

U.S.C.G. Merchant Marine Exam

DDE-Unlimited HP

Q622 Gas Turbine Plants

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. 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.

2. 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.

3. 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.

4. Borescope inspection of the combustor section requires which type of light source?

- (A) 150 watt
- (B) 500 watt
- (C) 1000 watt
- (D) All of the above.

If choice C is selected set score to 1.

5. 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.

6. 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.

7. Aboard ship, single-shaft gas turbines are used mostly as prime movers for which of the following applications?

- (A) Multi-screw ships
- (B) Single-screw ships
- (C) Generators
- (D) Auxiliary power units

If choice C is selected set score to 1.

8. When the main reduction gear lube oil system is secured, which of the following components maintains the air within the casing at less than 35 percent relative humidity?

- (A) Rehumidifier
- (B) Precipitator
- (C) Reciprocator
- (D) Dehumidifier

If choice D is selected set score to 1.

9. The turbine nozzles function to direct the gases in what direction?

- (A) In the direction opposite of turbine rotation
- (B) In the direction of turbine rotation
- (C) Parallel to the turbine axis
- (D) Radial to the turbine axis

If choice B is selected set score to 1.

10. 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.

11. 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.

12. 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.

13. 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.

14. 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.

15. The main lubrication system utilized by the gas turbine engine shown in the illustration is what type? Illustration GT-0017

- (A) Dry sump
- (B) Common drain sump
- (C) Oil mist recovery sump
- (D) Wet sump

If choice A is selected set score to 1.

16. 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.

17. 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.

18. What is the purpose of the Controllable-Pitch Propeller (CPP) hydraulic oil power system?

- (A) Supplies low-pressure oil for both pitch control and stern tube sealing.
- (B) Supplies high-pressure oil for both propeller blade actuation and stern tube sealing.
- (C) Supplies low-pressure oil for propeller blade actuation and control oil for propeller pitch control.
- (D) Supplies high-pressure oil for blade actuation and control oil for propeller pitch control.

If choice D is selected set score to 1.

19. What is the difference between an open cycle and a closed cycle gas turbine engine?

- (A) An open cycle discards the working fluid and a closed cycle retains the working fluid.
- (B) A closed cycle heats the working fluid from an internal source and an open cycle uses an external source for heating the working fluid.
- (C) There is no difference because both use the same working fluid.
- (D) An open cycle retains the working fluid and a closed cycle discards the working fluid.

If choice A is selected set score to 1.

20. 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.

- 21.** The purpose of the metal spray rub coating on the rotor and stator casing of an axial type compressor is which of the following?
- (A) control air flow through the compressor
 - (B) provide close vane to rotor and blade to stator case clearances
 - (C) seal the circumferential dovetails
 - (D) ensure protection for the gearbox adapter when removing or replacing the bearings

If choice B is selected set score to 1.

- 22.** 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.

- 23.** A body that has energy due to its motion is said to have which of the following?

- (A) Potential energy
- (B) Static energy
- (C) Kinetic energy
- (D) Dynamic energy

If choice C is selected set score to 1.

- 24.** 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.

- 25.** 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.

26. 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.

27. 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.

28. 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.

29. 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.

30. A gas turbine engine in which exhaust gas heat energy is added to the compressor air charge before entering the combustor, is classified as which of the following?

- (A) Reheat cycle.
- (B) Regenerative cycle.
- (C) Combined cycle.
- (D) ICR cycle.

If choice B is selected set score to 1.

31. What type of seal is used in the gearbox of a gas turbine engine?

- (A) Lip-type
- (B) Fishmouth
- (C) Labyrinth-Windback
- (D) Carbon ring

If choice D is selected set score to 1.

32. 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.

33. 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.

34. 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.

35. In the operation of a marine propulsion gas turbine, kinetic and thermal energy required to drive the main propeller shaft are extracted by which of the following?

- (A) Multi-stage compressor.
- (B) Combustor.
- (C) Exhaust gas.
- (D) Power turbine.

If choice D is selected set score to 1.

36. The gas generator section of the GE LM2500 gas turbine is composed of all of the following components EXCEPT which of the following?

- (A) FOD screen
- (B) Bell mouth
- (C) Two-stage HP turbine
- (D) Six-stage LP turbine

If choice D is selected set score to 1.

37. 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.

38. The purpose of the main reduction gear in a marine gas turbine propulsion installation is which of the following?

- (A) Increase gas turbine speed to engage the clutch.
- (B) Transfer high-speed gas turbine rotation to low-speed propeller rotation.
- (C) Transfer low-speed gas turbine rotation to high-speed propeller rotation.
- (D) Reduce gas turbine speed to engage the clutch.

If choice B is selected set score to 1.

39. A temperature of 69.5 degrees Fahrenheit converts to approximately what temperature in degrees Rankine?

- (A) 342.5 degrees R.
- (B) 529.5 degrees R.
- (C) 590.5 degrees R.
- (D) 203.5 degrees R.

If choice B is selected set score to 1.

40. You are on watch on a gas turbine propelled vessel as shown in the illustration. After reducing power in response to a high lube oil supply temperature alarm, the temperature continues to increase. Your next step should be which of the following? Illustration GT-0017

- (A) Continue to reduce power.
- (B) Shutdown the engine.
- (C) Water wash the engine.
- (D) Check oil consumption.

If choice B is selected set score to 1.

41. How are the individual burners in a Can-type combustor arranged?

- (A) Joined by crossover tubes.
- (B) Joined by an outer combustion chamber.
- (C) Separate from the air inlet to the exhaust.
- (D) Joined at the igniter mounts.

If choice A is selected set score to 1.

42. The fuel oil system of a gas turbine engine provides all EXCEPT which of the following?

- (A) Acts as a hydraulic medium to actuate the fuel control
- (B) Provides accurately metered fuel for combustion
- (C) Controls the angle of the variable stator vanes
- (D) Acts as a cooling medium for the lube oil cooler

If choice D is selected set score to 1.

43. Which of the following is a disadvantage of utilizing a gas turbine versus a diesel engine for propulsion?

- (A) Excessive vibration.
- (B) The need for shore side repair facilities.
- (C) Low power-to-weight ratio.
- (D) All of the above.

If choice B is selected set score to 1.

44. When removing the gas turbine engine as shown in the illustration, how is the engine removal accomplished? Illustration GT-0022

- (A) By removing the inlet screen, barrier wall and module front panel, then installing the rails and moving the engine into the engine room and up through the soft patch to the main deck.
- (B) By removing the exhaust boot, HSCS and PT, then lifting the engine up the exhaust stack.
- (C) By removing the inlet screen and barrier wall, then installing the rails and lifting the engine out through the inlet duct.
- (D) By removing the upper half casing and separately lifting out the compressor and power turbine rotors.

If choice A is selected set score to 1.

45. How is the lube oil supplied to each bearing in a gas turbine engine controlled?

- (A) Regulating valve.
- (B) Flow divider.
- (C) Lube oil pump.
- (D) Calibrated orifice.

If choice D is selected set score to 1.

46. Turbine disks are commonly attached to the shaft by which of the following methods?

- (A) Bolted or welded.
- (B) Locking tabs or retaining rings.
- (C) Pinned or locking tabs.
- (D) Riveted or pinned.

If choice A is selected set score to 1.

47. An axial compressor basically consists of which of the following?

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

If choice C is selected set score to 1.

48. How can compressor stall be prevented?

- (A) Utilize a two-spool compressor rotor.
- (B) Lowering the angle of attack on the front stages.
- (C) Installing air bleed valves in the middle of the compressor.
- (D) All of the above.

If choice D is selected set score to 1.

49. 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.

50. 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.

51. Air used to cool the combustion liners and turbine components is referred to as which of the following?

- (A) Primary air.
- (B) Secondary air.
- (C) Control air.
- (D) None of the above.

If choice B is selected set score to 1.

52. 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.

53. 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.

54. 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.

55. What is the purpose of the air/oil separator shown in the illustration of the gas turbine lube oil system? Illustration GT-0024

- (A) Minimize oil consumption by separating oily vapors being vented to the atmosphere.
- (B) Reduce oil foaming.
- (C) Maintain oil pressure in the sumps.
- (D) All of the above.

If choice A is selected set score to 1.

56. If the lube oil scavenge temperature exceeds 300 degrees Fahrenheit on the gas turbine engine shown in the illustration, and reducing power does NOT bring the temperature within limits, the operator should do which of the following? Illustration GT-0017

- (A) Continue to operate at the reduced power level.
- (B) Monitor the temperature while continuing to operate.
- (C) Continue to reduce power on the engine.
- (D) Shutdown the engine and troubleshoot.

If choice D is selected set score to 1.

57. While air is being compressed in a centrifugal flow gas turbine, what happens to the direction of air flow?

- (A) Changes only once from inlet to outlet.
- (B) Changes only at the compressor inlet.
- (C) Changes at each separate component.
- (D) Changes only at the compressor discharge.

If choice C is selected set score to 1.

58. 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.

59. For the GE LM2500 gas turbine engine shown in the illustration, the HP turbine 2nd stage blades are cooled by convection, with the cooling air being discharged where? Illustration GT-0011

- (A) Nose holes on the leading edge.
- (B) Gill holes on the side.
- (C) Trailing edge slots.
- (D) Blade tips.

If choice D is selected set score to 1.

60. 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.

61. 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.

62. The acronym MFC represents which of the following?

- (A) Manifold fuel control.
- (B) Maritime fuel congress.
- (C) Midframe compressor.
- (D) Main fuel control.

If choice D is selected set score to 1.

63. 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.

64. 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.

65. 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.

66. 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.

67. When conducting a borescope inspection, you must be aware of all of the following factors EXCEPT which?

- (A) The inspection areas and ports.
- (B) The engineer's experience.
- (C) The limitations of your equipment.
- (D) The internal reference points.

If choice B is selected set score to 1.

68. 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.

69. 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

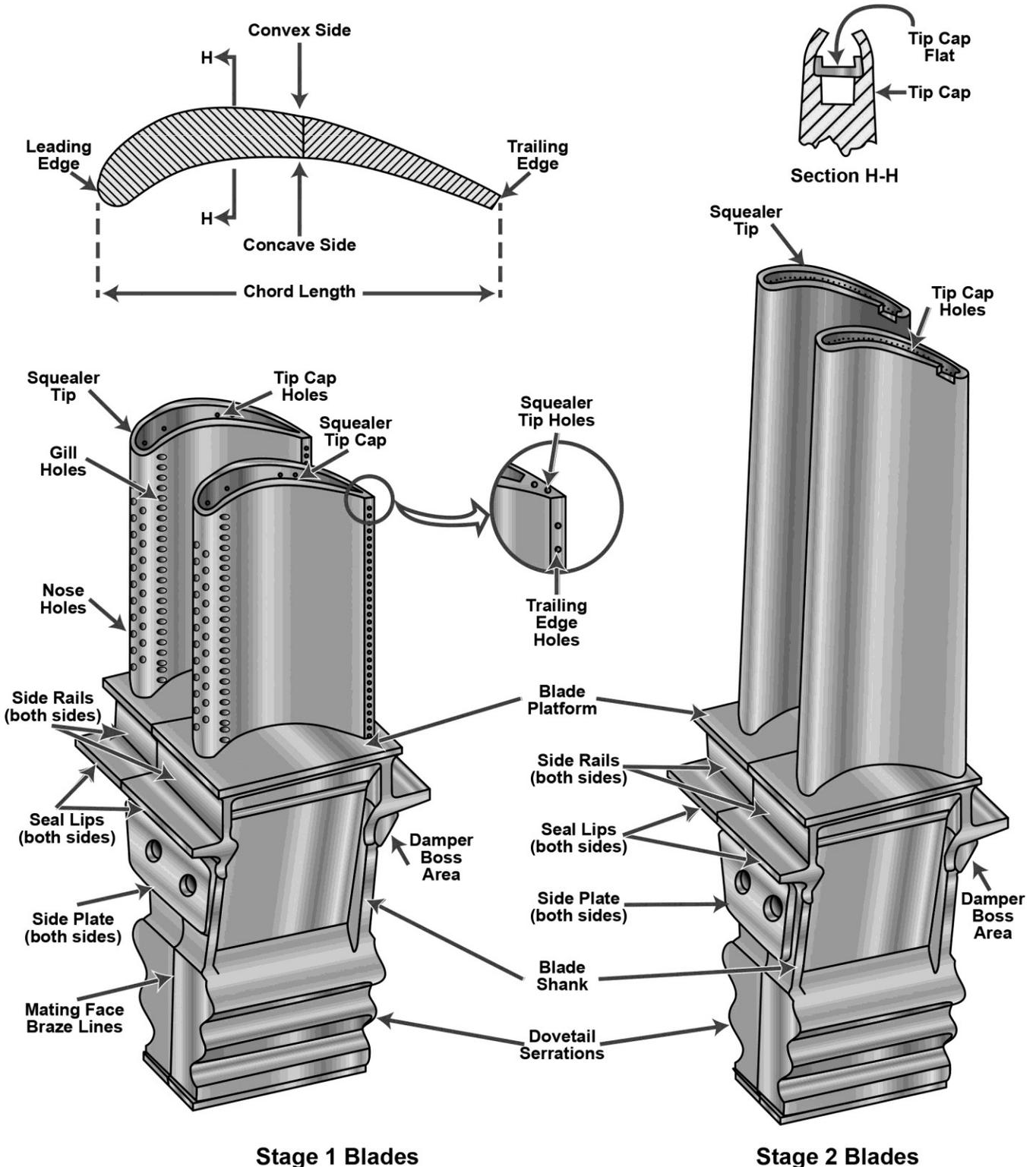
If choice B is selected set score to 1.

70. Which of the following components prevent(s) objects smaller than 1/4 inch from entering the GE LM2500 gas turbine?

- (A) Inlet louvers
- (B) FOD screens
- (C) Centerbody
- (D) Demister pads

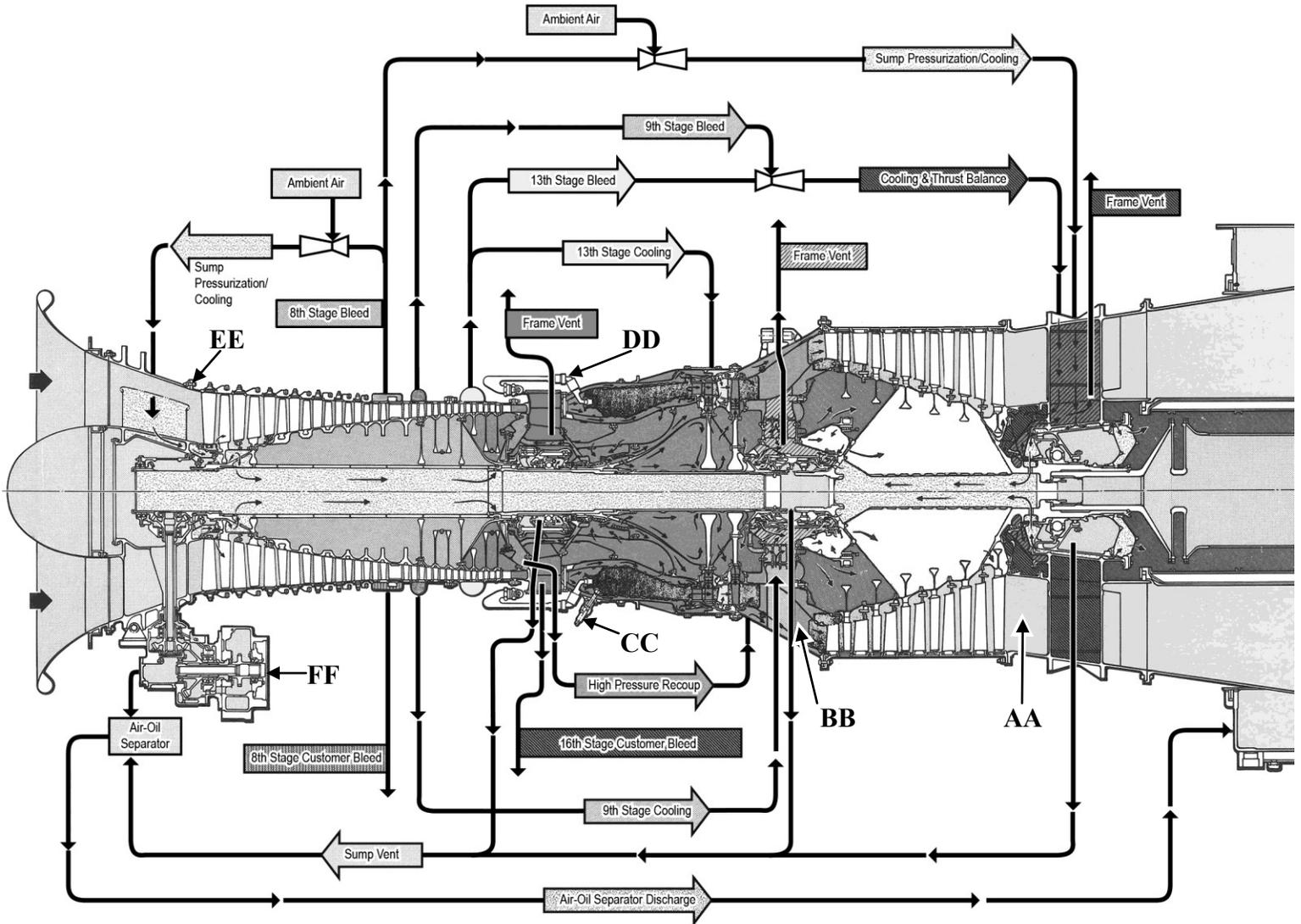
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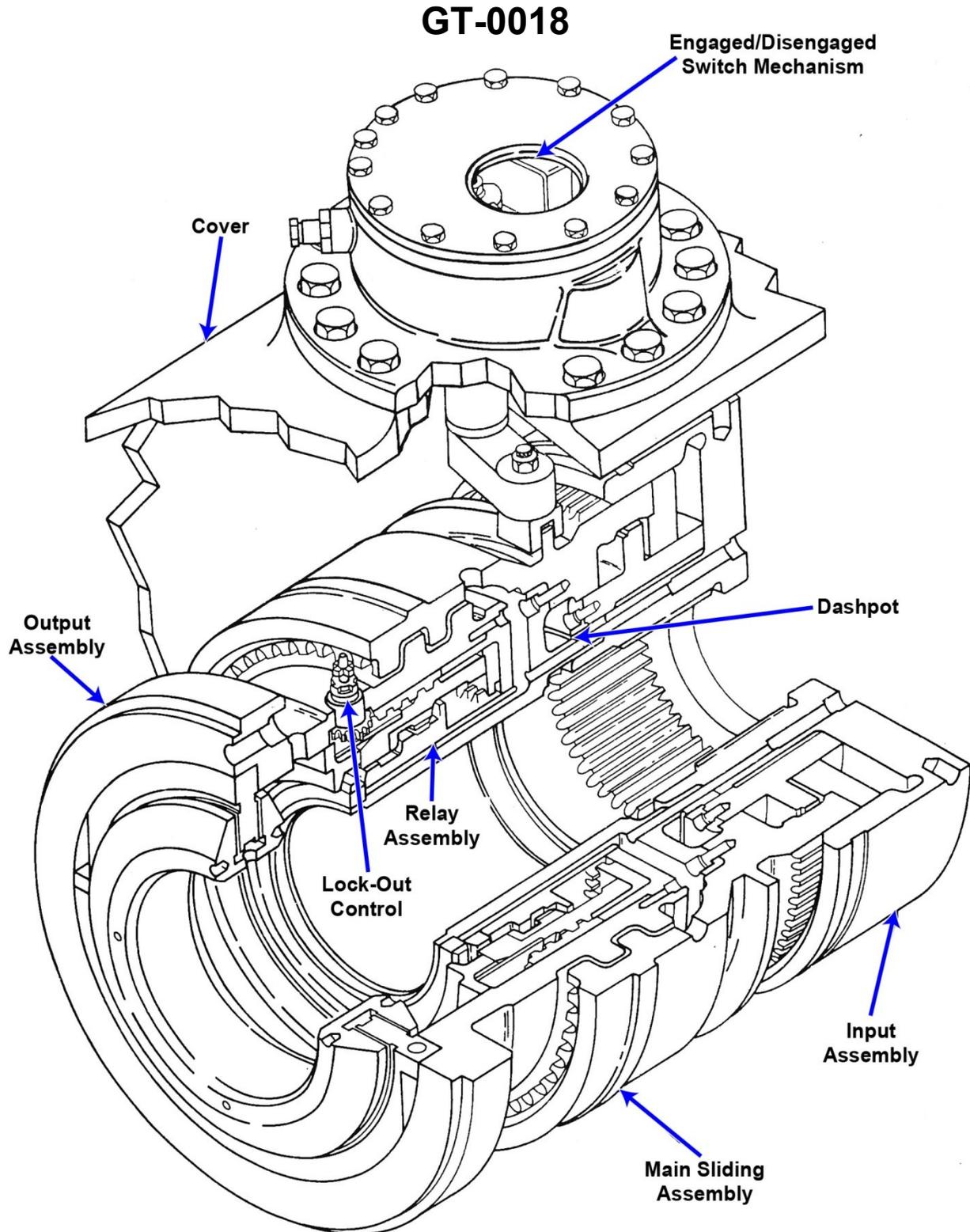


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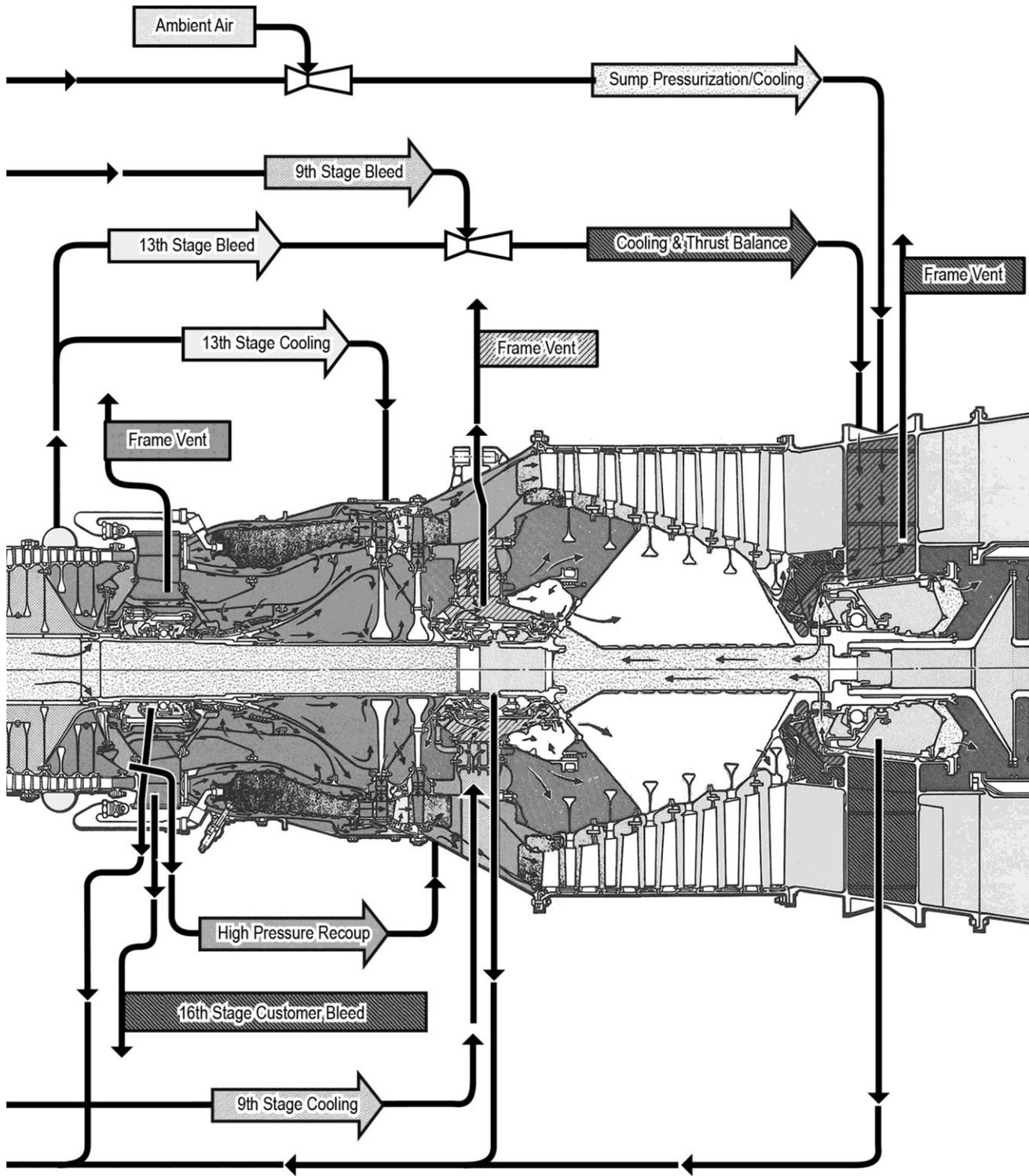


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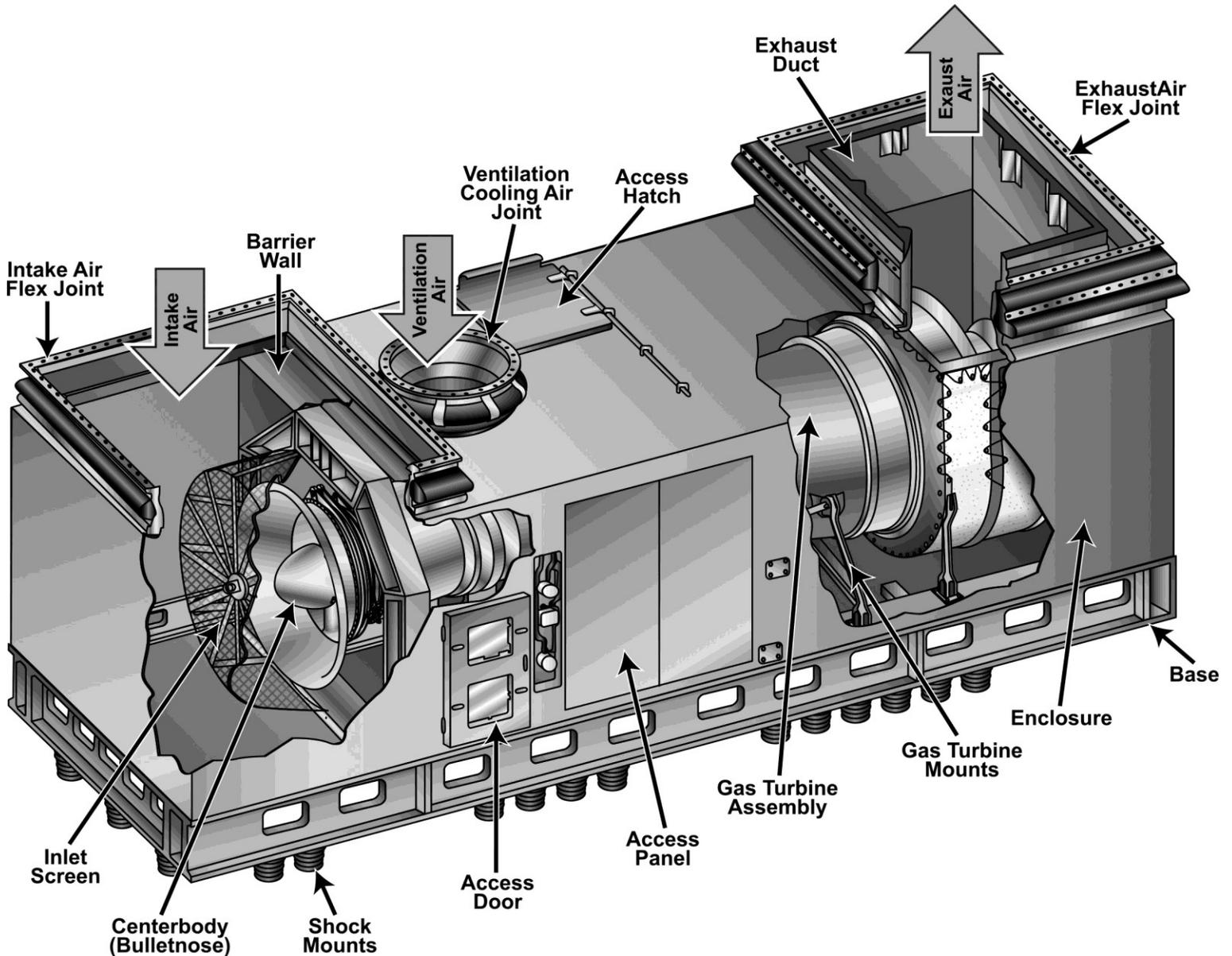
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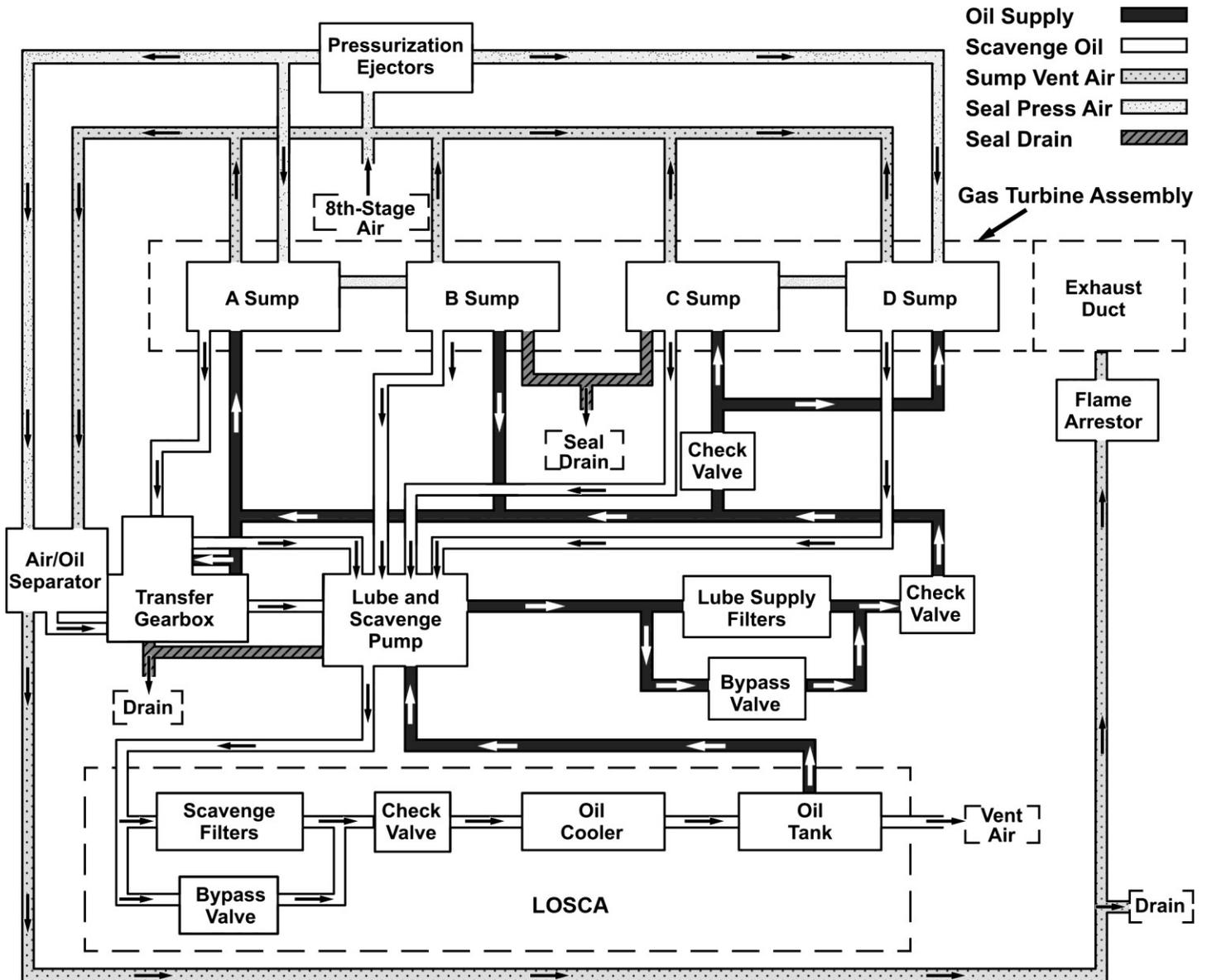
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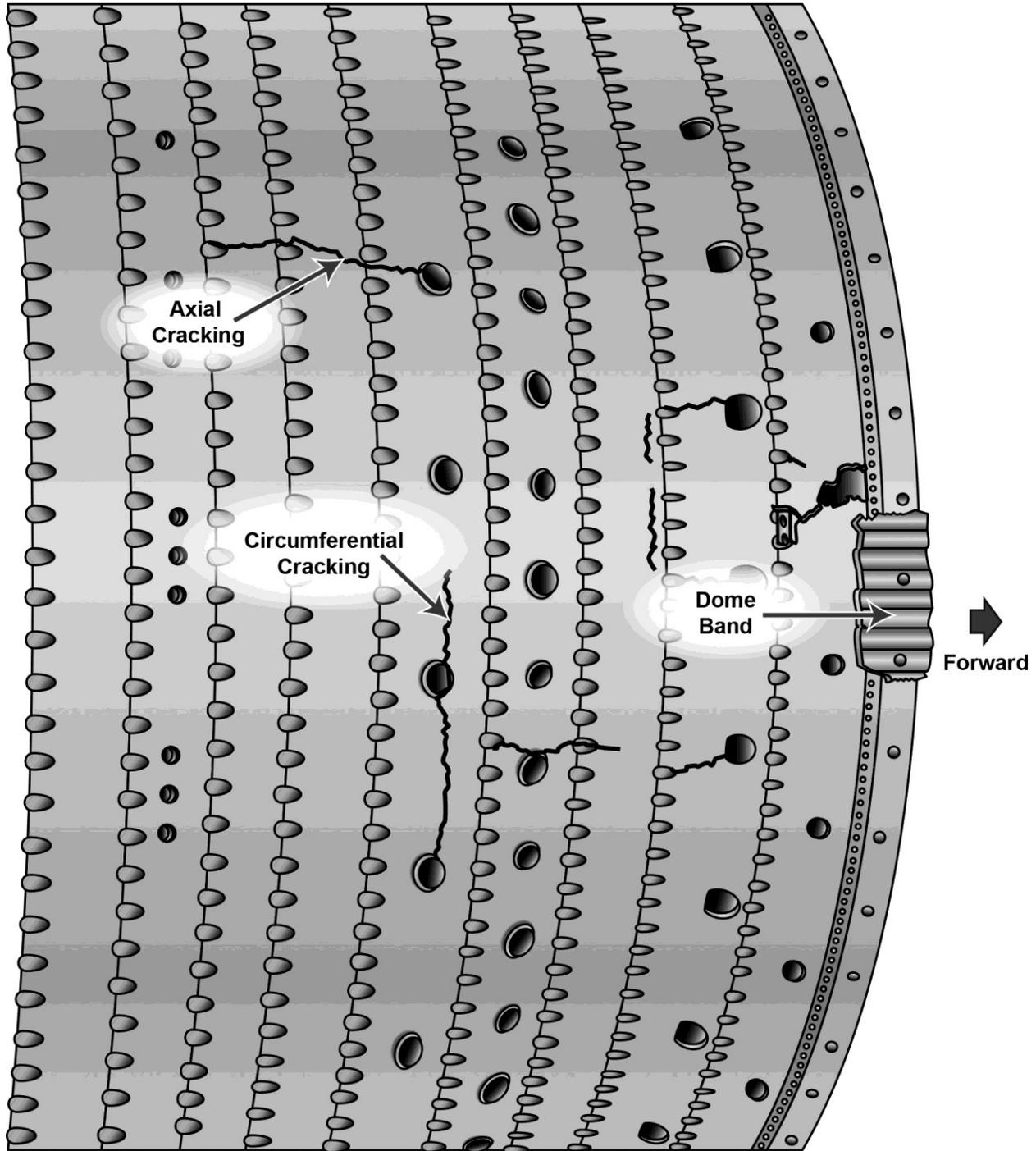
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