

U.S.C.G. Merchant Marine Exam
Third Assistant Engineer, Unlimited
Q533 Gas Turbine Plants
(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. What type of air seal is used in the combustor and turbine mainframe 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.

2. 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.

3. The turbine nozzle blades convert the combustion gases heat and pressure energy into what form of energy?

- (A) Electrical
- (B) Chemical
- (C) Thermal
- (D) Velocity

If choice D is selected set score to 1.

4. 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.

5. The lube oil system shown in the illustration, is designed to lubricate the main bearings by what principle? Illustration GT-0023

- (A) spray lubrication with dry sumps
- (B) totally submerged oil bath
- (C) splash lubrication
- (D) self-contained partial oil bath

If choice A is selected set score to 1.

6. Assuming at least a 500 rpm for the input shaft speed from the power turbine, as shown in the illustration, the synchronous self-shifting (SSS) clutch used on marine gas turbine main propulsion gears, requires which of the following inputs or conditions to make engagement possible? Illustration GT-0018

- (A) Availability of low-pressure air to provide control air pressure for engagement.
- (B) Availability of high-pressure air to provide clutch air inflation pressure.
- (C) When the input shaft speed from the power turbine falls below the output shaft speed.
- (D) When the input shaft speed from the power turbine rises to the output shaft speed.

If choice D is selected set score to 1.

7. HP turbine blades are generally cooled by which of the following methods?

- (A) Compressed air entering the tip and exiting the root.
- (B) Cooling water entering the tip and exiting the root.
- (C) Compressed air entering the root and exiting the tip.
- (D) Cooling water entering the root and exiting the tip.

If choice C is selected set score to 1.

8. What type of engine starter motor is commonly found on the marine gas turbine shown in the illustration? Illustration GT-0006

- (A) Hydraulic motor
- (B) AC synchronous motor
- (C) AC induction motor
- (D) DC series wound electric motor

If choice A is selected set score to 1.

9. Thermal energy is the only form of energy that can be added to or removed from a substance. How is thermal energy that is added to a substance stored?

- (A) In the form of potential kinetic energy.
- (B) In the form of heat.
- (C) In the form of mechanical energy.
- (D) In the form of internal energy.

If choice D is selected set score to 1.

10. 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.

11. The electrostatic vent fog precipitator removes oil mist from which of the following areas?

- (A) Lube oil storage tank
- (B) Main reduction gear
- (C) Synchronous self-shifting clutch
- (D) Gas turbine engine

If choice B is selected set score to 1.

12. 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.

13. 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.

14. 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

If choice B is selected set score to 1.

15. 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.

16. 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.

17. 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.

18. Why is a gas turbine considered to operate on the Brayton cycle?

- (A) Combustion causes large increase in pressure.
- (B) Combustion causes no increase in volume.
- (C) Combustion causes an increase in total mass flow.
- (D) Combustion occurs with no increase in pressure.

If choice D is selected set score to 1.

19. 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.

20. An axial compressor stator vane that is mechanically adjusted to provide optimum compressor performance over a wide operating range is referred to as which of the following?

- (A) Variable Guide Vane (VGV)
- (B) Static Guide Vane (SGV)
- (C) Variable Stator Vane (VSV)
- (D) Inlet Guide Vane (IGV)

If choice C is selected set score to 1.

21. 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.

22. 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.

23. 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) Bellmouth
- (C) Two-stage HP turbine
- (D) Six-stage LP turbine

If choice D is selected set score to 1.

24. The three most common types of combustors used in gas turbine engines are which of the following?

- (A) can, annular, and can-annular.
- (B) can, derivative, and can-derivative.
- (C) can, vortex, and can-vortex.
- (D) can, angular, and can-angular.

If choice A is selected set score to 1.

25. 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.

26. 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.

27. The acronym FOD stands for which of the following?

- (A) Foreign object damage.
- (B) Fuel override demand.
- (C) Flow offset design.
- (D) Fuel oil discharge.

If choice A is selected set score to 1.

28. 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.

29. 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.

30. What is the power source for the ignition exciter of a gas turbine engine?

- (A) Ship's 400 Hz system
- (B) Ship's 115 volt AC system
- (C) Ship's 28 volt DC system
- (D) Four lead-acid batteries

If choice B is selected set score to 1.

31. 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.

32. 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.

33. 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.

34. 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.

35. For the GE LM2500 gas turbine shown in the illustration, the 9th stage bleed air is used for which of the following? Illustration GT-0017

- (A) High-pressure turbine second stage nozzle cooling.
- (B) Compressor balance piston cavity pressurization.
- (C) Power turbine cooling.
- (D) Sump pressurization and cooling.

If choice C is selected set score to 1.

36. 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.

37. 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.

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. A gas turbine engine in which exhaust gas heat energy is added to the air charge between the compressor and combustion chamber is classified as which of the following?

- (A) Open cycle engine.
- (B) Closed cycle engine.
- (C) Semi-open cycle engine.
- (D) Regenerative cycle engine.

If choice D is selected set score to 1.

40. 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.

41. 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.

42. 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.

43. 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.

44. What is the term given to a process that occurs without a loss or gain of heat?

- (A) Exothermic.
- (B) Isothermal
- (C) Endothermic.
- (D) Adiabatic

If choice D is selected set score to 1.

45. 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.

46. 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.

47. 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.

48. 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.

49. The term "lockout" on the synchronous self-shifting (SSS) clutch system means that the _____.

- (A) SSS clutch will not engage
- (B) shaft will not rotate above 10 RPM's
- (C) reduction gear will not rotate
- (D) shaft will not rotate

If choice A is selected set score to 1.

50. 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.

51. 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.

52. On the gas turbine lube oil system shown in the illustration, air and oil are primarily separated in the air/oil separator through the use of which of the following? Illustration GT-0024

- (A) Filter
- (B) Impeller
- (C) Heater
- (D) Strainer

If choice B is selected set score to 1.

53. 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.

54. 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.

55. 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.

56. 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.

57. Accelerometers are generally used on gas turbine engines to sense which of the following?

- (A) Rate of rotor speed changes.
- (B) Gas generator speed with respect to power turbine speed.
- (C) PLARA rate limited feedback to the FSEE.
- (D) High frequency vibration.

If choice D is selected set score to 1.

58. What is the primary purpose of the diffuser and distributor on the GE LM2500 gas turbine?

- (A) To provide uniform air flow to the compressor
- (B) To provide even temperature distribution at the compressor
- (C) To provide uniform air flow to the combustor
- (D) To provide uniform air flow to the turbine

If choice C is selected set score to 1.

59. 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.

60. 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.

61. Wrenches that are recommended for use on gas turbine engines should be plated with which of the following elements?

- (A) Bronze
- (B) Nickel
- (C) Carbon
- (D) Silver

If choice B is selected set score to 1.

62. What are the two common forms of axial compressor rotor blade roots?

- (A) Grub and bulb.
- (B) Fir tree and key.
- (C) Saw tooth and knob.
- (D) Fir tree and bulb.

If choice D is selected set score to 1.

63. The two main types of compressor stall are known as what?

- (A) Flame out and inlet temperature stall.
- (B) Over speed and overload stall.
- (C) Steady state and transient.
- (D) Rapid rise and temperature inversion.

If choice C is selected set score to 1.

64. Power is defined as which of the following?

- (A) Force applied through a distance.
- (B) The rate of applying a force.
- (C) The rate of doing work.
- (D) Work performed through a distance.

If choice C is selected set score to 1.

65. 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.

66. Which of the following drawbacks of a gas turbine engine provides the greatest potential for injury to personnel?

- (A) High pitched noise.
- (B) Mechanical stresses the engine is subject to.
- (C) High temperature of the exhaust gases.
- (D) Susceptibility to foreign object damage.

If choice A is selected set score to 1.

67. 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.

68. A temperature of 32.5 degrees Celsius converts to approximately what temperature in degrees Kelvin?

- (A) 305.5 degrees K.
- (B) 240.5 degrees K.
- (C) 492.5 degrees K.
- (D) 427.5 degrees K.

If choice A is selected set score to 1.

69. 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.

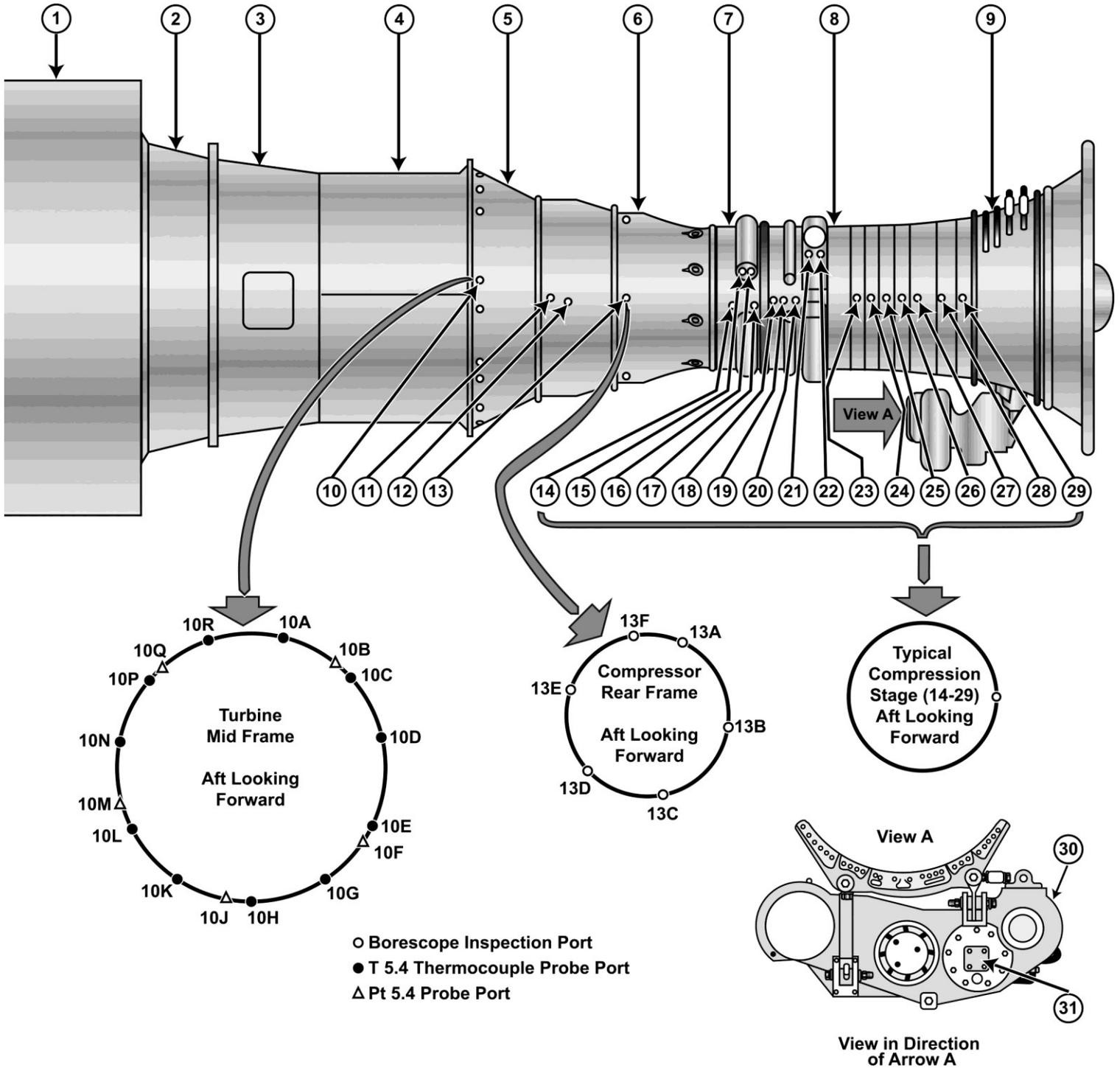
If choice A is selected set score to 1.

70. 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

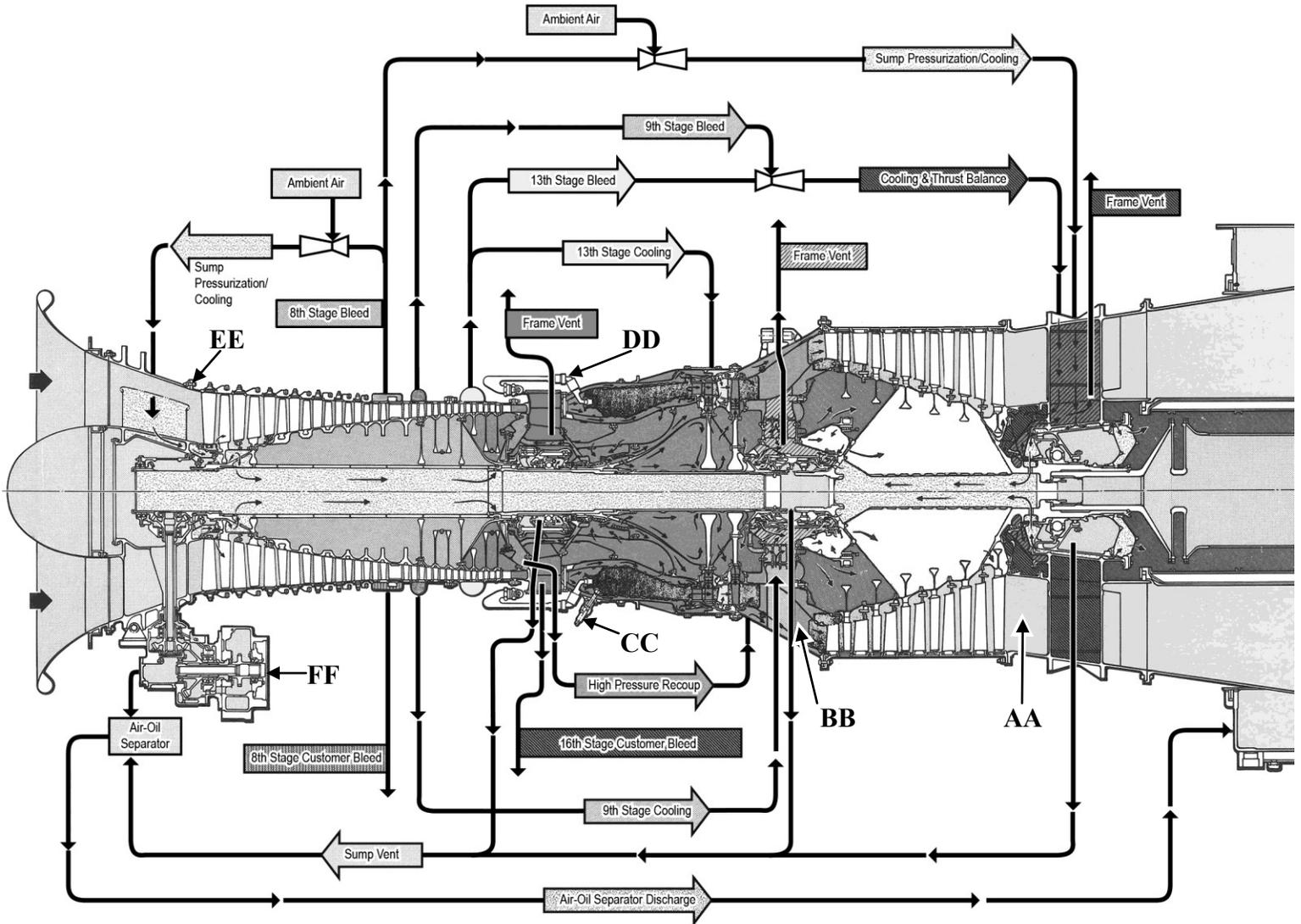
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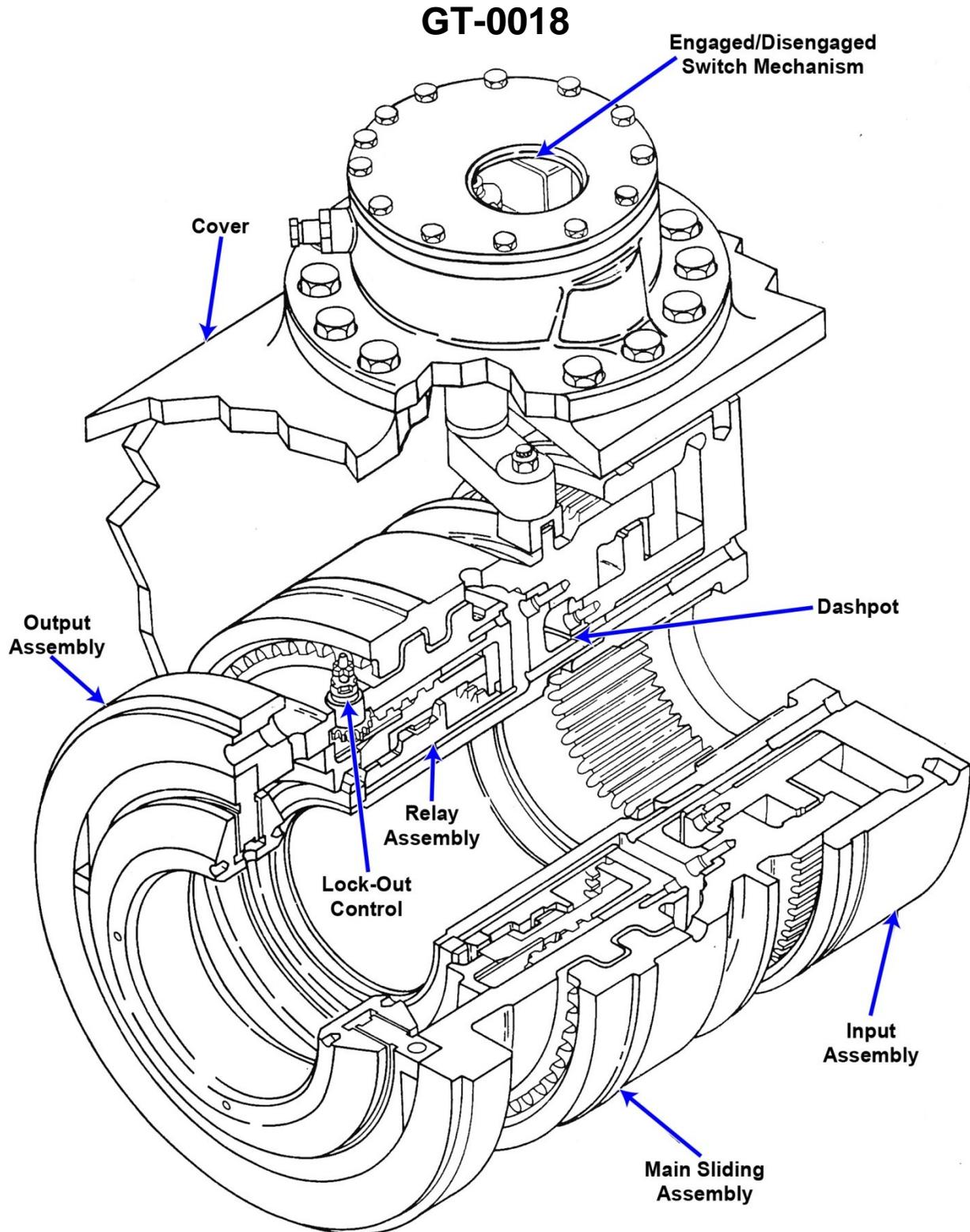


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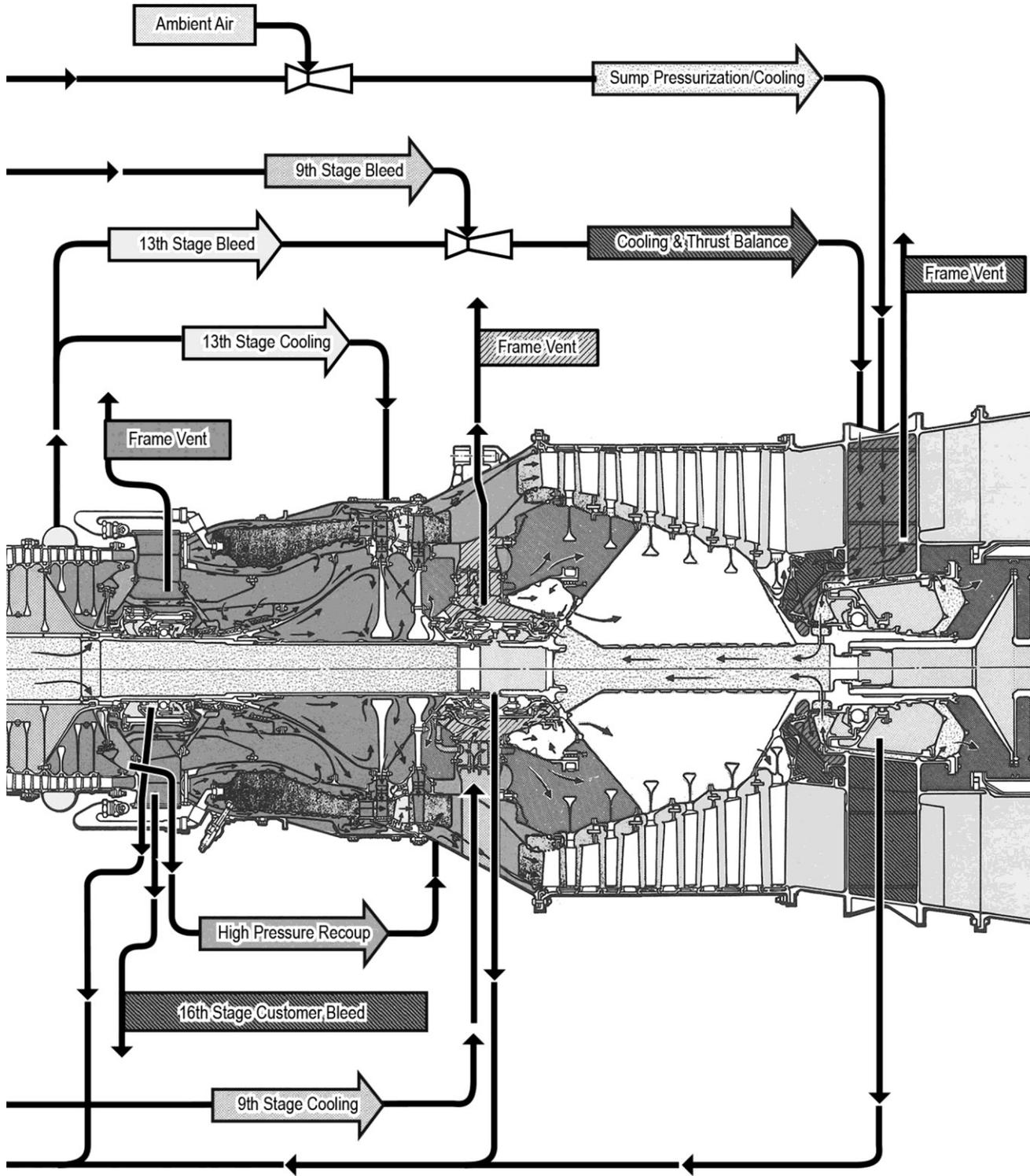


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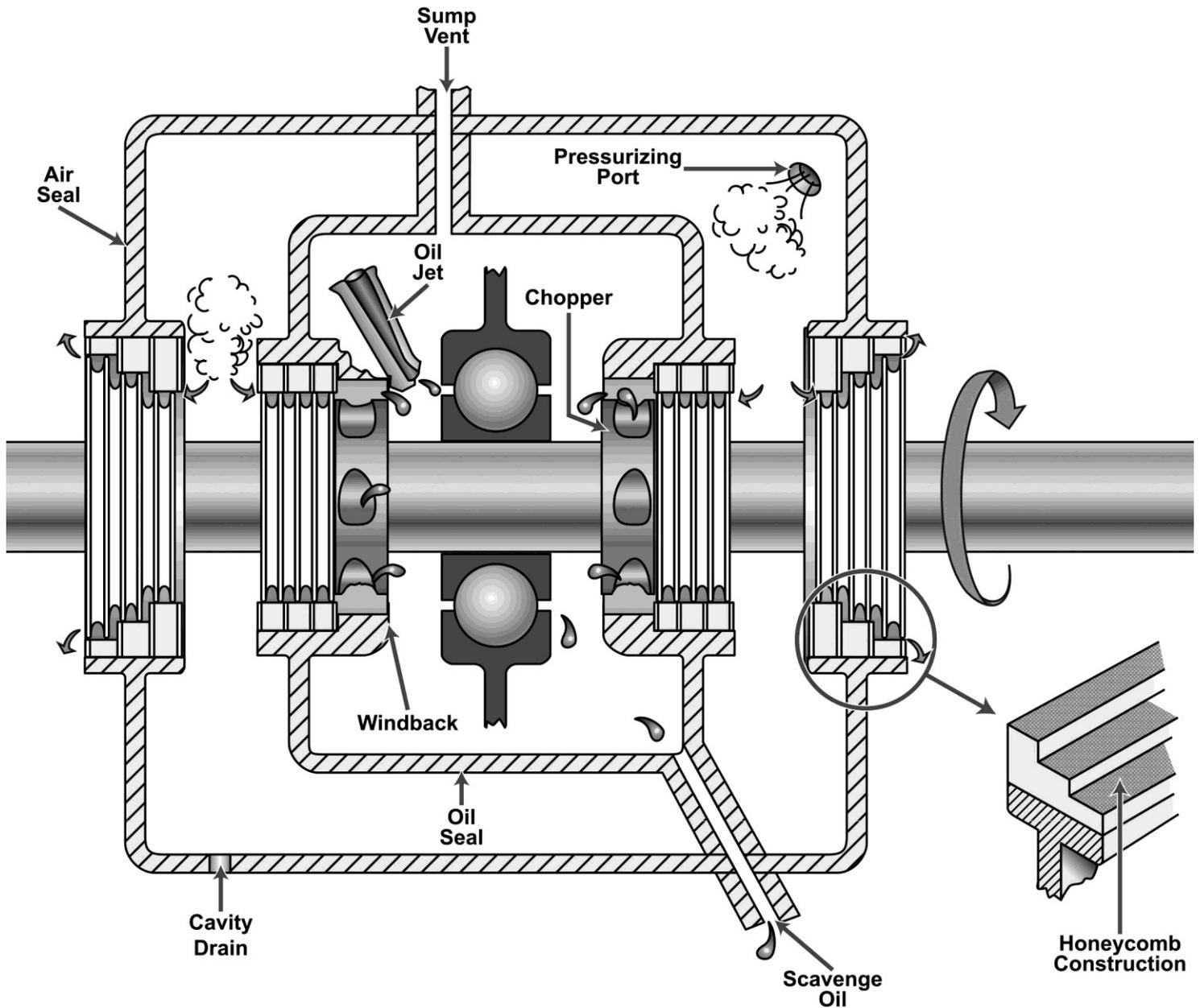
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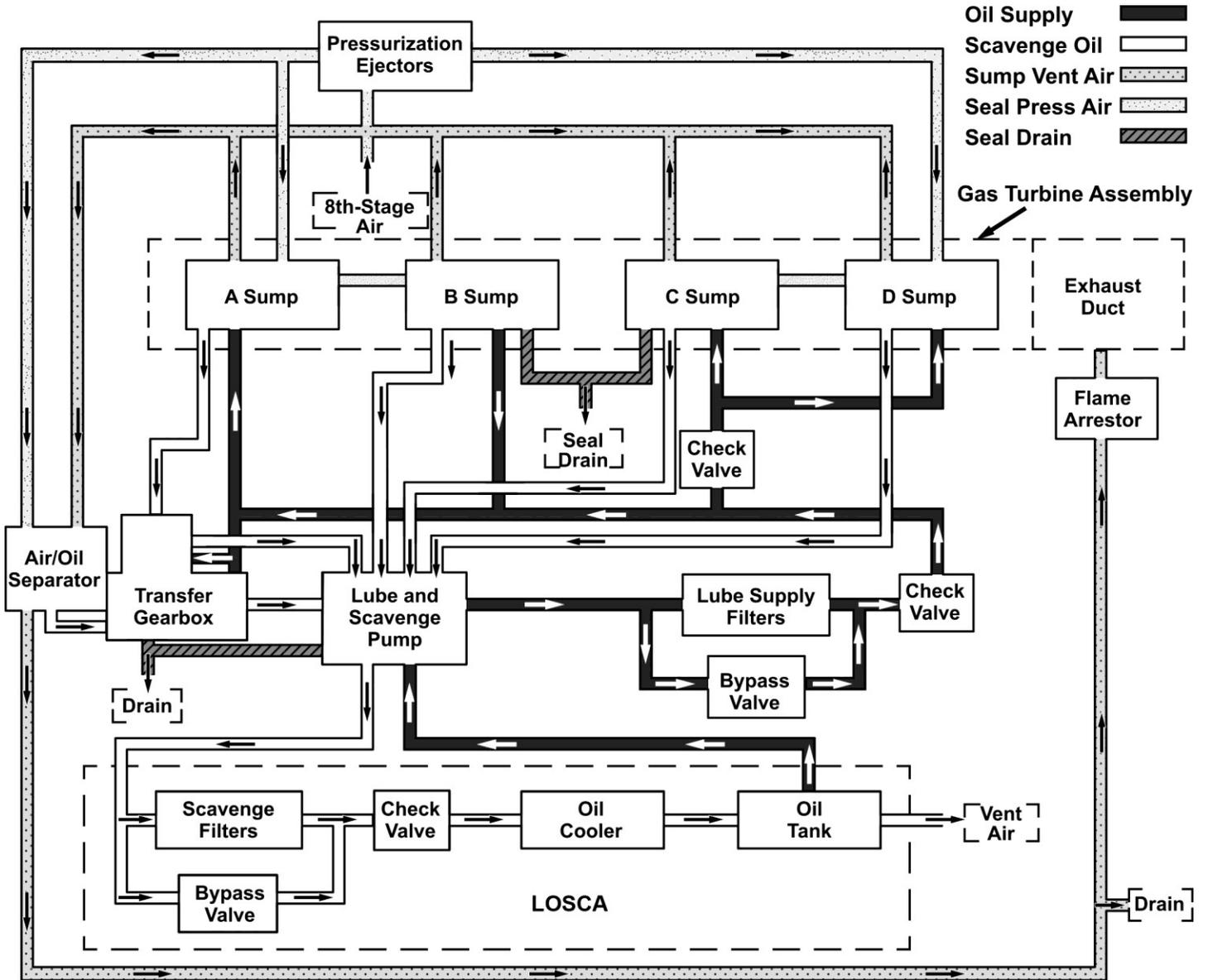
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