

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. The gas generating sections of marine gas turbine engines are based on which of the following?

- (A) Oil-fired auxiliary boilers
- (B) Radial piston engines
- (C) Aircraft jet engines
- (D) Free piston engines

If choice C is selected set score to 1.

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

- (A) Increases pressure
- (B) Increases volume
- (C) Decreases pressure
- (D) Decreases volume

If choice B is selected set score to 1.

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

If choice A is selected set score to 1.

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

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

If choice C is selected set score to 1.

5. Why is the cycle efficiency higher in the intercooled-recuperated cycle as compared to a simple cycle gas turbine? Illustration GT-0026
- (A) 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.
 - (B) 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.
 - (C) 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.
 - (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 B is selected set score to 1.

6. The acronym VSV represents which of the following?
- (A) Vibration stator vanes
 - (B) Variable stator vane
 - (C) Variable speed valve
 - (D) Vibration shutdown valve

If choice B is selected set score to 1.

7. The acronym MFC represents which of the following?
- (A) Manifold fuel control
 - (B) Midframe compressor
 - (C) Main fuel control
 - (D) Maritime fuel congress

If choice C is selected set score to 1.

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

If choice D is selected set score to 1.

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

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

If choice C is selected set score to 1.

10. 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.

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

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

If choice B is selected set score to 1.

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

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

If choice D is selected set score to 1.

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

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

If choice D is selected set score to 1.

14. Which of the following is the main advantage of a split-axial compressor case?

- (A) Stronger construction
- (B) Cheaper to manufacture
- (C) Easier to repair and inspect
- (D) Simpler to disassemble

If choice C is selected set score to 1.

15. 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.

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

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

If choice C is selected set score to 1.

17. Variable stator vanes give an axial gas turbine compressor which of the following capabilities?

- (A) Ability to maintain constant turbine primary air flow across all speeds.
- (B) Ability to maximize turbine surge capacity across all speeds.
- (C) Ability to maintain constant turbine compression ratio across all speeds.
- (D) Ability to maximize turbine efficiency across all speeds.

If choice D is selected set score to 1.

18. What is the term used to describe the stationary vanes preceding the first stage of an axial compressor?

- (A) First stage stator vanes
- (B) Inlet guide vanes
- (C) Variable stator vanes
- (D) Variable inlet vanes

If choice B is selected set score to 1.

19. Which of the following statements is true concerning axial compressor disk-type rotors?

- (A) Rotor is only suitable for low-speed compressors.
- (B) Rotor discs are shrunk fit onto a steel shaft.
- (C) Rotor consists of rings that are flanged to fit one against the other.
- (D) Rotor discs are held together by through bolts.

If choice B is selected set score to 1.

20. Why are loose-fitting blades used on the first several stages of large axial compressors?

- (A) To compensate for the abrasive action of the blade tips.
- (B) To maintain close tolerances in the compressor.
- (C) To compensate for a malfunctioning compressor support bearing.
- (D) To minimize vibration while the engine is passing through critical speed ranges.

If choice D is selected set score to 1.

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

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

If choice C is selected set score to 1.

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

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

If choice B is selected set score to 1.

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

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

If choice C is selected set score to 1.

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

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

If choice D is selected set score to 1.

25. A turbine 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) Two sets of stationary vanes, one set of rotating blades.
- (D) One set of rotating vanes, one set of stationary blades.

If choice B is selected set score to 1.

26. The circle of turbine stationary vanes that convert pressure and thermal energy to velocity energy and direct the combustion gases in the direction of turbine wheel rotation is referred to as what?

- (A) Nozzle assembly
- (B) Compressor assembly
- (C) Rotor assembly
- (D) Diffuser assembly

If choice A is selected set score to 1.

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

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

If choice C is selected set score to 1.

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

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

If choice D is selected set score to 1.

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

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

If choice C is selected set score to 1.

30. In a single shaft, cold-end drive gas turbine, the power output speed has what relationship to the speed of the compressor?

- (A) It is in an inverse relationship through reduction gears.
- (B) It varies independently of compressor speed.
- (C) It is the same or in a direct relationship through reduction gears.
- (D) None of the above.

If choice C is selected set score to 1.

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

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

If choice B is selected set score to 1.

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

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

If choice D is selected set score to 1.

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

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

If choice C is selected set score to 1.

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

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

If choice B is selected set score to 1.

35. In the ignition system of a gas turbine engine, how is optimum spark achieved?

- (A) Concentration of minimum energy in minimum time
- (B) Concentration of maximum energy in minimum time
- (C) Concentration of maximum energy in maximum time
- (D) Concentration of minimum energy in maximum time

If choice B is selected set score to 1.

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

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

If choice B is selected set score to 1.

37. 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) RTD
- (B) Manometer
- (C) Probe
- (D) Transducer

If choice D is selected set score to 1.

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

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

If choice A is selected set score to 1.

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

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

If choice C is selected set score to 1.

40. 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) Assists in cooling the lube oil.
- (B) Increases lube oil penetration.
- (C) Provides uniform lube oil distribution around the bearing.
- (D) Minimizes oil leakage from the rotor shaft.

If choice D is selected set score to 1.

41. 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) Splash lubrication
- (C) Totally submerged oil bath
- (D) Self-contained partial oil bath

If choice A is selected set score to 1.

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

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

If choice A is selected set score to 1.

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

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

If choice B is selected set score to 1.

44. How do you manually lockout an SSS clutch?

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

If choice B is selected set score to 1.

45. 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.

46. What feature is commonly used on articulated reduction gear arrangements for the correction of misalignment between the 1st reduction gear and the 2nd reduction pinions?

- (A) Locked train shims
- (B) Quill shafts
- (C) Fixed block pads
- (D) Torsion pads

If choice B is selected set score to 1.

47. 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.

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

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

If choice A is selected set score to 1.

49. A magnet pickup typically produces what type of signal output?

- (A) steady DC voltage
- (B) high current
- (C) pure sine wave
- (D) voltage pulse

If choice D is selected set score to 1.

50. Which of the following conditions permits a gas turbine to produce 100% power?

- (A) Maximum fuel flow
- (B) Minimum air inlet temperature
- (C) Maximum combustion temperature
- (D) Minimum air mass/weight flow

If choice B is selected set score to 1.

51. Which of the following are the principle factors that affect the performance of a gas turbine compressor?

- (A) Bleed pressure, fuel pressure, exhaust temperature
- (B) Fuel flow, air flow, exhaust temperature
- (C) Pressure ratio, air flow, rotational speed
- (D) None of the above

If choice C is selected set score to 1.

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

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

If choice B is selected set score to 1.

53. Routine water washing of the gas turbine compressor shown in the illustration, is usually performed while operating under which of the following conditions? Illustration GT-0017

- (A) At 25% power
- (B) At 75% power
- (C) At 100% power
- (D) With the starter motor drive

If choice D is selected set score to 1.

54. 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.

55. 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.

56. The only hand tools that should be used on gas turbine engines are chrome plated, nickel plated, or which of the following?

- (A) Cadmium plated
- (B) Unplated
- (C) Silver plated
- (D) Bronze plated

If choice B is selected set score to 1.

57. 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) One of the UV flame detectors is activated.
- (C) The fire emergency shutdown switch located on the gas turbine module is activated.
- (D) All of the above.

If choice D is selected set score to 1.

58. When a compressor is in a stall condition, what will happen to the combustor and turbine temperatures?

- (A) Slowly decrease
- (B) Rapidly increase
- (C) Rapidly decrease
- (D) Slowly increase

If choice B is selected set score to 1.

59. 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.

60. 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 low.
- (D) The angle at which the air strikes the compressor rotor blades is too high.

If choice D is selected set score to 1.

61. On a vessel equipped with marine propulsion gas turbines, the operator's initial response to a high vibration alarm should be which of the following?

- (A) Change out the vibration transducer.
- (B) Shut down the turbine.
- (C) Wait for the harmonic vibration to dampen out.
- (D) Switch to the secondary channel to confirm the alarm.

If choice B is selected set score to 1.

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

If choice D is selected set score to 1.

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

If choice C is selected set score to 1.

64. Where are the carbon dioxide nozzles located in the GE LM2500 gas turbine enclosure?

- (A) On either side of the power turbine
- (B) Above and below the combustor section
- (C) Above the compressor
- (D) On the cross beam under the compressor front frame

If choice D is selected set score to 1.

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

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

If choice D is selected set score to 1.

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

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

If choice A is selected set score to 1.

67. Marine GTE fuel oil systems, as shown in the illustration, require fuel oil shutdown valves to be _____. Illustration GT-0021

- (A) piped in series
- (B) piped in series-parallel
- (C) piped in parallel
- (D) manually operated from MPCMS

If choice A is selected set score to 1.

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

If choice A is selected set score to 1.

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

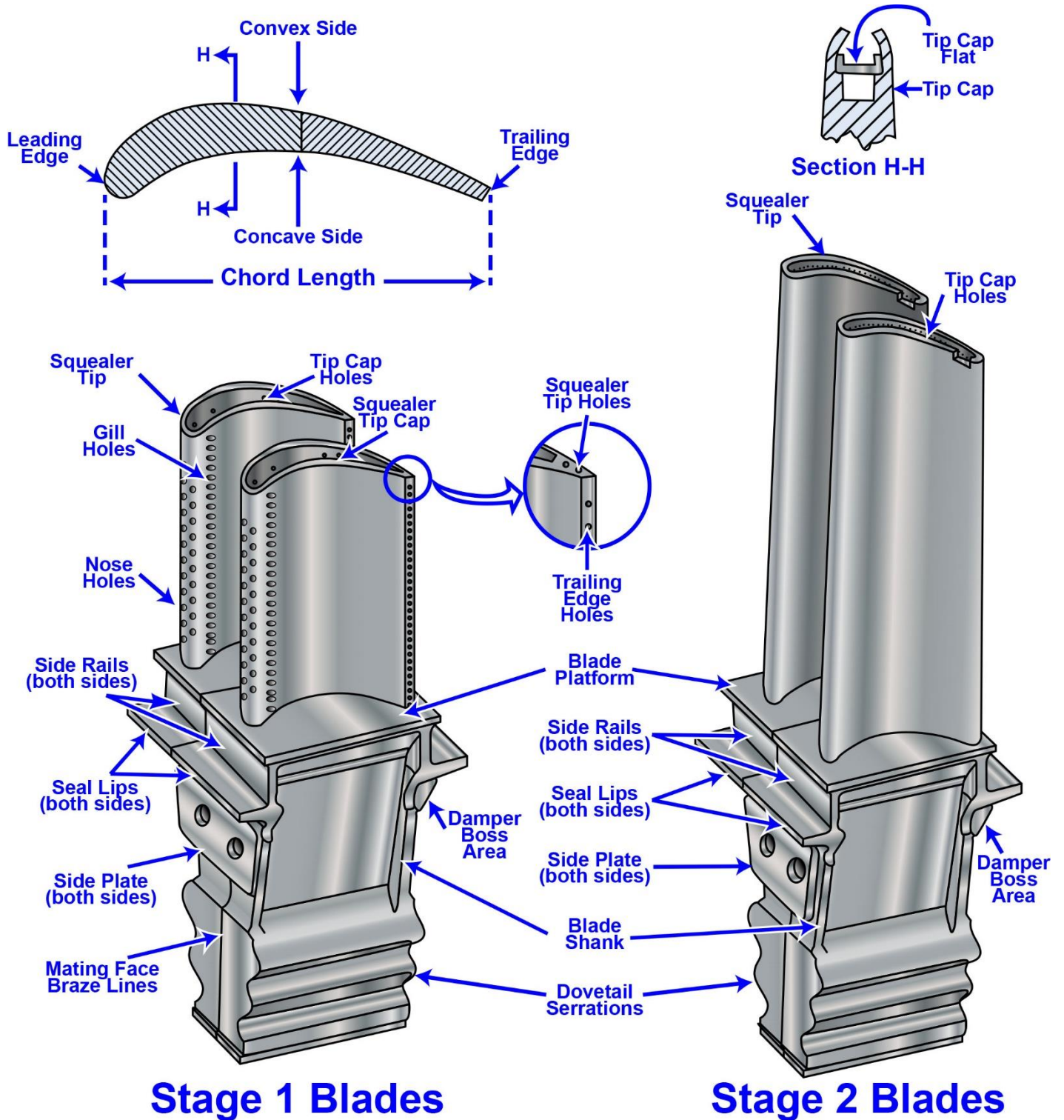
If choice A is selected set score to 1.

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

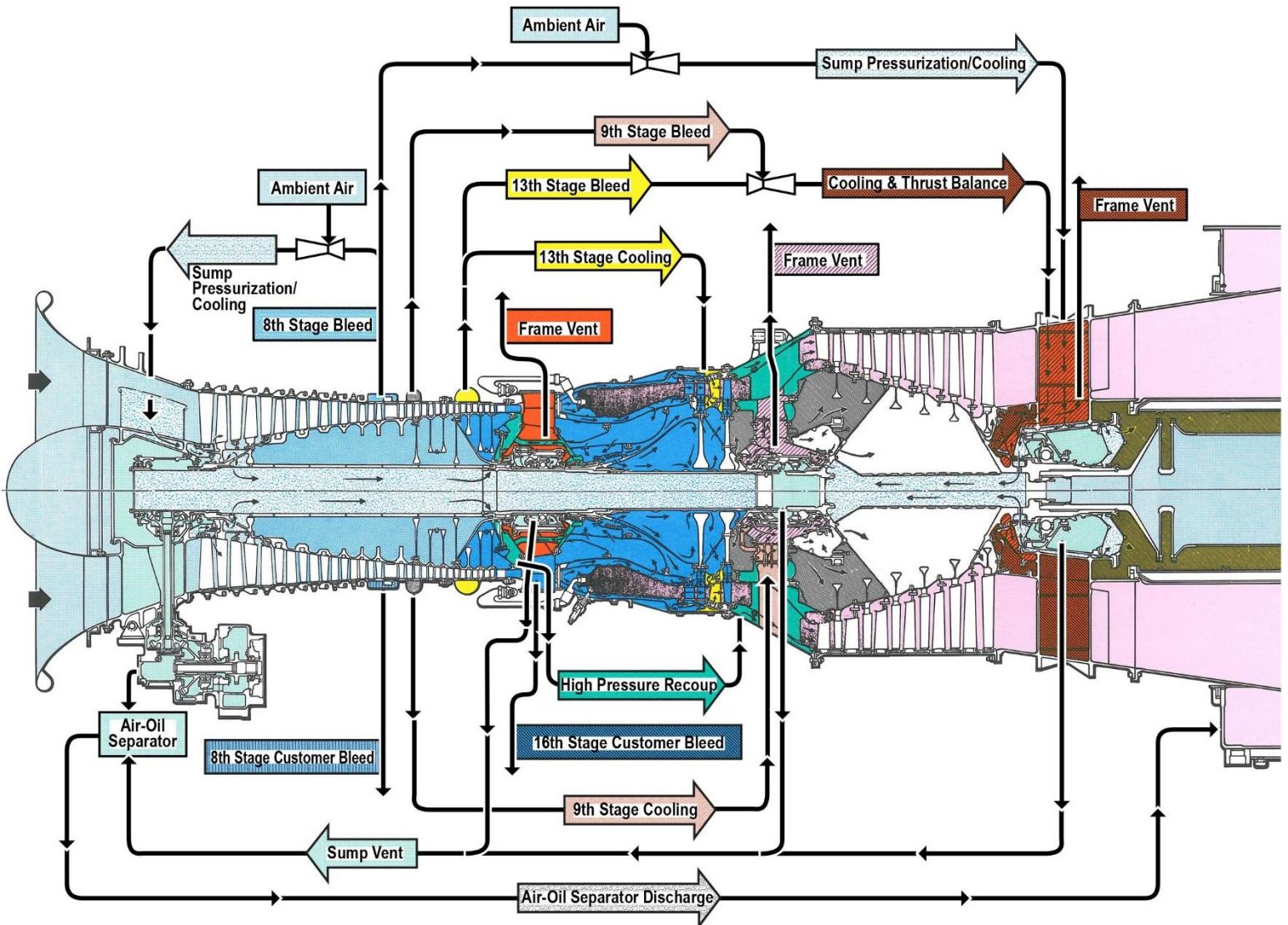
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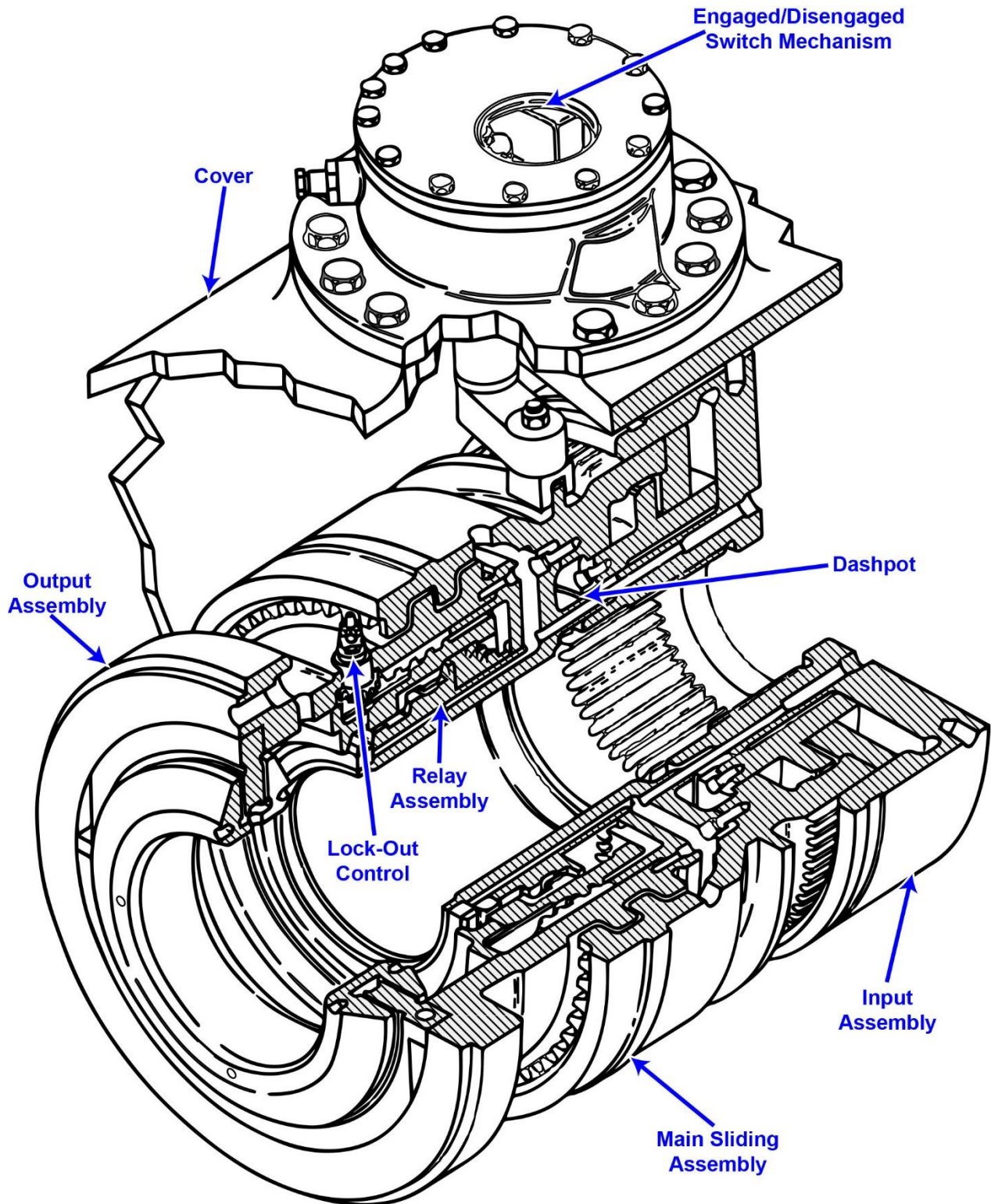
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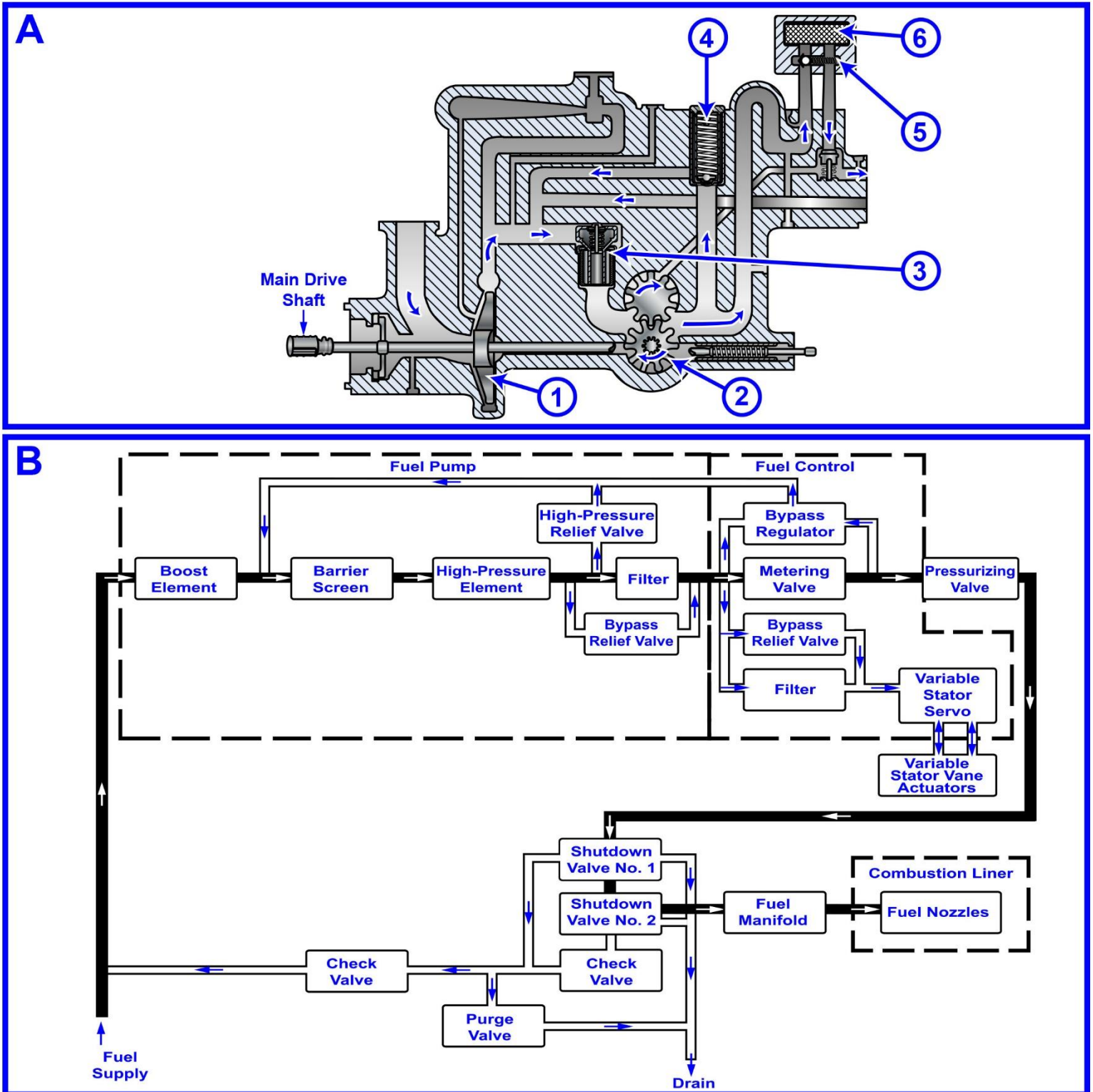
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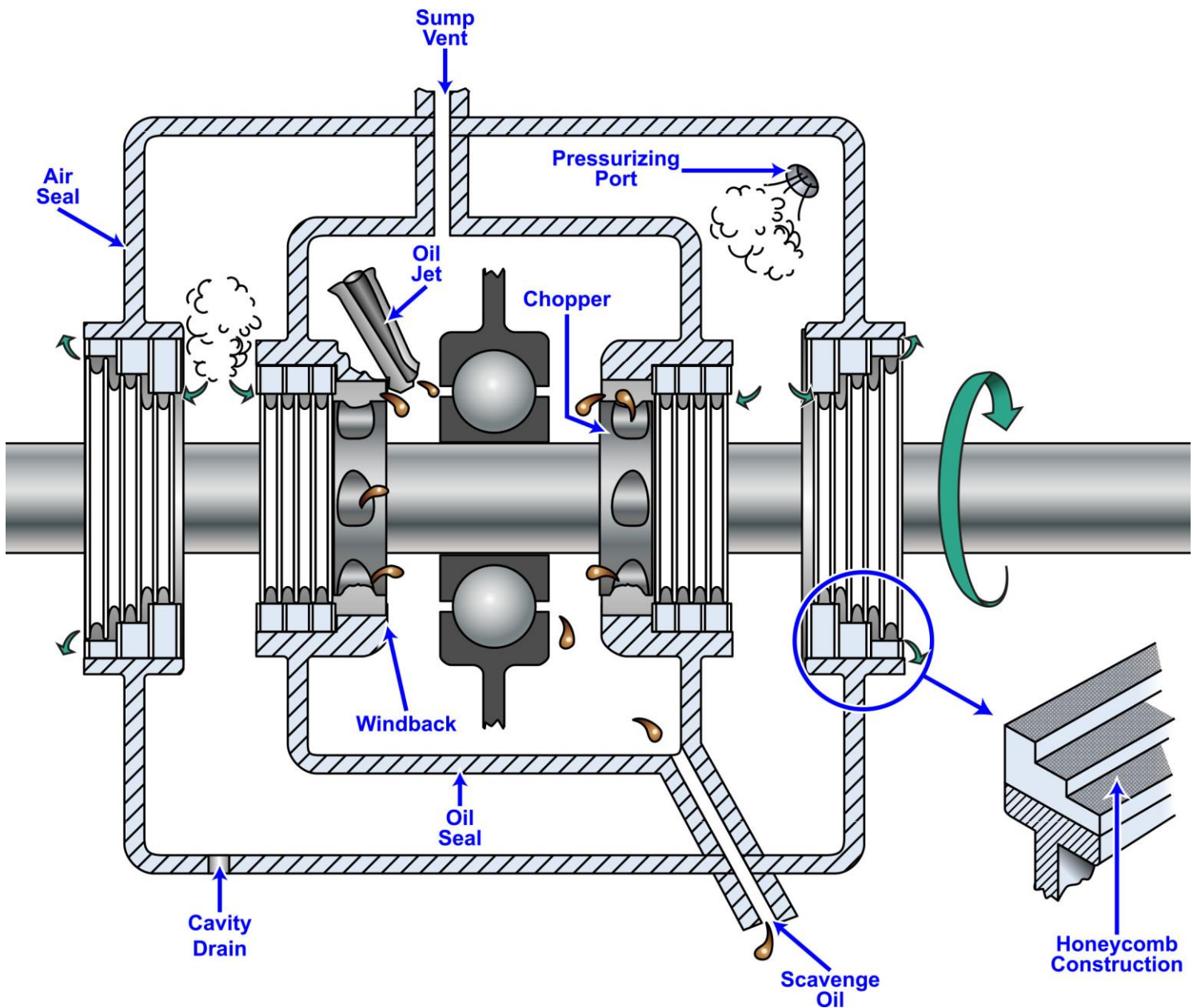


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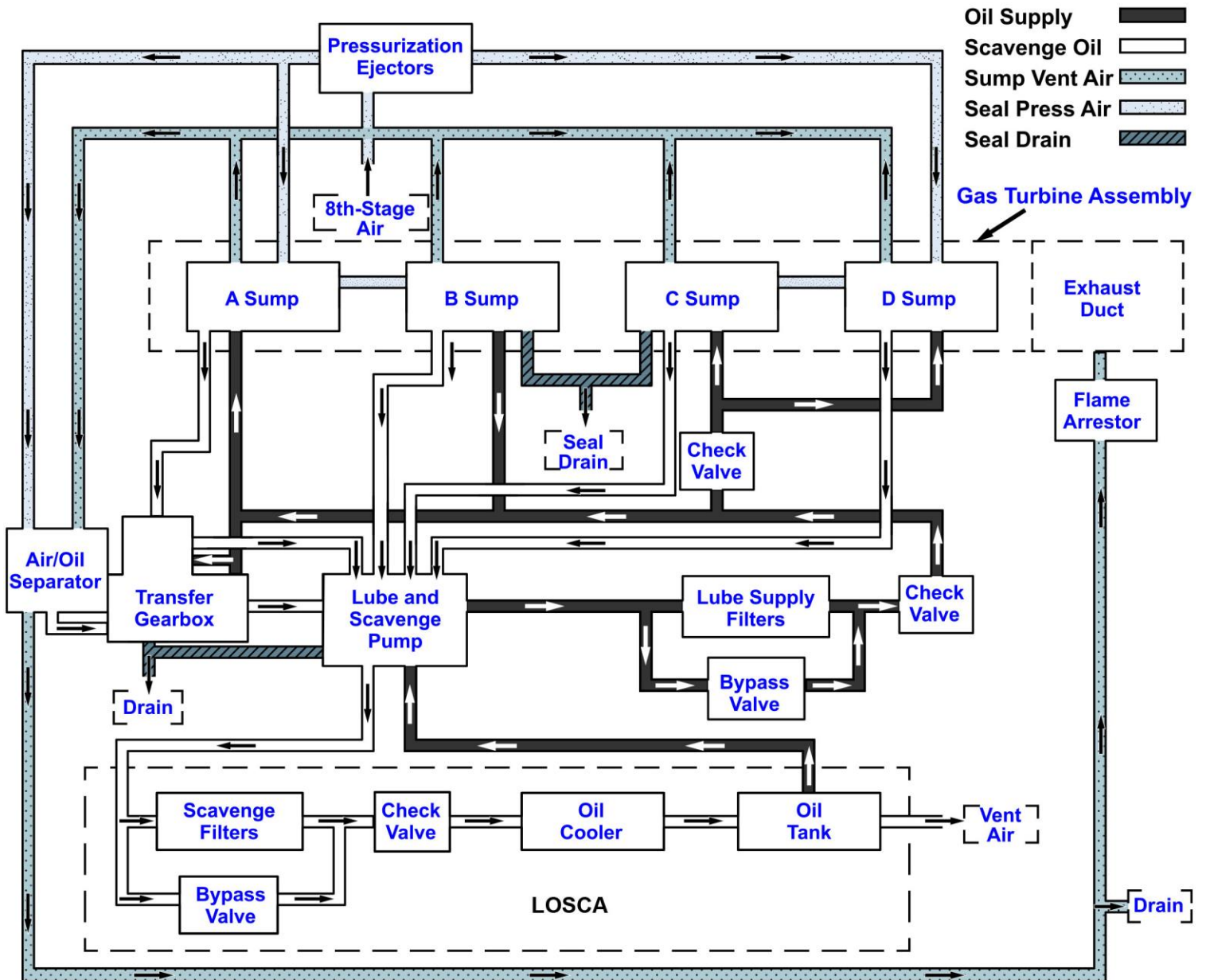


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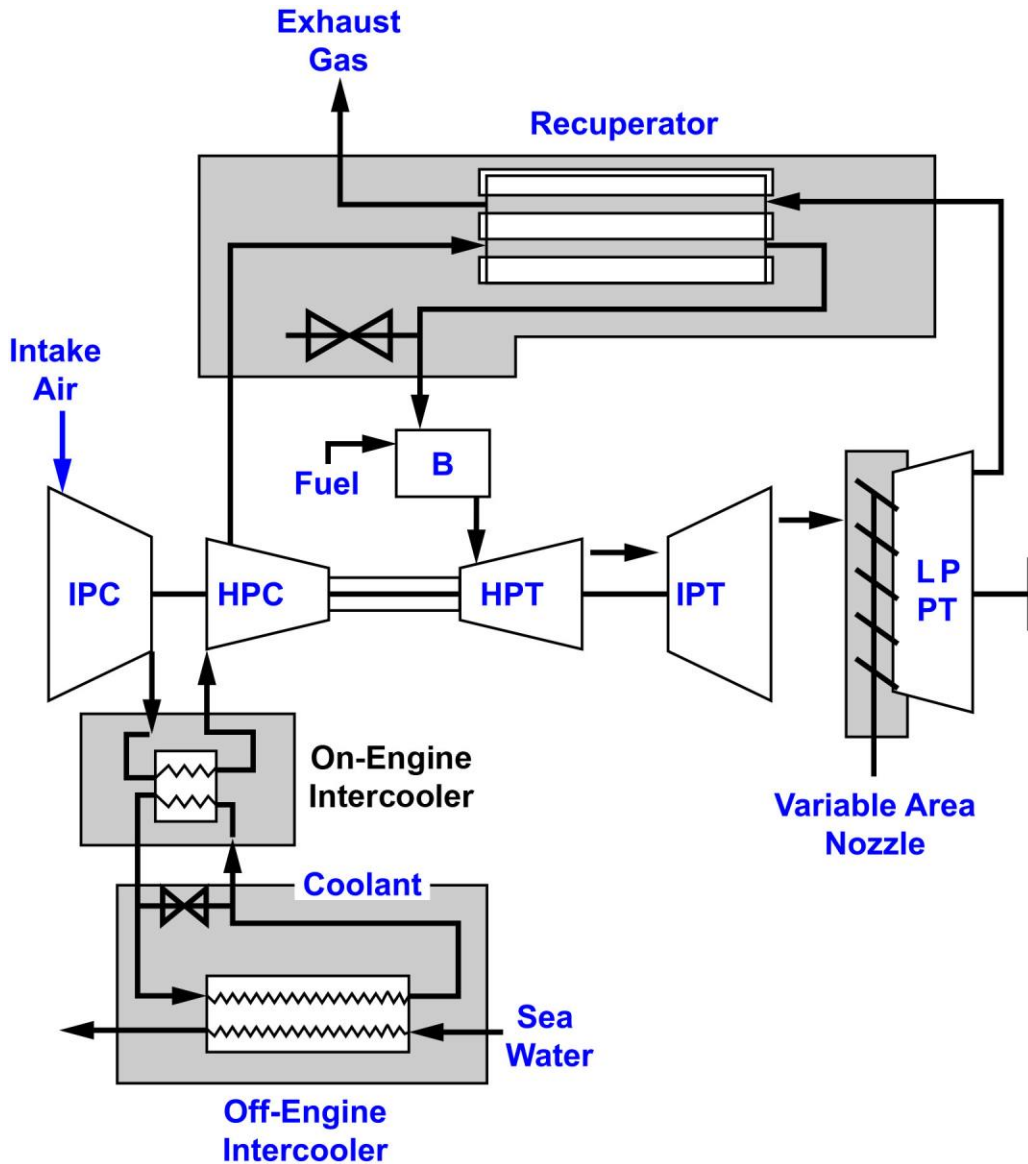


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