

U.S.C.G. Merchant Marine Exam
Assistant Engineer, Limited
Q612 Gas Turbine Plants
(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. For the GE LM2500 gas turbine engine shown in the illustration, the HP turbine 1st stage nozzle vanes are cooled by which of the following? Illustration GT-0020
- (A) 8th stage compressor air.
 - (B) 9th stage compressor air.
 - (C) 13th stage compressor air.
 - (D) 16th stage compressor air.

If choice D is selected set score to 1.

2. An axial compressor stage is represented by which of the following components and in which order?
- (A) One set of rotating blades, one set of stationary vanes.
 - (B) One set of stationary vanes, one set of rotating blades.
 - (C) One set of rotating blades, two sets of stationary vanes.
 - (D) One set of rotating vanes, one set of stationary blades.

If choice A is selected set score to 1.

3. Which of the following statements correctly describes force?
- (A) Force is not a vector quantity.
 - (B) Force is a scalar quantity.
 - (C) Force is work in a unit of time.
 - (D) Force has magnitude and direction.

If choice D is selected set score to 1.

4. As shown in the illustration, what is the purpose of pressurizing the main bearing lube oil sumps on a typical marine gas turbine? Illustration GT-0023
- (A) Provides uniform lube oil distribution around the bearing.
 - (B) Minimizes oil leakage from the rotor shaft.
 - (C) Increases lube oil penetration.
 - (D) Assists in cooling the lube oil.

If choice B is selected set score to 1.

5. How many shock mounts are used to secure the GE LM2500 gas turbine enclosure to the ship's foundation?

- (A) 16
- (B) 24
- (C) 32
- (D) 40

If choice C is selected set score to 1.

6. Gas turbine fuel manifold pressure is established by which of the following actions?

- (A) Closing the fuel recirculating valve.
- (B) Starting the fuel service pumps on low-speed.
- (C) Rotating the gas generator.
- (D) Starting the fuel service pumps on high-speed.

If choice C is selected set score to 1.

7. Compressor characteristics are normally summarized in the form of which of the following?

- (A) Venn diagram.
- (B) Straight line graph.
- (C) Compressor map.
- (D) Spread sheet.

If choice C is selected set score to 1.

8. What type of starter is commonly used on smaller gas turbine engines?

- (A) Pneumatic
- (B) Air turbine
- (C) Electric
- (D) Hydraulic

If choice C is selected set score to 1.

9. The thermal energy added to the gas as it flows through the combustion section has what effect on the gas?

- (A) Increase pressure.
- (B) Decrease volume.
- (C) Decrease pressure.
- (D) Increase volume.

If choice D is selected set score to 1.

10. Mechanical work is defined as which of the following?

- (A) A measurement in pounds per square inch.
- (B) Rate of doing work.
- (C) A force acting through a distance.
- (D) Distance traveled over time.

If choice C is selected set score to 1.

11. On the marine gas turbine engine shown in the illustration, the 8th stage bleed air is used for which of the following? Illustration GT-0017

- (A) Power turbine balance piston cavity pressurization.
- (B) Lube oil sump pressurization and cooling.
- (C) High-pressure turbine 2nd stage nozzle cooling.
- (D) Power turbine blade cooling.

If choice B is selected set score to 1.

12. Which of the following could cause compressor stall?

- (A) Air flow over the lower foil section becomes turbulent and destroys the pressure zone.
- (B) The angle at which the hot gases strike the turbine rotor blades is too high.
- (C) The angle at which the air strikes the compressor rotor blades is too high.
- (D) The angle at which the air strikes the compressor rotor blades is too low.

If choice C is selected set score to 1.

13. The Brayton Cycle is a series of events best described by which of the following statements?

- (A) Intake, pressurization, ignition, exhaust.
- (B) Intake, compression, combustion, explosion, exhaust.
- (C) Intake, decompression, combustion, expansion, exhaust.
- (D) Intake, compression, combustion, expansion, exhaust.

If choice D is selected set score to 1.

14. The acronym GG represents which of the following?

- (A) Vibration-gas generator
- (B) Temperature-gas generator
- (C) Gas generator
- (D) Speed-gas generator

If choice C is selected set score to 1.

15. What is the purpose of the spring in a lip-type oil seal?

- (A) To remove burrs and dirt from the shaft
- (B) To keep the neoprene snugly fit around the shaft
- (C) To seal against maximum fluid pressure
- (D) To prevent air from entering the sump

If choice B is selected set score to 1.

16. Compressor surge is caused by which of the following factors?

- (A) Interrupted air flow.
- (B) Maximum fuel pressure.
- (C) Low ambient air temperature.
- (D) Increased demand for secondary air.

If choice A is selected set score to 1.

17. Each stage of an axial compressor of a gas turbine can compress the atmospheric air a total of how many times?

- (A) 1.2 times
- (B) 2.2 times
- (C) 3.2 times
- (D) 4.2 times

If choice A is selected set score to 1.

18. On a propulsion marine gas turbine, if full power temperatures become excessive, what action should the operator take?

- (A) Reduce power to stay within limits.
- (B) Water wash the engine.
- (C) Borescope the engine.
- (D) No action is needed until auto shutdown occurs.

If choice A is selected set score to 1.

19. Accelerating the compressor to the self-sustaining speed of the engine is the function of which of the following components?

- (A) Compressor extension shaft
- (B) Starter
- (C) PT shaft
- (D) Mechanical drive shaft

If choice B is selected set score to 1.

20. For the gas turbine engine lube oil system shown in the illustration, what is the purpose of the lube oil supply check valves? Illustration GT-0024

- (A) keep the lube oil lines in the engine primed
- (B) prevent lube oil contained in the LO storage and conditioning tank from draining into gearboxes and sumps
- (C) prevent the lube oil and scavenge pump from losing its prime
- (D) All of the above

If choice B is selected set score to 1.

21. The bleed air surge relief valve differs from a normal relief valve in which of the following ways?

- (A) Opens completely at a specified lift pressure and closes immediately as soon as the pressure begins to drop.
- (B) Gradually opens at a specified lift pressure and remains open until the pressure drops to a specified preset pressure.
- (C) Opens completely at a specified lift pressure and remains open until the pressure drops to a specified preset pressure.
- (D) Gradually opens at a specified lift pressure and closes immediately as soon as the pressure begins to drop.

If choice C is selected set score to 1.

22. To keep the exit pressures relatively constant across a HP turbine blade, which type of construction is generally utilized?

- (A) Curtis.
- (B) Impulse-Reaction.
- (C) Impulse.
- (D) Rateau.

If choice B is selected set score to 1.

23. In order to get a ready indication for a normal start with a GE LM2500 gas turbine engine, what permissive(s) must be met?

- (A) Bleed air valve must be closed.
- (B) GG speed must be less than 1200 RPM and all engine trips reset.
- (C) Fuel supply pressure must be greater than 8 psig.
- (D) All of the above.

If choice D is selected set score to 1.

24. What is the primary function of the main fuel control on the GE LM2500 gas turbine engine?

- (A) To control fuel pump inlet pressure
- (B) To control stator vane angle and bleed air discharge
- (C) To control stator vane angle and GG speed
- (D) To control fuel temperature

If choice C is selected set score to 1.

25. A gas turbine engine's main lube oil system pump check valve serves to maintain system prime and perform what other function?

- (A) To increase system pressure
- (B) To prevent reverse flow of oil through a secured pump
- (C) To return oil to the main reduction gear sump
- (D) None of the above

If choice B is selected set score to 1.

26. How is the clutch shown in the attached illustration engaged? Illustration GT-0018

- (A) Pneumatic pressure from the compressor engages the clutch.
- (B) Clutch engages automatically when input shaft flange is rotating faster than the output assembly.
- (C) Clutch is engaged manually prior to start up.
- (D) Clutch engages automatically once the output assembly begins rotating.

If choice B is selected set score to 1.

27. The main reduction gear performs which of the following functions?

- (A) It transfers low-speed gas turbine rotation to high-speed propeller rotation
- (B) It increases gas turbine speed for clutch engagement
- (C) It reduces gas turbine speed for clutch engagement
- (D) It transfers high-speed gas turbine rotation to low-speed propeller rotation

If choice D is selected set score to 1.

28. On most marine gas turbines used aboard ships, vibration sensors are identified as which of the following?

- (A) Resistance temperature detectors
- (B) Frequency synthesizers
- (C) Transducers
- (D) Accelerometers

If choice D is selected set score to 1.

29. Which of the following wrenches should NOT be used while working on a gas turbine?

- (A) Adjustable wrench.
- (B) Box wrench.
- (C) Flare nut wrench.
- (D) Crowfoot wrench.

If choice A is selected set score to 1.

30. What type of air seal is used in the combustor and turbine midframe of a gas turbine?

- (A) Pneumatic carbon ring
- (B) Labyrinth-Honeycomb
- (C) Lip-type
- (D) Fishmouth

If choice D is selected set score to 1.

31. In a gas turbine engine, the majority of the energy is added to the working fluid in which of the following components?

- (A) Combustor.
- (B) Power turbine.
- (C) Compressor.
- (D) High-pressure turbine.

If choice A is selected set score to 1.

32. The turbine nozzles convert heat and pressure energy to velocity energy by means of which of the following?

- (A) Deflection process.
- (B) Convergent-Divergent process.
- (C) Divergent process.
- (D) Convergent process.

If choice D is selected set score to 1.

33. Kelvin is the absolute temperature scale that corresponds to which of the following?

- (A) Absolute reading of a measured temperature in degrees Celsius.
- (B) Absolute reading of a measured temperature in degrees Fahrenheit.
- (C) Absolute reading of a measured temperature in degrees Rankine.
- (D) None of the above.

If choice A is selected set score to 1.

34. A centrifugal compressor assembly consists of which of the following?

- (A) A stationary impeller and a rotating diffuser.
- (B) Stationary vanes and rotating blades.
- (C) Rotating pistons and stationary liners.
- (D) A rotating impeller and a stationary diffuser.

If choice D is selected set score to 1.

35. What is a compressor midspan shroud?

- (A) A support for the tips of the stator blades.
- (B) The center of a two-piece rotor blade.
- (C) A method of securing stator blades.
- (D) A brace built into the middle of a rotor blade for damping.

If choice D is selected set score to 1.

36. How do the high-velocity high-temperature gases cause the gas turbine rotor to rotate?

- (A) By creating a low-pressure area before the rotor.
- (B) By converting the high-velocity gas to low-velocity gas.
- (C) By transferring velocity energy and thermal energy to the turbine blades.
- (D) By increasing the velocity of the gases.

If choice C is selected set score to 1.

37. What type of combustor is used by the GE LM2500 gas turbine?

- (A) Can-annular
- (B) Can
- (C) Annular
- (D) Cannular

If choice C is selected set score to 1.

38. What is the term given to the condition in which cyclic pressure changes result in a repetitive failure and recovery of compressor air flow?

- (A) Laminar.
- (B) Turbulence.
- (C) Stall.
- (D) Surge.

If choice D is selected set score to 1.

39. The lube oil scavenge pressure on the gas turbine engine shown in the illustration is sensed by which of the following? Illustration GT-0017

- (A) Manometer
- (B) RTD
- (C) Transducer
- (D) Probe

If choice C is selected set score to 1.

40. Which of the following is NOT a gas turbine auto shutdown parameter?

- (A) Module enclosure fire.
- (B) Power turbine over speed.
- (C) High exhaust gas temperature.
- (D) High compressor discharge pressure.

If choice D is selected set score to 1.

41. What is the function of the stator in an axial gas turbine compressor?

- (A) To convert pressure to velocity.
- (B) To convert velocity to pressure.
- (C) To increase volume.
- (D) To provide velocity energy.

If choice B is selected set score to 1.

42. The acronym CDP stands for which of the following?

- (A) Choke Down Point.
- (B) Coupling Disassembly Point.
- (C) Compressor Discharge Pressure.
- (D) Compressor Discharge Pyrometer.

If choice C is selected set score to 1.

43. Which of the following instruments is designed to help you when performing an internal inspection of the gas turbine engine?

- (A) Telescope
- (B) Stroboscope
- (C) Oscilloscope
- (D) Borescope

If choice D is selected set score to 1.

44. What are the two principle functions of the turbine nozzle guide vanes?

- (A) Convert the heat energy of the hot gases into kinetic energy and direct the flow of gases to the turbine rotor blades.
- (B) Convert the potential energy of the hot gases into heat energy and direct the flow of gases to the turbine rotor blades.
- (C) Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the compressor rotor blades.
- (D) Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the turbine rotor blades.

If choice A is selected set score to 1.

45. How is the HP turbine rotor of the GE LM2500 gas turbine cooled?

- (A) By synthetic lube oil
- (B) By the ship's service sea water cooling system
- (C) By a continuous flow of compressor discharge air
- (D) By an air to air heat exchanger

If choice C is selected set score to 1.

46. What is the most common type of spark igniter used on a gas turbine engine?

- (A) Resistive gap
- (B) Annular gap
- (C) Delayed gap
- (D) Suppression gap

If choice B is selected set score to 1.

47. How do you manually lockout an SSS clutch?

- (A) Remove the SSS clutch locking pawls.
- (B) Calculate the engagement speed of the SSS clutch.
- (C) Using the special wrench provided.
- (D) Using air pressure.

If choice C is selected set score to 1.

48. While standing watch underway on a ship with the gas turbine shown in the illustration, a fire emergency stop is initiated when which of the following occurs? Illustration GT-0017

- (A) Either the primary or reserve gas turbine module CO₂ system activates.
- (B) The fire emergency shutdown switch located on the gas turbine module is activated.
- (C) One of the UV flame detectors is activated.
- (D) All of the above.

If choice D is selected set score to 1.

49. Most GTE fuel nozzles have passages for all of the following except?

- (A) Compressed air.
- (B) Cooling water.
- (C) Secondary fuel flow.
- (D) Primary fuel flow.

If choice B is selected set score to 1.

50. Which of the following is an advantage of a single-shaft gas turbine engine compared to a split-shaft gas turbine engine?

- (A) Lower starting torque
- (B) Reversible
- (C) Fewer moving parts
- (D) Better fuel economy

If choice C is selected set score to 1.

51. What is the disadvantage of a dual-entry centrifugal compressor compared to a single-entry centrifugal compressor?

- (A) The dual-entry compressor has a greater efficiency.
- (B) The dual-entry compressor rotates at slower speeds.
- (C) The dual-entry compressor is larger in diameter.
- (D) The dual-entry compressor utilizes a more complicated inlet ducting.

If choice D is selected set score to 1.

52. All clock positions, engine references, and enclosure references apply to viewing the gas turbine engine shown in the illustration, from which of the following locations? Illustration GT-0017

- (A) Right side of the compressor to the left side.
- (B) Left side of the power turbine to the right side.
- (C) Intake end, looking toward the exhaust end.
- (D) Rear (exhaust end), looking toward the intake end.

If choice D is selected set score to 1.

53. What method is utilized to allow turbine nozzle blades to withstand high inlet temperatures?

- (A) Laser cooling
- (B) Thermoelectric cooling
- (C) Water cooling
- (D) Air cooling

If choice D is selected set score to 1.

54. The lube oil system shown in the illustration, consists of which of the following sub-systems?
Illustration GT-0024

- (A) Lube oil scavenging.
- (B) Sump venting.
- (C) Lube oil supply.
- (D) All of the above.

If choice D is selected set score to 1.

55. Why is the cycle efficiency higher in the intercooled-recuperated cycle as compared to a simple cycle gas turbine? Illustration GT-0031

- (A) The intercooler serves to increase the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to decrease turbine inlet temperature.
- (B) The intercooler serves to increase the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to increase turbine inlet temperature.
- (C) The intercooler serves to reduce the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to decrease required fuel to achieve the turbine inlet temperature.
- (D) The intercooler serves to reduce the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to decrease turbine inlet temperature.

If choice C is selected set score to 1.

56. Under standard atmospheric conditions, 208.7 PSIG converts to approximately what in absolute pressure?

- (A) 104.7 PSIA
- (B) 214.7 PSIA
- (C) 194.0 PSIA
- (D) 223.4 PSIA

If choice D is selected set score to 1.

57. Which of the following designs is the most satisfactory method for attaching turbine blades to the rotor disk?

- (A) Pinning design.
- (B) Locking tab design.
- (C) Fir-tree design.
- (D) Retaining ring design.

If choice C is selected set score to 1.

58. Which of the following terms refers to axial compressor stator blades?

- (A) Nozzles.
- (B) Roots.
- (C) Shrouds.
- (D) Vanes.

If choice D is selected set score to 1.

59. A centrifugal flow gas turbine uses what type of combustion chamber?

- (A) double-annular
- (B) can
- (C) can-annular
- (D) annular

If choice B is selected set score to 1.

60. A compressor is operating at an inlet pressure of 14.7 (atmospheric pressure at the time of measurement) and a compressor discharge pressure of 123 psig. Calculate the absolute pressure ratio across the compressor.

- (A) 8.2:1
- (B) 8.4:1
- (C) 9.4:1
- (D) 10.5:1

If choice C is selected set score to 1.

61. Displacement, velocity and acceleration describe three types of which of the following?

- (A) Random access memory.
- (B) Vibration sensors.
- (C) Filters.
- (D) Multiplexers.

If choice B is selected set score to 1.

62. Which of the following terms refers to thermal energy in transition?

- (A) Power
- (B) Foot-Pound
- (C) Heat
- (D) Horsepower

If choice C is selected set score to 1.

63. For the GE LM2500 gas turbine engine shown in the illustration, the HP turbine 2nd stage nozzle vanes are cooled by which of the following? Illustration GT-0020

- (A) 9th stage compressor air.
- (B) 13th stage compressor air.
- (C) 16th stage compressor air.
- (D) Frame vent bleed air.

If choice C is selected set score to 1.

64. What type of main reduction gear arrangement prevents independent axial and rotational movement of the pinions?

- (A) Independent suspension
- (B) Locked train
- (C) Unlocked train
- (D) Hydraulic suspension

If choice B is selected set score to 1.

65. Compared to other types of engines, what is the biggest advantage of a gas turbine engine?

- (A) Simplicity of the control circuits.
- (B) Highest power-to-weight ratio.
- (C) Low power-to-weight ratio.
- (D) Simplicity of installation.

If choice B is selected set score to 1.

66. In a gas turbine, the air charge is permitted to be compressed adiabatically by what factor, process, or condition?

- (A) Rapid heat transfer
- (B) Low-compression ratio
- (C) Interstage cooling
- (D) Speed of the process

If choice D is selected set score to 1.

67. The primary function of an axial compressor rotor blade is which of the following?

- (A) To use centrifugal force to increase the pressure of the air stream.
- (B) To impart acceleration to the air mass, resulting in an increase in velocity.
- (C) To act as a diffuser to the air flow causing an increase in pressure with a resultant decrease in velocity.
- (D) To change the direction of the air flow.

If choice B is selected set score to 1.

68. Rotation of the controllable-pitch propeller (CPP) blades is achieved through axial movement of what component in the hub body assembly?

- (A) Crosshead
- (B) Sliding block
- (C) Crank pin ring
- (D) Servomotor piston

If choice A is selected set score to 1.

69. What are the two primary sources of deposits that build up on compressor blades?

- (A) Salt spray and carbon residue.
- (B) Lube oil mist and carbon residue.
- (C) Salt spray and lube oil mist.
- (D) Lube oil mist and dry particulate matter.

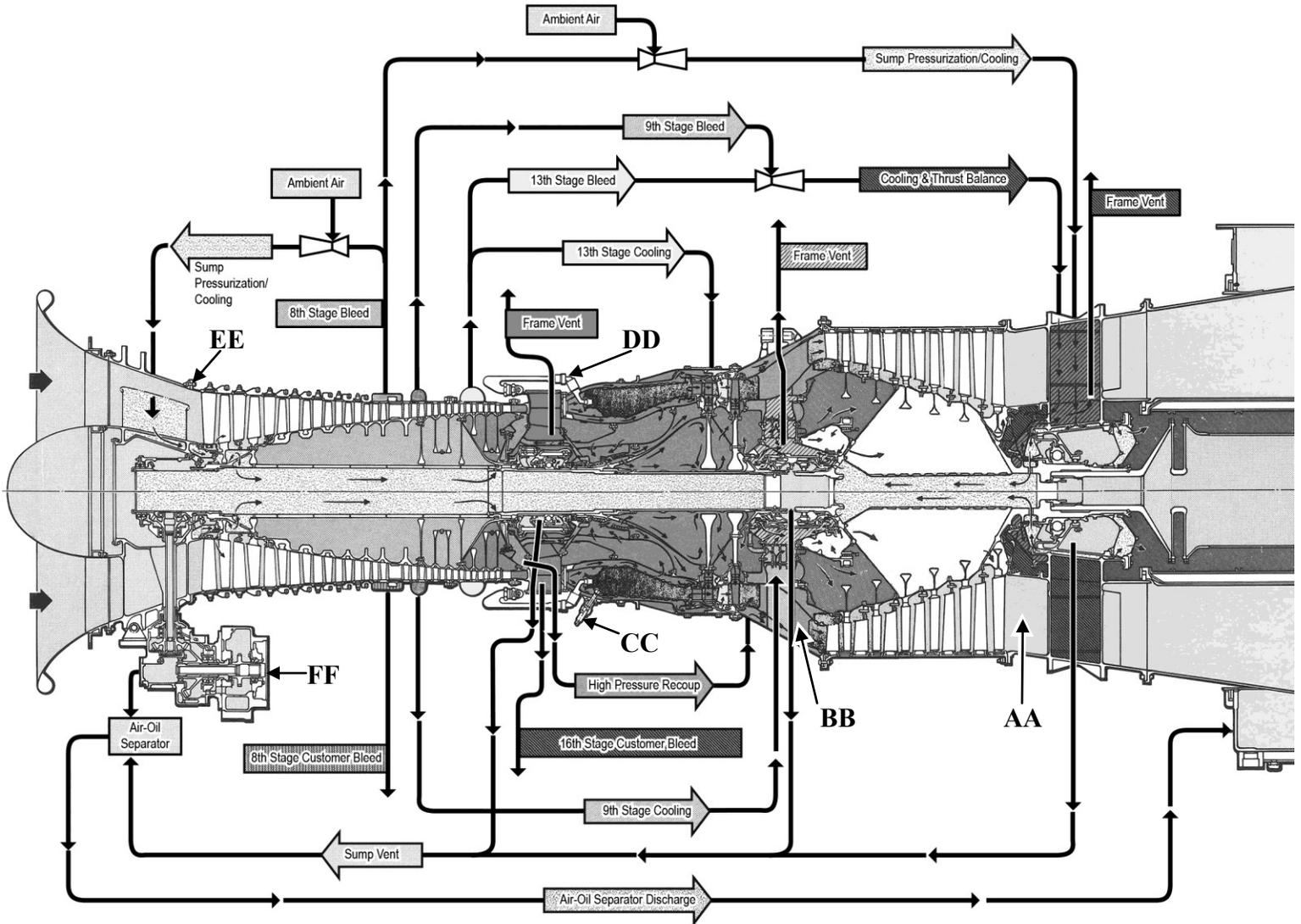
If choice C is selected set score to 1.

70. Which of the following statements is true concerning the fuel oil ignition system of the gas turbine engine shown in the illustration? Illustration GT-0017

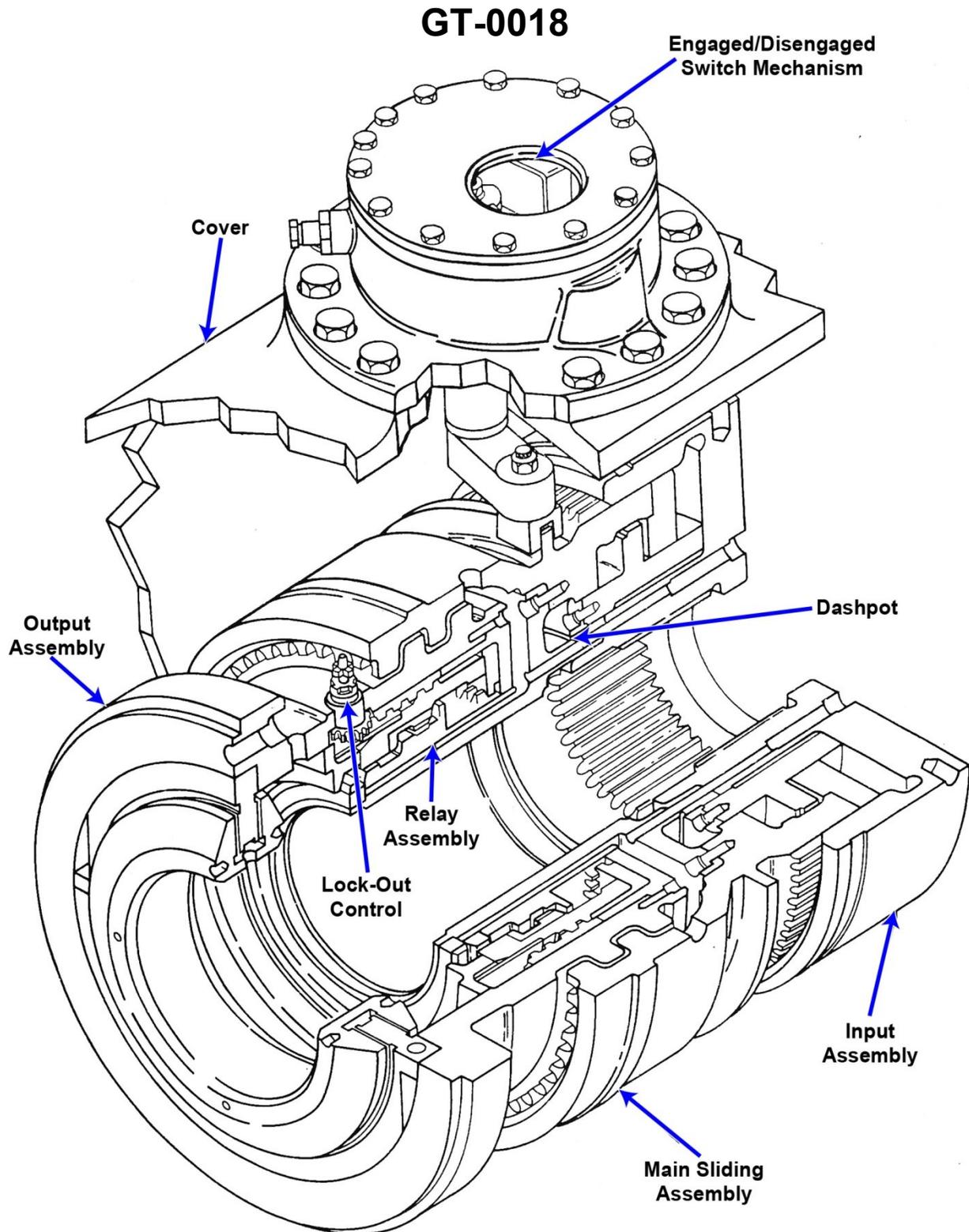
- (A) The igniters will only energize if the exhaust gas temperature falls below a preset value.
- (B) The igniters will de-energize when the power turbine exceeds a preset RPM.
- (C) The igniters will de-energize when the gas generator exceeds a preset RPM.
- (D) The igniters remain energized throughout the normal operation of the engine.

If choice C is selected set score to 1.

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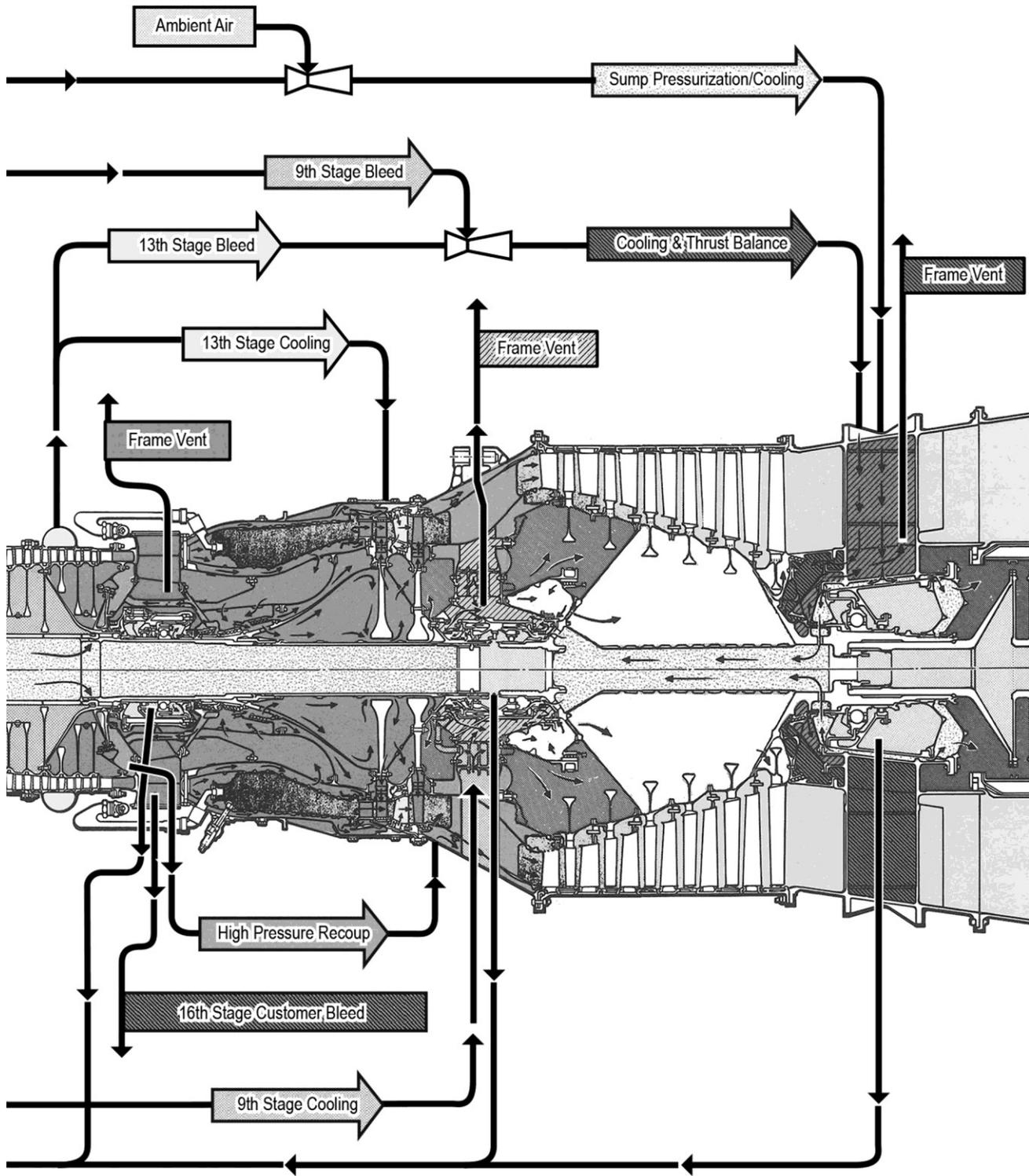


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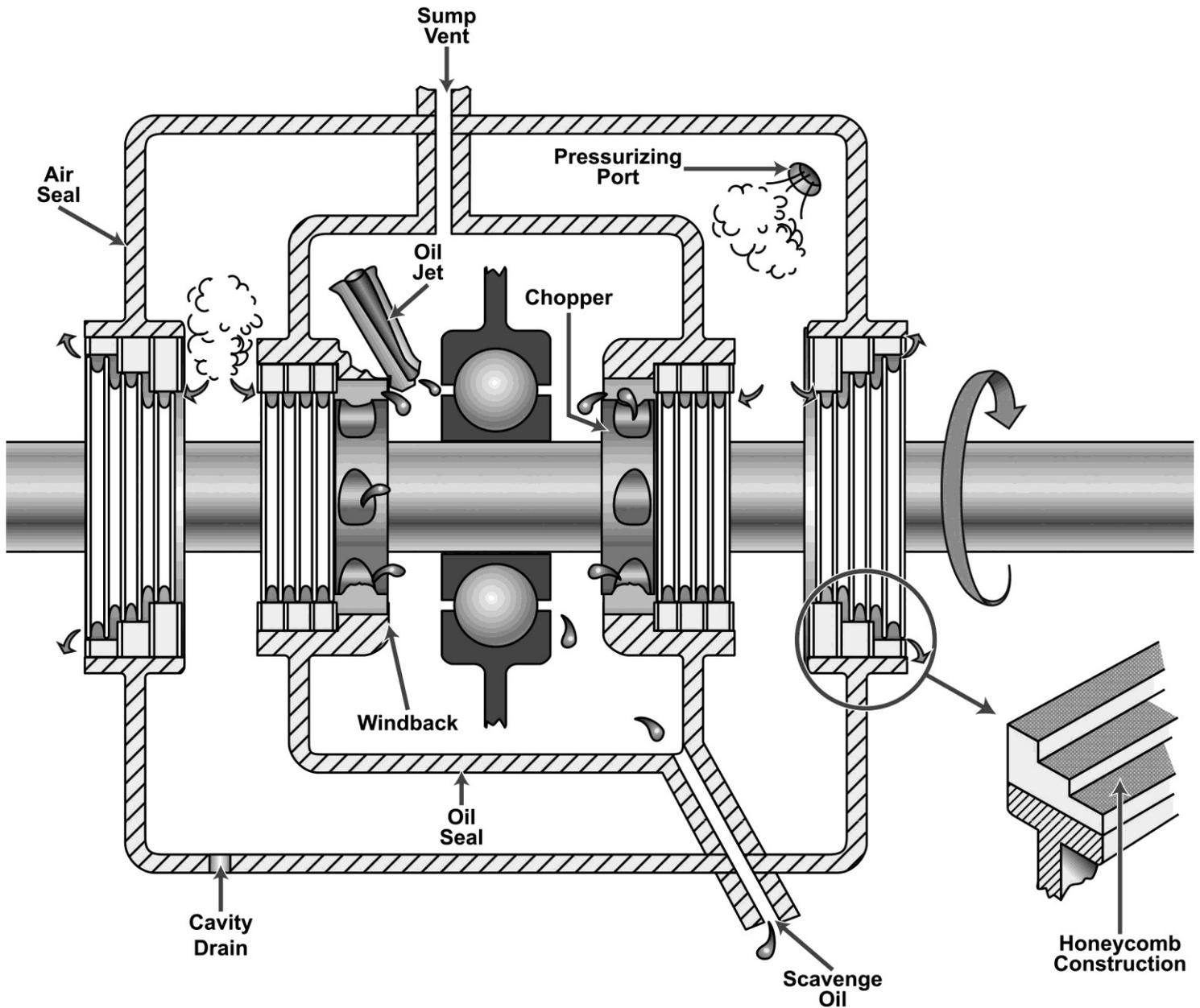
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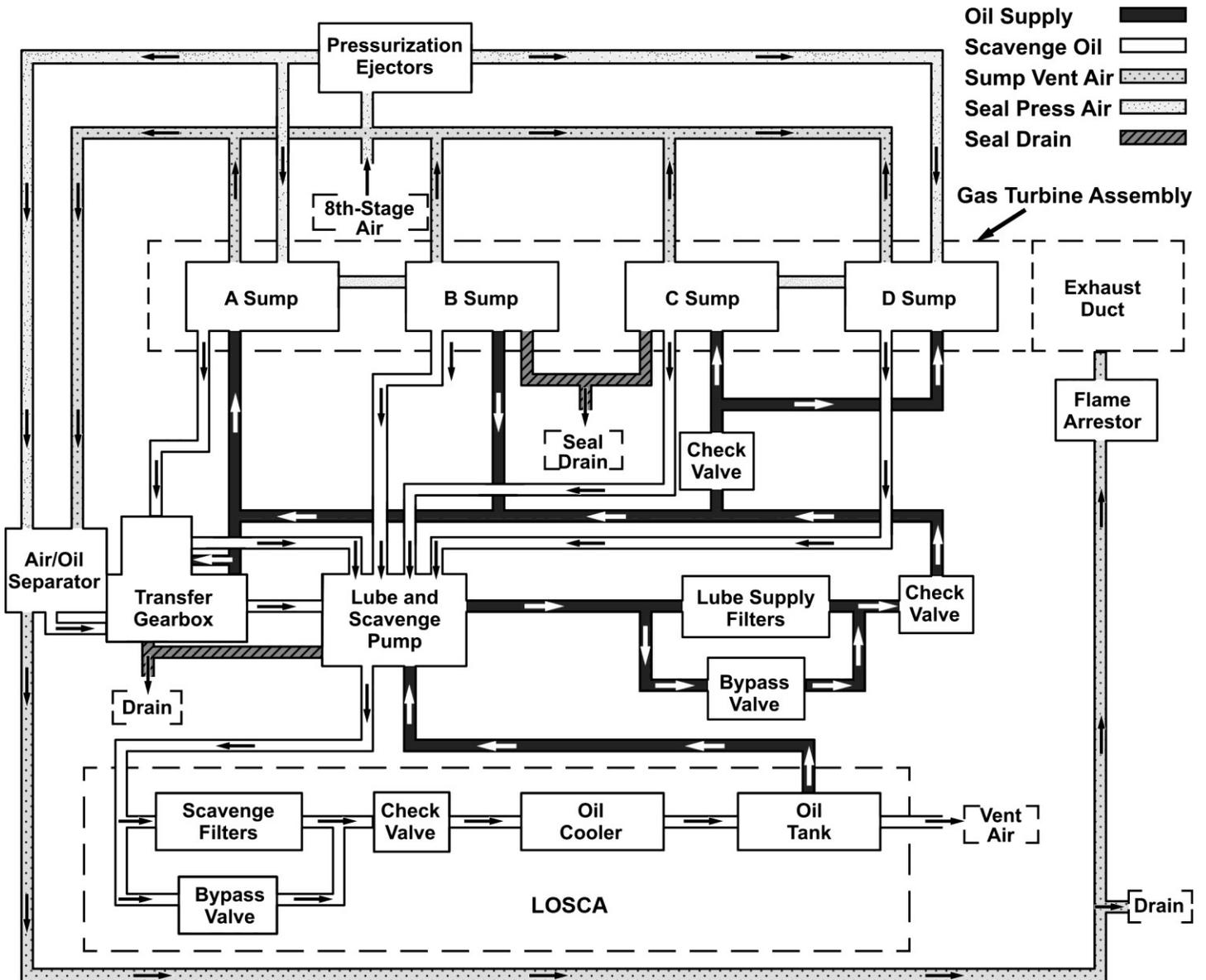
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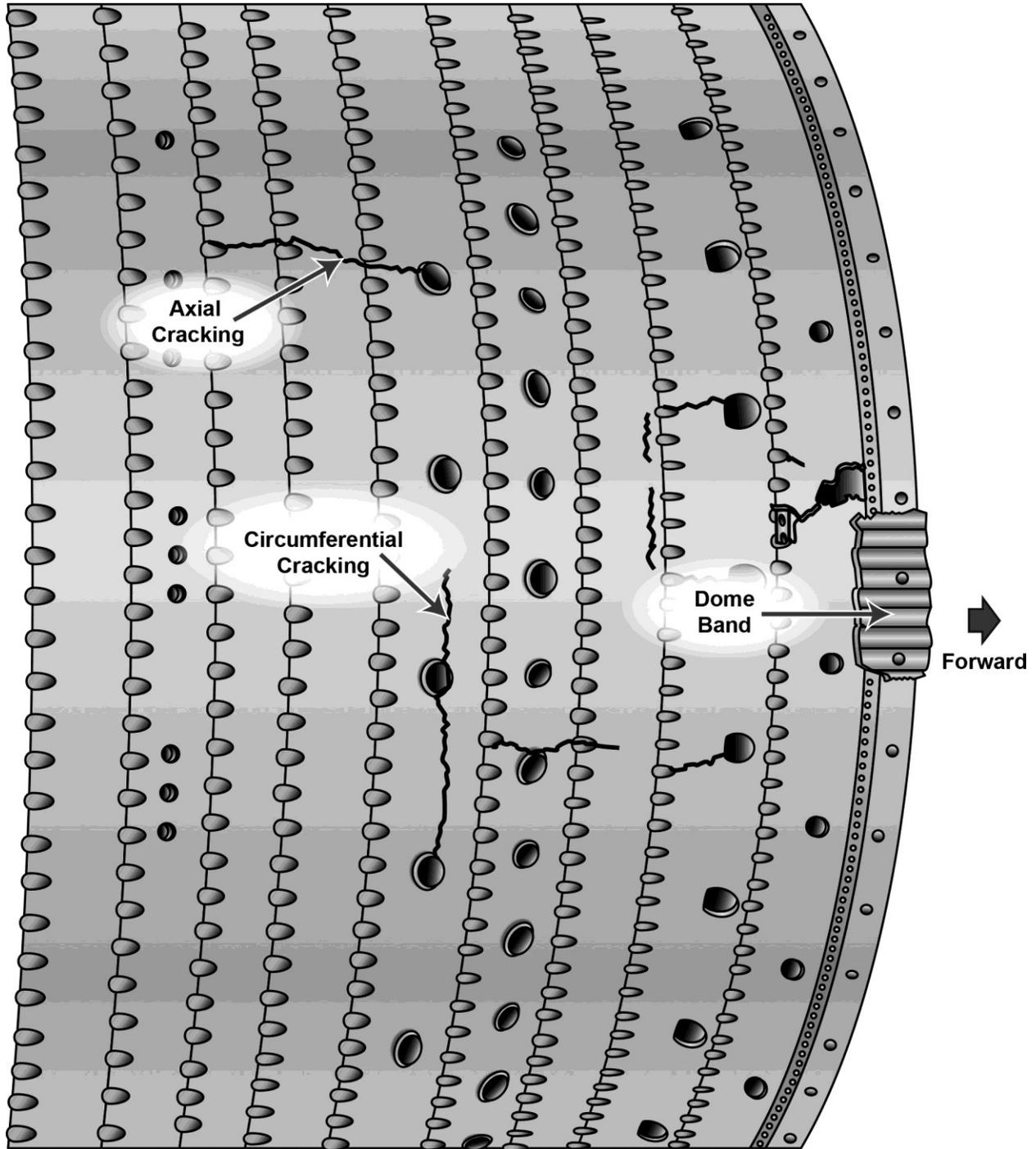
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