

CHAPTER

72

Engine

(CFM56 ENGINES (CFM56-7))

CHAPTER 72
ENGINE

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ENGINE**

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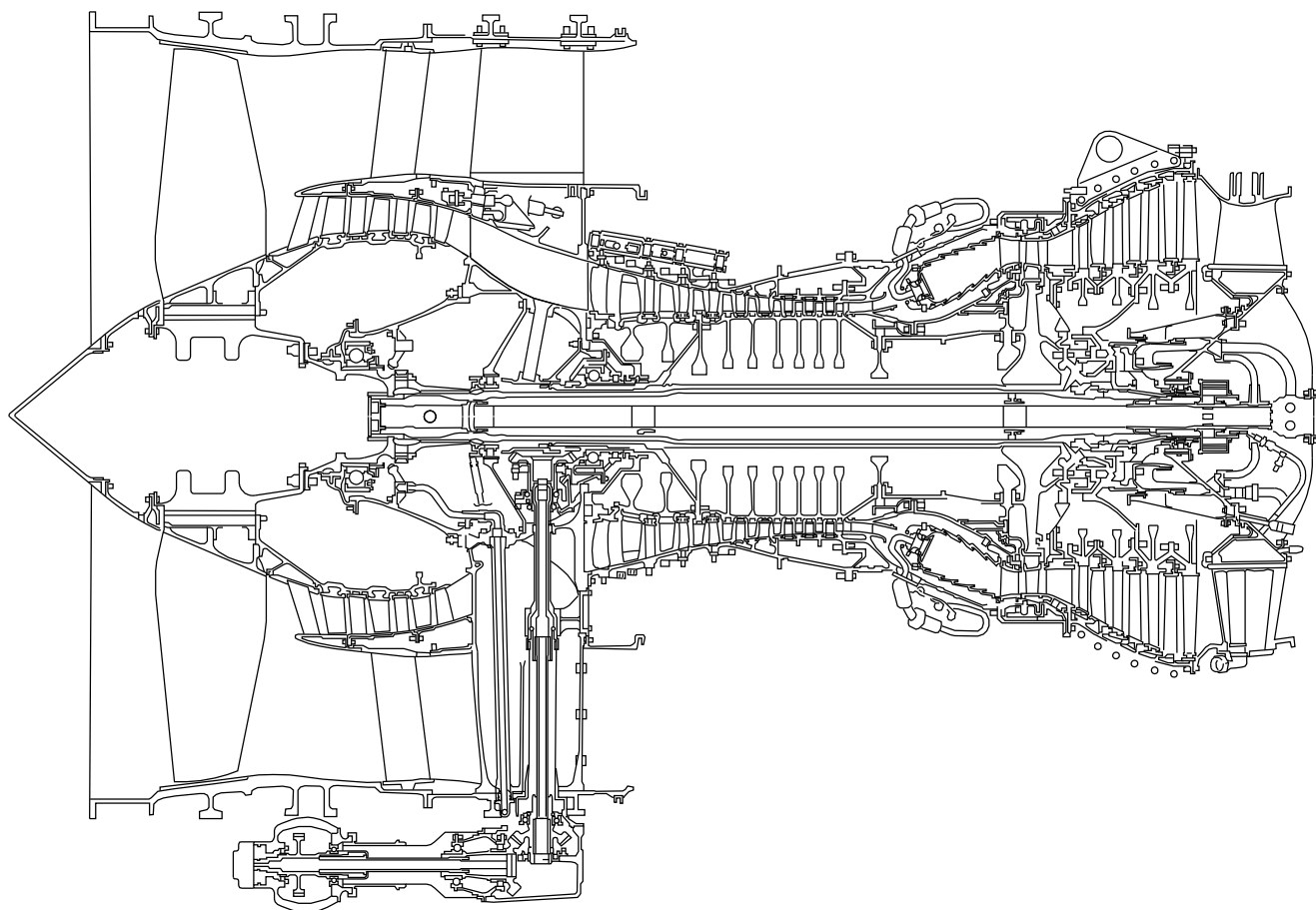
**ENGINE - INTRODUCTION****Purpose**

The engines supply thrust to the airplane. The engines also supply power to these airplane systems:

- Electrical
- Hydraulic
- Pneumatic.

Abbreviations and Acronyms

- AGB - accessory gearbox
- HDS - horizontal drive shaft
- HPC - high pressure compressor
- HPT - high pressure turbine
- IDG - integrated drive generator
- IGB - inlet gear box
- LPC - low pressure compressor
- LPT - low pressure turbine
- RDS - radial drive shaft
- TGB - transfer gear box



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ENGINE - INTRODUCTION

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ENGINE - GENERAL DESCRIPTION

General

The CFM56-7 is a high bypass, dual rotor, axial flow turbofan engine. The engine fan diameter is 61 inches (1.55 meters). The bare engine weight is 5257 pounds (2385 kilograms).

The engine has these sections:

- Fan and booster
- High pressure compressor (HPC)
- Combustor
- High pressure turbine (HPT)
- Low pressure turbine (LPT)
- Accessory drive.

The fan and booster rotor and the LPT rotor are on the same low pressure shaft (N1).

The HPC rotor and the HPT rotor are on the same high pressure shaft (N2).

Fan and Booster

The fan and booster is a four-stage compressor.

The fan increases the speed of the air. A splitter fairing divides the air into these two air flows:

- Primary
- Secondary.

The primary air flow goes into the core of the engine. The booster increases the pressure of this air and sends it to the HPC.

The secondary air flow goes in the fan duct. It supplies approximately 80 percent of the thrust during take-off.

High Pressure Compressor (HPC)

The HPC is a nine-stage compressor. It increases the pressure of the air from the LPC and sends it to the combustor. The HPC also supplies bleed air for the aircraft pneumatic system and the engine air system.

Combustor

The combustor mixes air from the compressors and fuel from the fuel nozzles. This mixture of air and fuel burns in the combustion chamber to make hot gases. The hot gases go to the HPT.

See the engine fuel and control chapter for more information on the fuel nozzles. (CHAPTER 73)

High Pressure Turbine (HPT)

The HPT is a single-stage turbine. It changes the energy of the hot gases into a mechanical energy. The HPT uses this mechanical energy to turn the HPC rotor and the accessory drive.

Low Pressure Turbine (LPT)

The LPT is a four-stage turbine. It changes the energy of the hot gases into a mechanical energy. The LPT uses this mechanical energy to turn the fan and booster rotor.

Accessory Drive

The accessory drive has these components:

- Inlet gear box (IGB)
- Radial drive shaft (RDS)
- Transfer gear box (TGB)
- Horizontal drive shaft (HDS)
- Accessory gear box (AGB).

The N2 shaft turns the AGB through these shafts and gearboxes:

- IGB
- RDS
- TGB
- HDS.

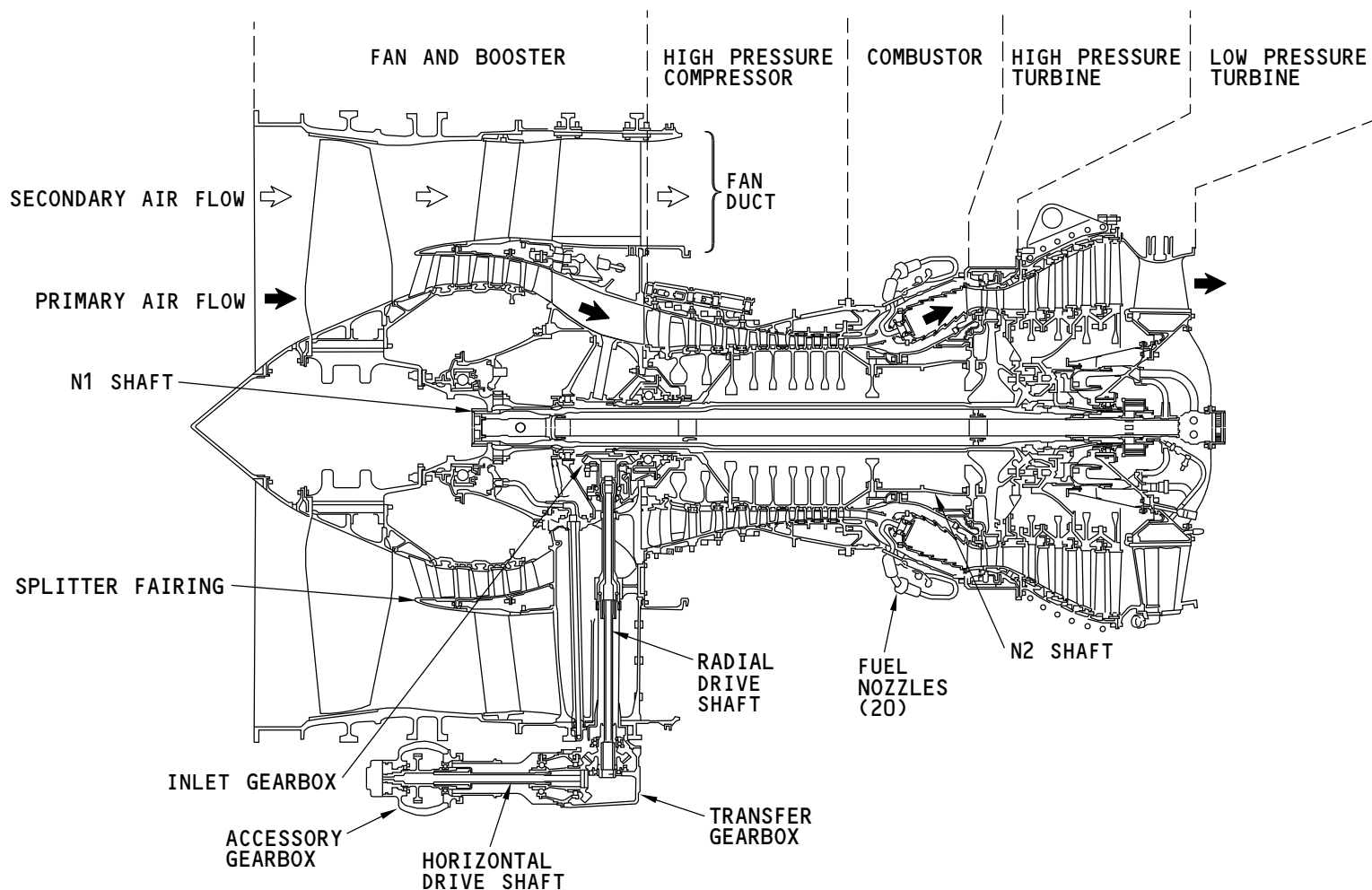
The AGB holds and operates the airplane accessories and the engine accessories. They are described later in this section.

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ENGINE - GENERAL DESCRIPTION

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**ENGINE - MAIN ENGINE BEARINGS****General**

Five main engine bearings hold the N1 shaft and the N2 shaft. Numbers from 1 to 5 identify the engine bearings. Ball bearings absorb the axial and the radial loads from the shafts. Roller bearings absorb only radial loads.

The main engine bearings are in two sump cavities. The sump cavities are the forward sump and the rear sump.

Main Engine Bearings

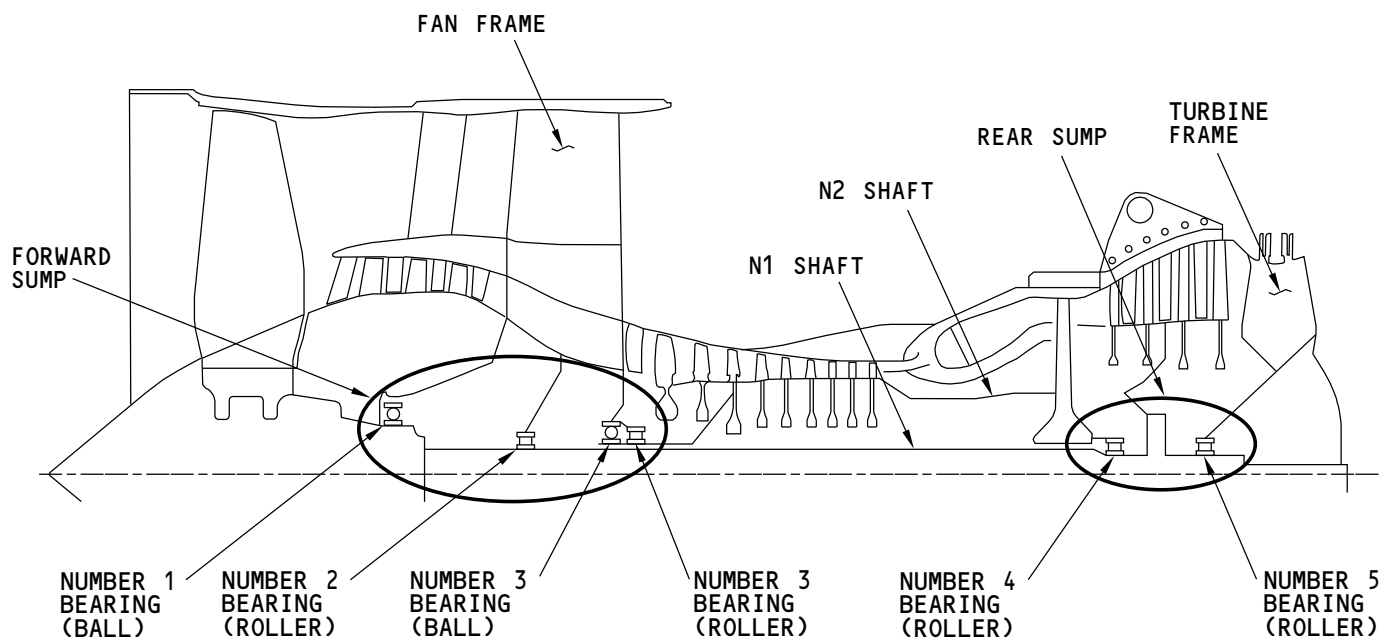
The number 1 and the number 2 bearings hold the front of the N1 shaft.

One ball bearing and one roller bearing are the number 3 bearing assembly. Both number 3 bearings hold the front of the N2 shaft.

The number 4 bearing holds the rear of the N2 shaft.

The number 5 bearing holds the rear of the N1 shaft.

The number 1, 2, and 3 bearings are in the forward sump. The number 4 and 5 bearings are in the rear sump.



ENGINE - MAIN ENGINE BEARINGS

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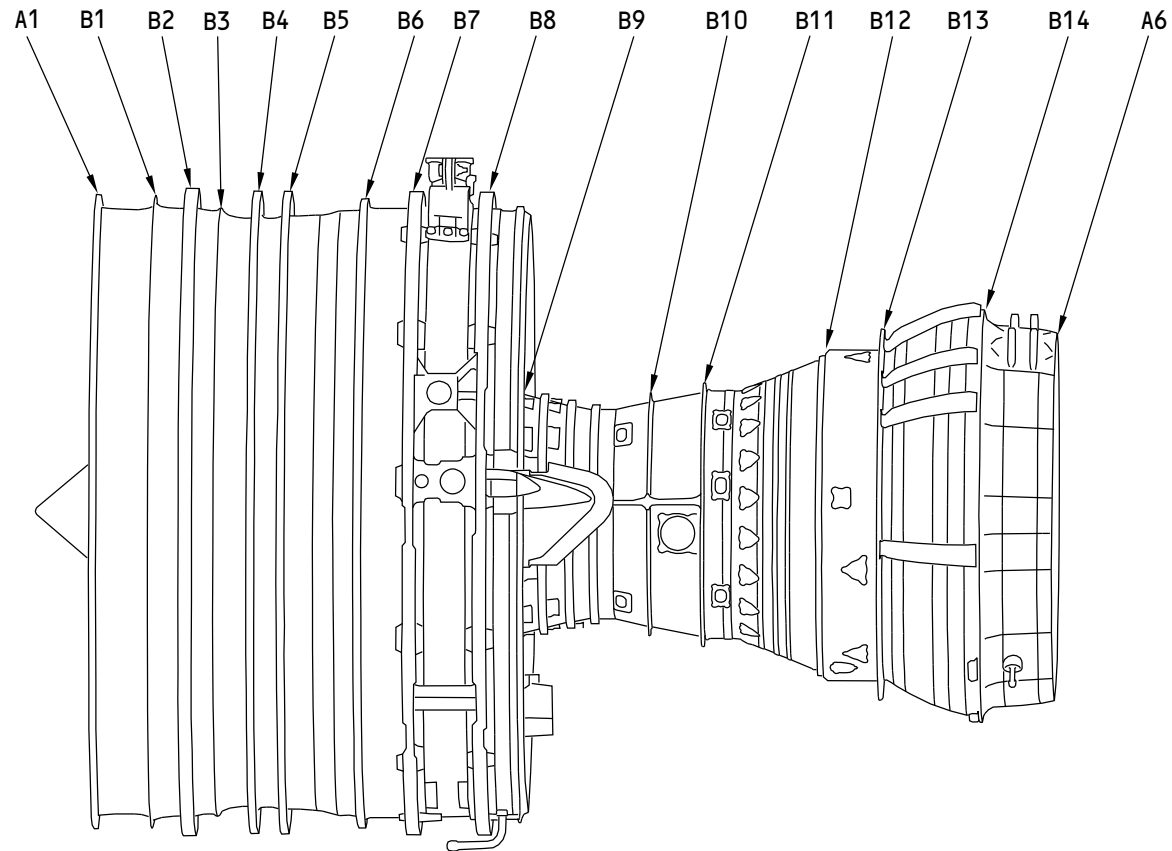
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**ENGINE - ENGINE FLANGE LOCATION****General**

The engine has 16 flanges. The flanges are identified with an alphanumeric designation. The flanges hold various accessories and components. You use the alphanumeric designations to find the position of components on the engine.

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ENGINE - ENGINE FLANGE LOCATION

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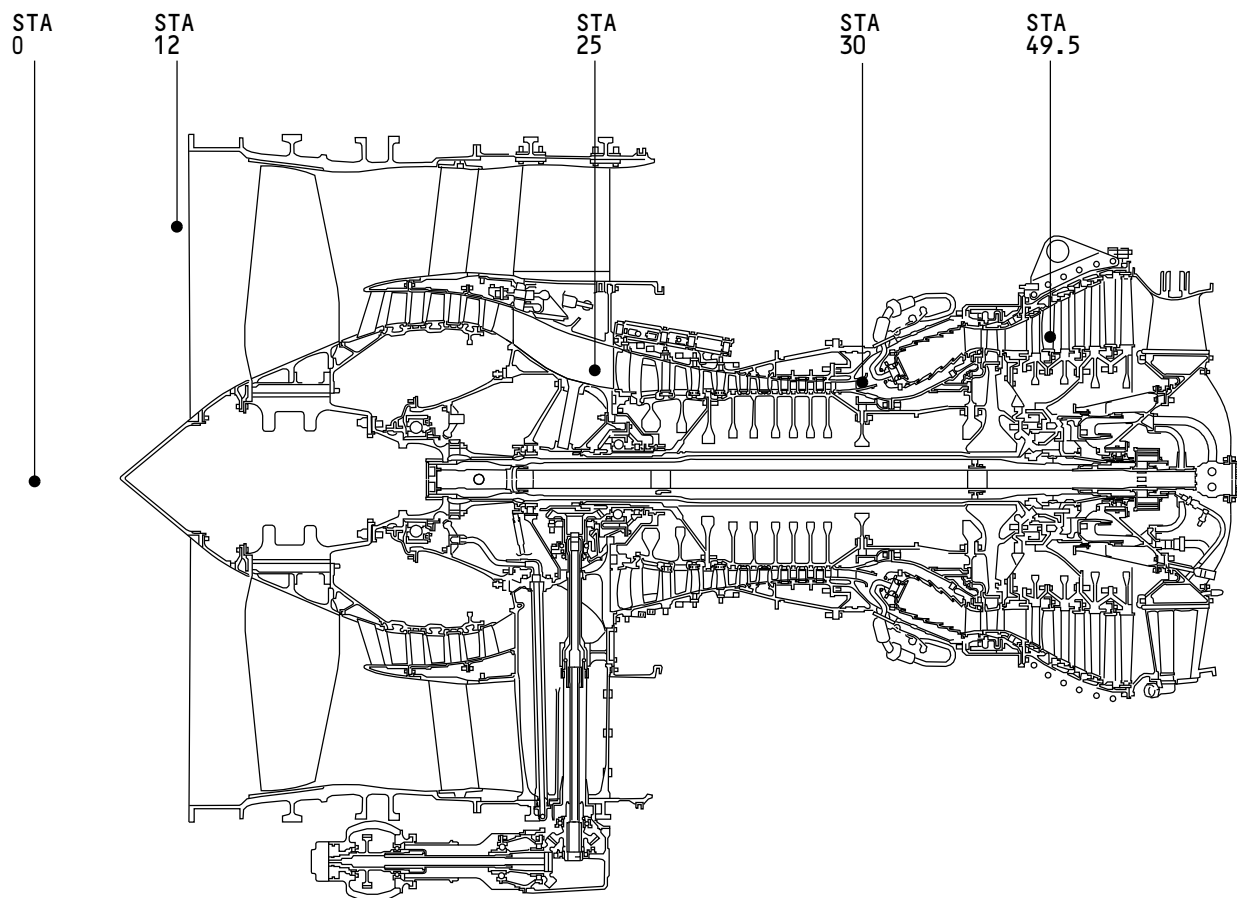
**ENGINE - ENGINE AERODYNAMIC STATIONS****General**

There are probes or sensors at these 5 aerodynamic stations on the CFM56-7.

- Station 0 (ambient air)
- Station 12 (fan inlet)
- Station 25 (high pressure compressor inlet)
- Station 30 (high pressure compressor discharge)
- Station 49.5 (stage 2 low pressure turbine stator).

See the engine fuel and control chapter for more information on engine fuel and control. (SECTION 73-00)

See the engine indicating chapter for more information on the probes and sensors. (SECTION 73-21)



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ENGINE - ENGINE AERODYNAMIC STATIONS

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**ENGINE - ACCESSORY DRIVE - COMPONENT LOCATIONS****General**

The accessory gearbox (AGB) is on the left side of the engine, on the fan inlet case. The AGB sends torque from the N2 rotor through spur gears to turn the engine and airplane accessories. They are line replaceable units. You get access to the AGB and the accessories when you open the left fan cowl.

Accessories Locations

These engine and airplane accessories are on the front face of the AGB:

- EEC alternator
- N2 sensor
- Hand cranking pad
- Engine air starter
- Integrated drive generator (IDG)
- Hydraulic pump.

These engine accessories are on the rear face of the AGB:

- Fuel pump package (fuel pumps, HMU, and main oil/fuel heat exchanger)
- Lubrication unit
- Scavenge oil filter.

Training Information Point

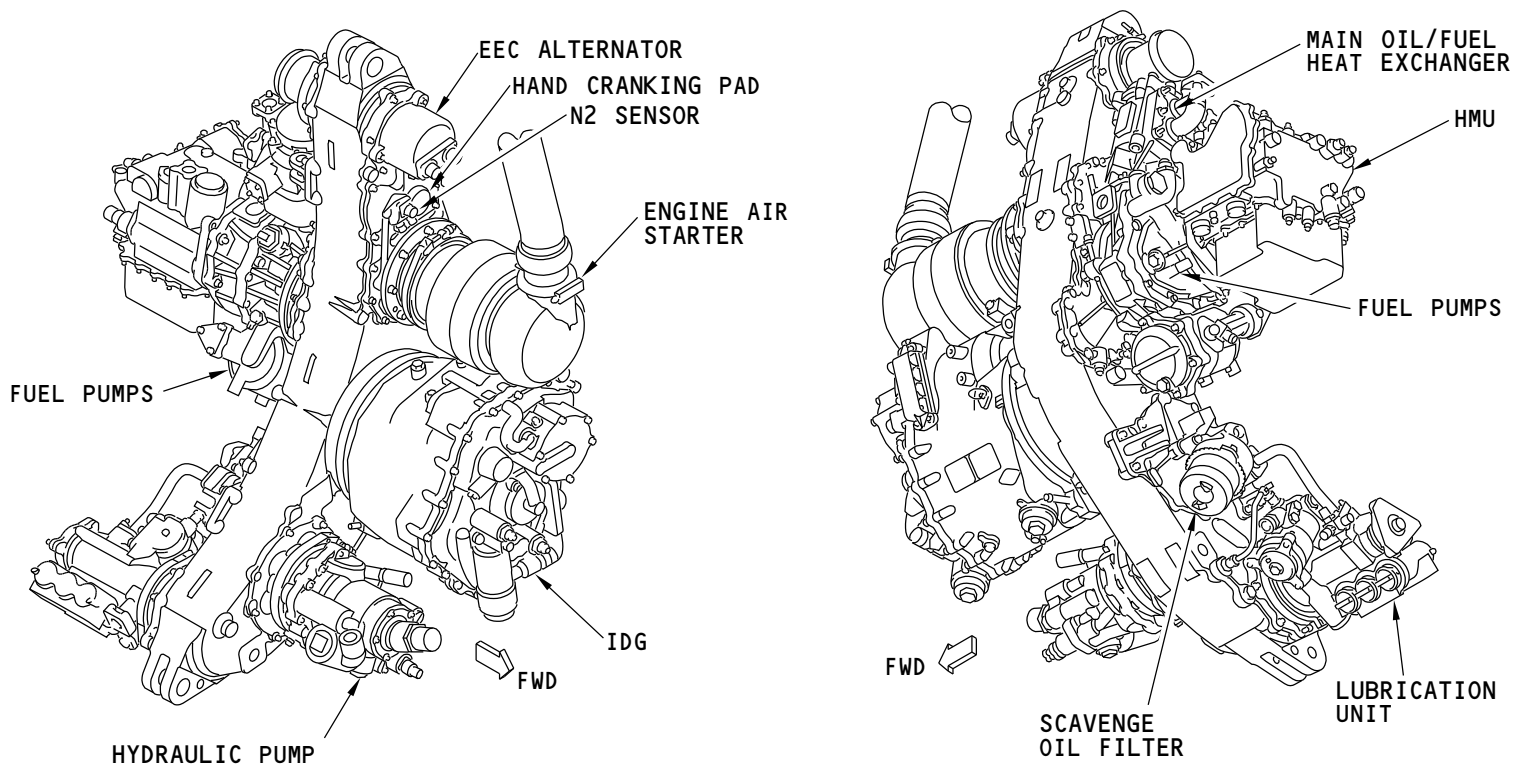
You use the hand cranking pad to turn the N2 rotor during borescope inspection.

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ENGINE - ACCESSORY DRIVE - COMPONENT LOCATIONS

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ENGINE - FAN BLADES AND SPINNERS

Front and Rear Spinner Cones

The front and rear spinner cones are aerodynamic fairings which direct engine inlet airflow.

Fan Blades

There are 24 wide-chord, titanium fan blades. A spacer shim under each fan blade holds it in the correct radial position. You remove the spacer shim to make it easier to remove the fan blade. The platforms between the blades make the airflow smooth. The fan retaining flange and retaining ring holds the fan blade spacer shims and platforms.

You read this information engraved under the root of the fan blade:

- Part number
- Serial number
- Momentum weight.

When you remove or replace fan blades, record the position and the serial number of the blades. That lets you do these tasks:

- Install the blades you removed in the same position to keep the engine in balance
- Calculate the spare blades position and the momentum weight correction when you replace blades.

Balance Weight Screws

You balance an engine with balance weight screws. You install the balance weight screws on the rear spinner.

Offset Holes

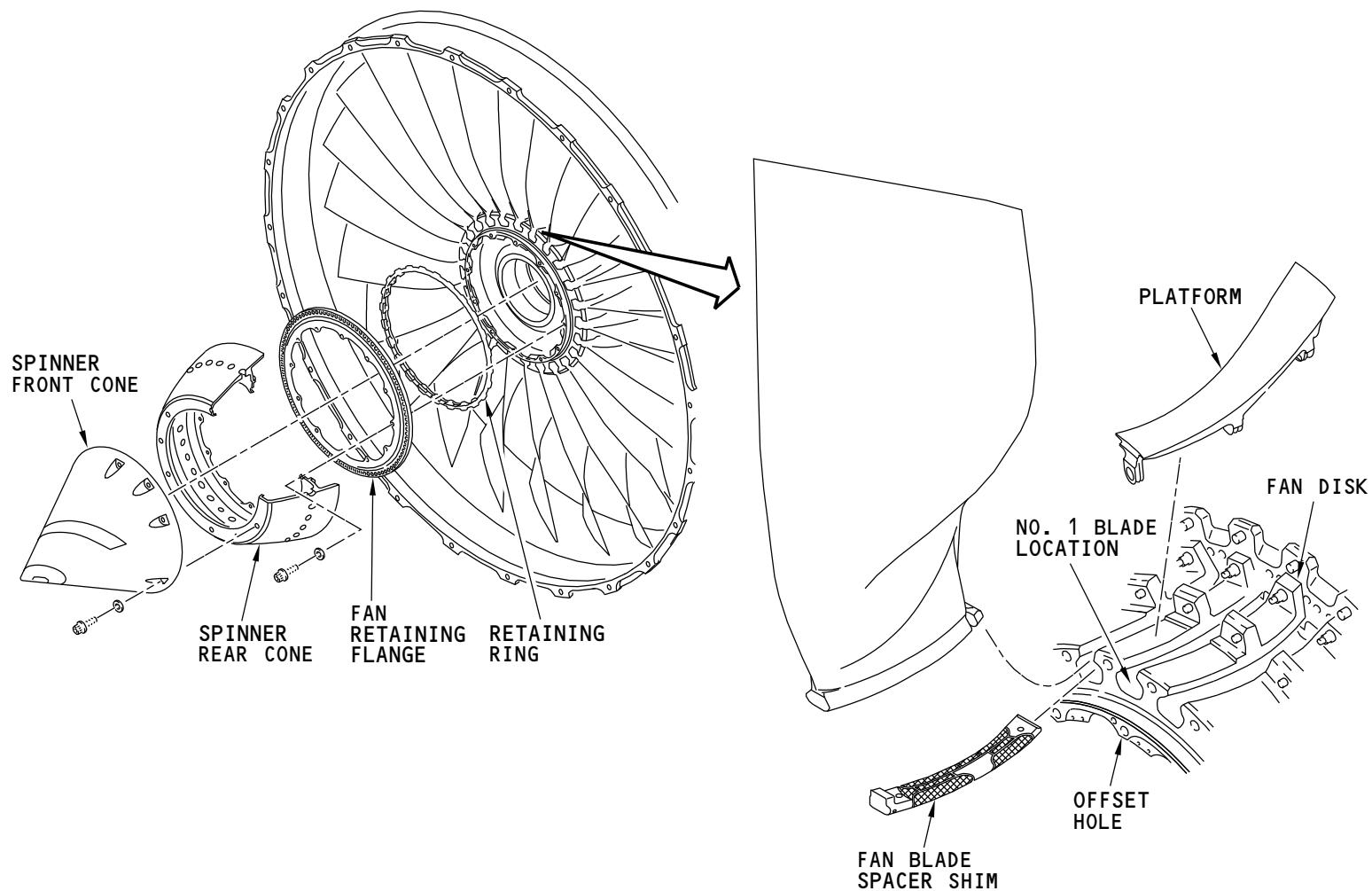
The offset holes let you install the spinner cones and the fan retaining flange in only one correct angular position. Spherical indents show the offset holes. There are offset bolt holes or threads on these components:

- Spinner Front Cone
- Spinner Rear Cone

- Fan Retaining Flange
- Fan disk.

Training Information Point

You must remove the spinner front cone to remove the spinner rear cone. You remove the spinner rear cone, fan retaining flange and the retaining ring to get access to the fan blades. You must remove the adjacent platforms and the fan blade spacer shim to remove a fan blade.



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ENGINE - FAN BLADES AND SPINNERS

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