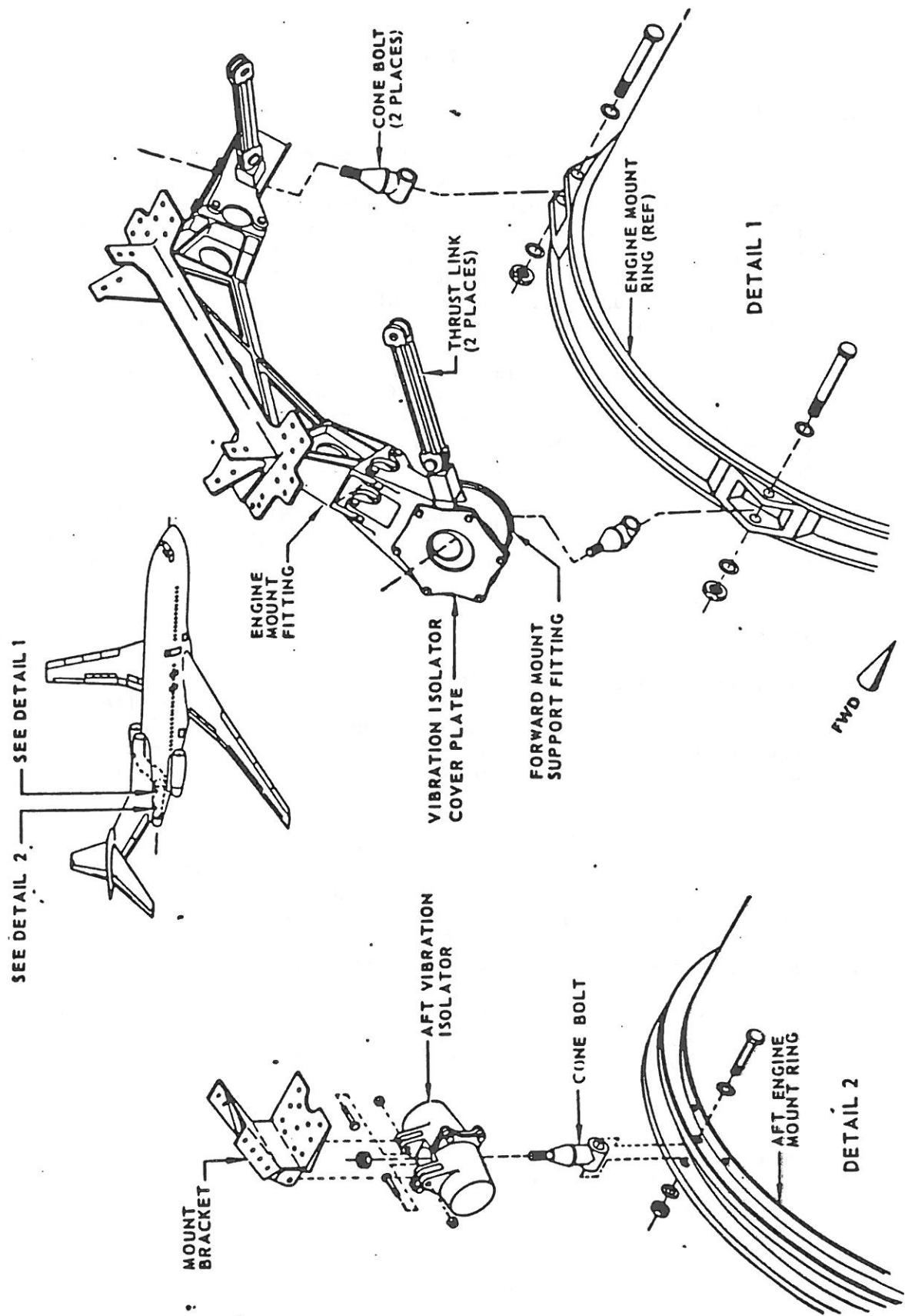
- a. Three cone bolts are used to attach each engine to the vibration isolators. The two forward cone bolts are identical and may be used in any forward position to support either engine. The aft cone bolt on each engine may also be used in any aft position on either engine.



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 24



ENGINE MOUNT INSTALLATION – ENGINE 2



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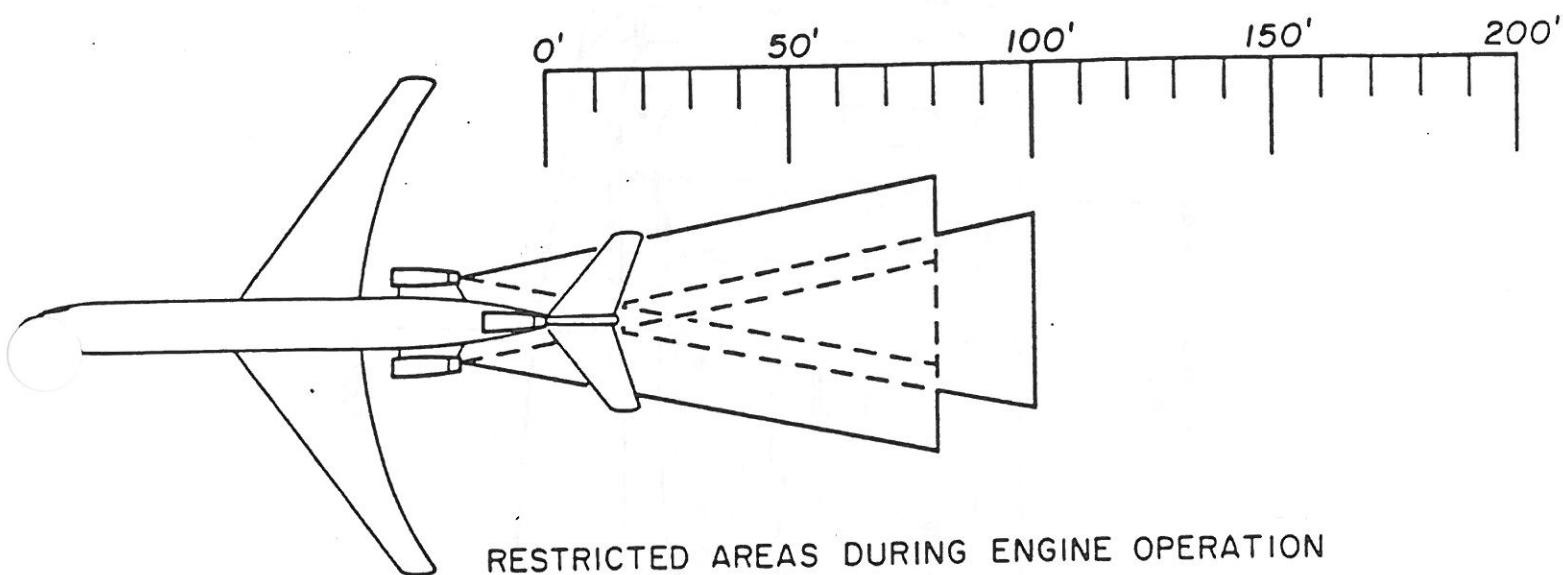
SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 25

4. Center Engine Forward Vibration Isolator Fittings

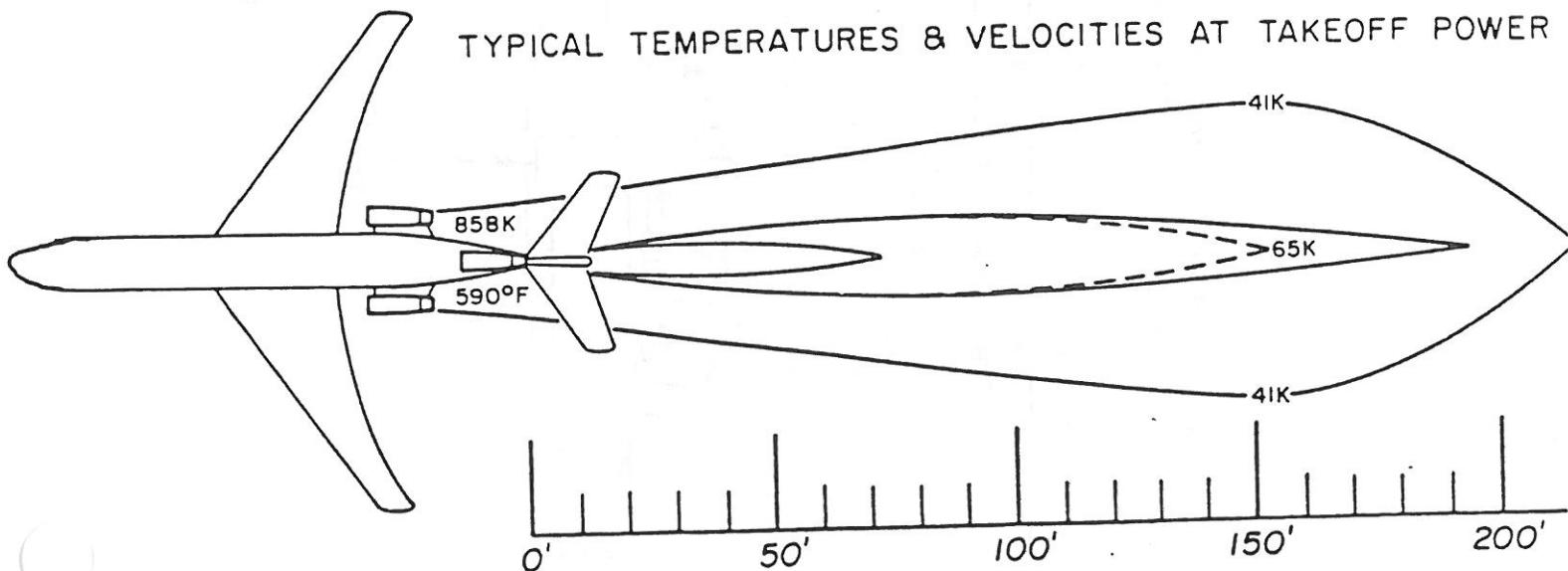
The center engine forward vibration isolator fittings support the forward vibration isolators on the center engine. These fittings are bolted to the forward engine mount fitting and to a pair of thrust link fittings.

5. Engine Support Fittings

The engine support fittings are described in Chapter 54, Nacelles/Pylons.



RESTRICTED AREAS DURING ENGINE OPERATION



JT8D HAZARD AREAS



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SUBJECT: B727 ENGINES ATA 71-80 DOC ID 1216E DATE 12/89 PAGE 26

