

U.S.C.G. Merchant Marine Exam

DDE – 1000/4000 HP

Q632 Gas Turbine Plants

(Sample Examination)

Choose the best answer to the following Multiple-Choice Questions.

1. 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 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.
 - B. 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.
 - 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 increase the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to increase turbine inlet temperature.

Correct answer: A

2. The acronym CDP stands for which of the following?
- A. Coupling Disassembly Point.
 - B. Compressor Discharge Pyrometer.
 - C. Compressor Discharge Pressure.
 - D. Choke Down Point.

Correct answer: C

3. Which of the following is the definition of absolute temperature?
- A. Temperature measured with reference to the theoretical temperature at which all molecular motion stops.
 - B. Temperature measured with reference to 0 degrees Fahrenheit.
 - C. Temperature measured with reference to 0 degrees Celsius.
 - D. Temperature measured with reference to 273 degrees Rankine.

Correct answer: A

4. 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.

Correct answer: D

5. The term "divergent" is best described as which of the following?
- A. Maintaining an equal distance between edges.
 - B. Approaching nearer together, as the inner walls of a tube that is constricted.
 - C. Moving away from each other, as the inner walls of a tube that flare outward.
 - D. Thermal and kinetic energy being converted to mechanical energy.

Correct answer: C

6. Newton's Second Law of Motion states which of the following?

- A. An unbalancing force on a body tends to produce an acceleration in the opposite direction of the force applied.
- B. An unbalancing force on a body tends to produce an acceleration in the same direction of the force applied.
- C. The acceleration of a body is inversely proportional to the applied force.
- D. The acceleration of a body is directly proportional to the mass.

Correct answer: B

7. 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 at each separate component
- C. Changes only once from inlet to outlet
- D. Changes only at the compressor inlet

Correct answer: B

8. A pressure stage of an axial-type compressor consists of which of the following?

- A. Set of rotor blades and a set of stator blades
- B. Set of rotor blades
- C. Compressor rotor and a set of inlet guide vanes
- D. Set of stator blades

Correct answer: A

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

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

Correct answer: A

10. Two functions of the compressor stator vanes include which of the following?

- A. Direct air flow to each rotor stage at the correct angle and deliver air to the combustor at the correct velocity and pressure.
- B. Direct air flow to rotor blades at the correct angle and are shaped to maintain a constant velocity and produce a pressure increase.
- C. Direct air flow to rotor blades at the correct angle and are shaped to produce a velocity increase and maintain a constant pressure.
- D. Direct air flow to rotor blades at the correct angle and are shaped to cause a velocity increase and a pressure decrease.

Correct answer: A

11. 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)

Correct answer: C

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

- A. Fir tree and key
- B. Sawtooth and knob
- C. Grub and bulb
- D. Fir tree and bulb

Correct answer: D

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

- A. Can-annular
- B. Double-annular
- C. Can
- D. Annular

Correct answer: C

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

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

Correct answer: B

15. 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 creating a low-pressure area before the rotor.
- C. By transferring velocity energy and thermal energy to the turbine blades.
- D. By converting the high-velocity gas to low-velocity gas.

Correct answer: C

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

- A. Electrical
- B. Chemical
- C. Kinetic
- D. Thermal

Correct answer: C

17. 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. Rotor assembly
- B. Nozzle assembly
- C. Compressor assembly
- D. Diffuser assembly

Correct answer: B

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

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

Correct answer: D

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

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

Correct answer: A

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

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

Correct answer: B

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

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

Correct answer: B

22. Which of the following components removes the oil from the transfer gearbox?

- A. Lube and scavenge pump
- B. Lube oil storage and conditioning assembly
- C. Air/Oil separator
- D. Duplex filter assembly

Correct answer: A

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

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

Correct answer: B

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

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

Correct answer: B

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

Correct answer: C

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

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

Correct answer: D

27. 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.

Correct answer: B

28. 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

Correct answer: A

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

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

Correct answer: C

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

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

Correct answer: C

31. 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. Fixed block pads
- B. Torsion pads
- C. Quill shafts
- D. Locked train shims

Correct answer: C

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

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

Correct answer: D

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

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

Correct answer: B

34. During an auto-start sequence on the marine gas turbine control console shown in the illustration, what would be the correct order of events required to occur after the start sequence begins? Illustration GT-0016

- A. NGG reaches ignition RPM, gas temperature greater than 400 degrees F, NGG reaches idle RPM.
- B. NGG reaches idle RPM, power turbine reaches ignition RPM, gas temperature greater than 400 degrees F.
- C. Power turbine reaches ignition RPM, gas temperature greater than 400 degrees F, power turbine reaches idle RPM.
- D. Power turbine reaches ignition RPM, gas temperature greater than 400 degrees F, NGG reaches idle RPM.

Correct answer: A

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

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

Correct answer: D

36. 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

Correct answer: B

37. 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

Correct answer: C

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

- A. Bronze plated
- B. Silver plated
- C. Unplated
- D. Cadmium plated

Correct answer: C

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

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

Correct answer: D

40. 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

Correct answer: D

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

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

Correct answer: B

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

Correct answer: A

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

- A. Overspeed and overload stall
- B. Flame out and inlet temperature stall
- C. Steady state and transient
- D. Rapid rise and temperature inversion

Correct answer: C

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

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

Correct answer: A

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

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

Correct answer: A

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

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

Correct answer: C

47. As shown in the illustration of a gas turbine fuel oil system, when the engine fuel oil valves are de-energized, the remaining fuel left in the system is recirculated back to which of the following? Illustration GT-0021

- A. Fuel purge manifold
- B. High-pressure relief valve
- C. Day tank
- D. Fuel pump inlet

Correct answer: D

48. 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.

Correct answer: D

- 49.** For the GE LM2500 gas turbine engine shown in the illustration, the 13th stage bleed air is used for which of the following? Illustration GT-0017
- A. Power turbine balance piston cavity pressurization
 - B. Sump pressurization and cooling
 - C. High-pressure turbine 2nd stage nozzle cooling
 - D. Power turbine cooling

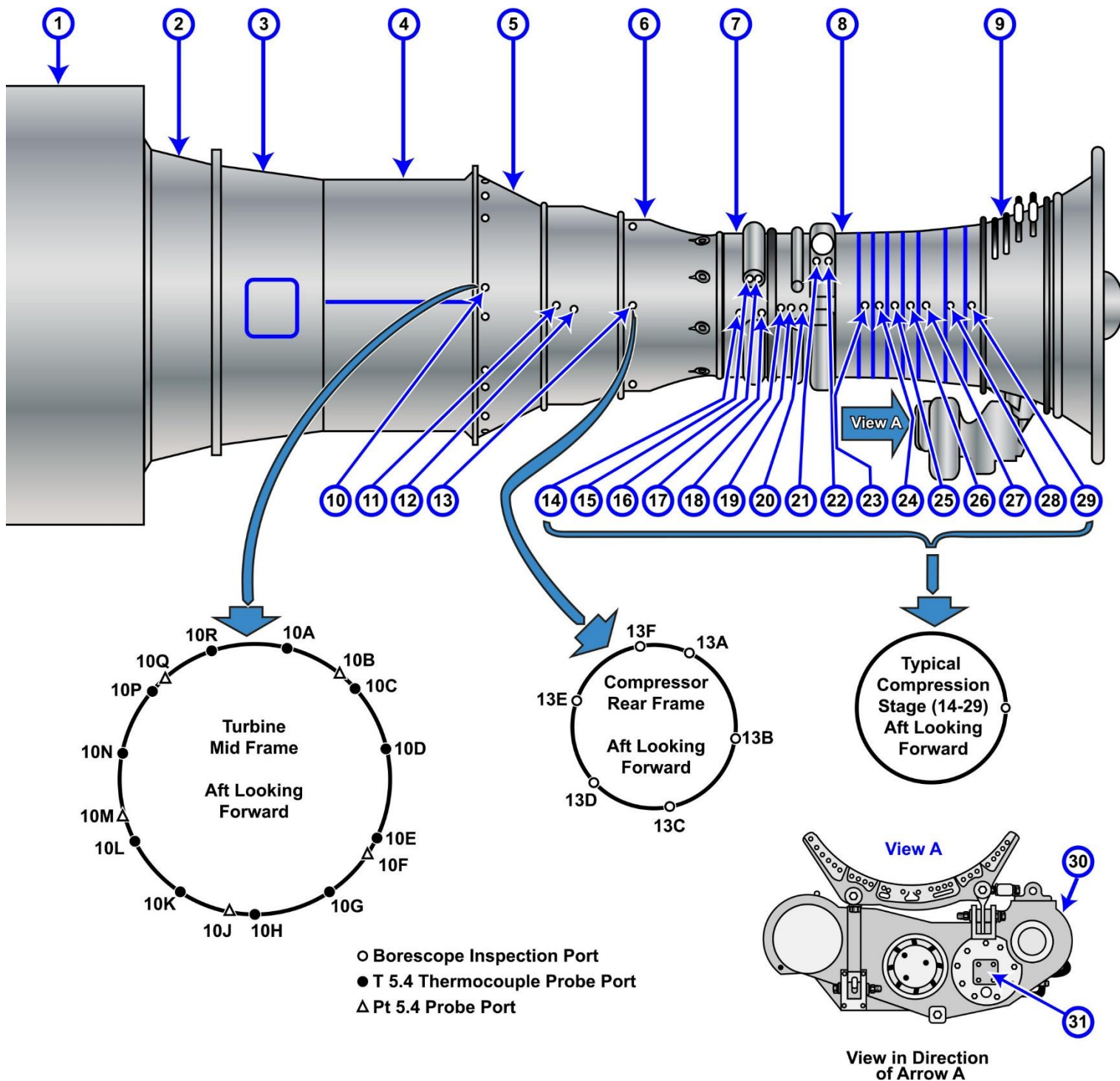
Correct answer: C

- 50.** You are preparing for a borescope inspection of an LM2500 gas turbine engine. You are reviewing the correct geometric orientation nomenclature which includes which of the following?
- A. All references left, right, and radial are orientated as viewed from aft looking forward on the engine.
 - B. All references left, right, and radial are orientated as viewed from forward looking aft on the engine.
 - C. All references are made from the combustor section, forward to the hp turbine and aft to the power turbine.
 - D. All references are made from the combustor section, aft to the hp turbine and forward to the power turbine.

Correct answer: A



GT-0006



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GT-0016

FUEL OIL

PUMP B FAULT	PUMP A FAULT	HEADER TEMP HI/LO
TANK B TEMP HI/LO	TANK A TEMP HI/LO	HEADER PRESS HI
		HEATER TEMP HI
SUCTION STR Δ P HI	DRAIN TANK LEVEL HI	FILTER WATER HI
		FILTER Δ P HI

TK B SUCT VALVE OPEN	TK A SUCT VALVE OPEN	
TK B RECIRC VALVE OPEN	TK A RECIRC VALVE OPEN	
TK B SUCT VALVE CL	TK A SUCT VALVE CL	FILTER A BLOCKED
TK B RECIRC VALVE CL	TK A RECIRC VALVE CL	FILTER B BLOCKED

HEADER

TEMP	PRESS

SERVICE TANK VALVES

<p>B OPEN</p> <p>CLOSE</p>	<p>A OPEN</p> <p>CLOSE</p>
----------------------------	----------------------------

PUMP

<p>B FAST</p> <p>B SLOW</p> <p>B STOP</p>	<p>A FAST</p> <p>A SLOW</p> <p>A STOP</p>
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EMERG TRIP

<p>B</p>	<p>A</p>
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CONTROL TRANSFER

REMOTE LOCAL

PUMP MODE

MANUAL

B LEAD A LEAD

GTM B

FUEL TEMP LO	LUBO LEVEL HI	LUBO COOLER OUT TEMP HI	COOLING AIR OUT TEMP HI	
FUEL FILTER BLOCKED	LUBO SCAV FILTER BLK	LUBO SUPPLY FILTER BLK	CLUTCH FAIL TO DISENGAGE	CLUTCH FAIL TO ENGAGE
				FIRE DETECTOR FAIL

	NO. 1 FUEL VALVE OPEN	TACH NO. 1 LOSS	STARTER CUTOUT	BLEED AIR VALVE OPEN
	NO. 2 FUEL VALVE OPEN	TACH NO. 2 LOSS	WATER WASH HEATER ON	

WATER WASH

TANK EMPTY

WASH ON OFF

HEATER ON OFF

OUT OF SERVICE

NORMAL

START COUNTER

GTM TIMER

HOURS

MANUAL START

VENT DAMPER OPEN	COOLING FAN ON	BLEED VALVE OPEN	STARTER AIR ON	IGNITER ON	MAIN FUEL VALVE OPEN
VENT DAMPER CLOSE	COOLING FAN OFF	BLEED VALVE CLOSE			MAIL FUEL VALVE CLOSE
FUEL LOW TEMP OVRD	FUEL PURGE ON	CLUTCH ENGAGE	CLUTCH DISENGAGE	BRAKE ON	BRAKE OFF

SPEED

GG	PT

PT INLET

TEMP	PRESS

MAIN FUEL VALVE CHECK SWITCH

NO. 1 NO. 2

CONTROL TRANSFER

ENABLE INHIBIT

EMERGENCY CONTROLS

FIRE SYS DISABLED PUSH TO RESTORE

CO2 RELEASE INHIBIT

BATTLE OVRD ON

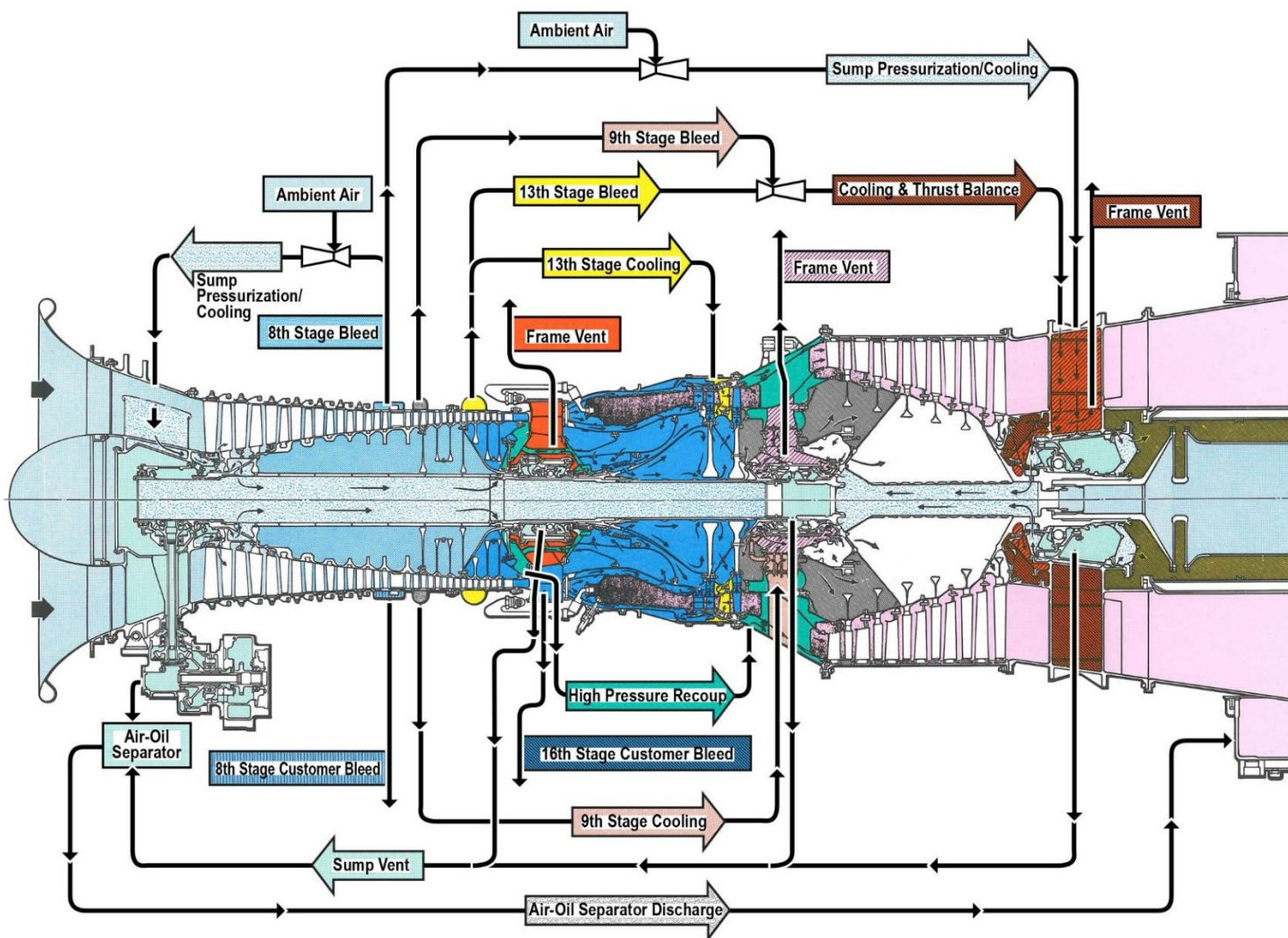
EMERGENCY STOP

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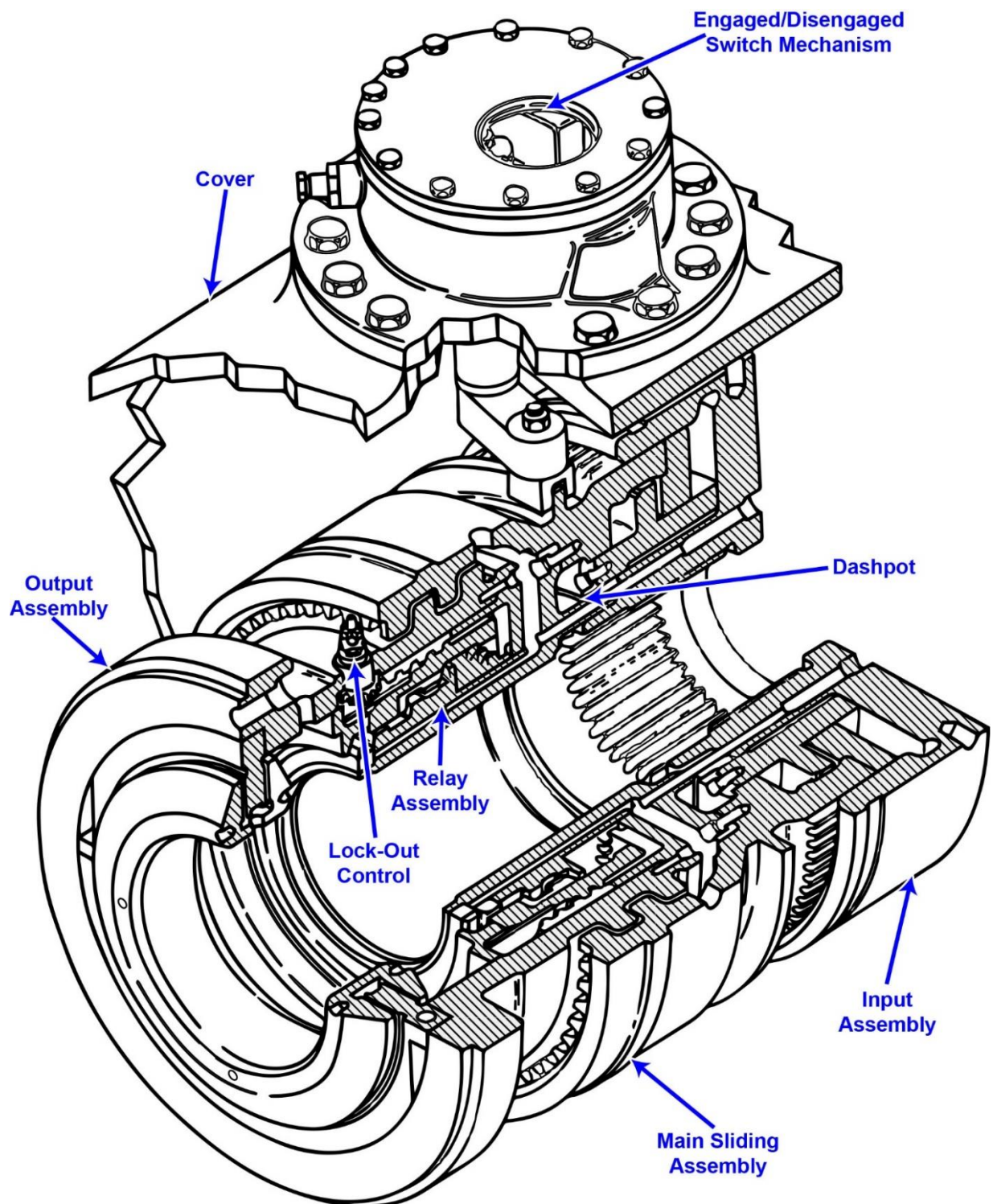
GT-0017



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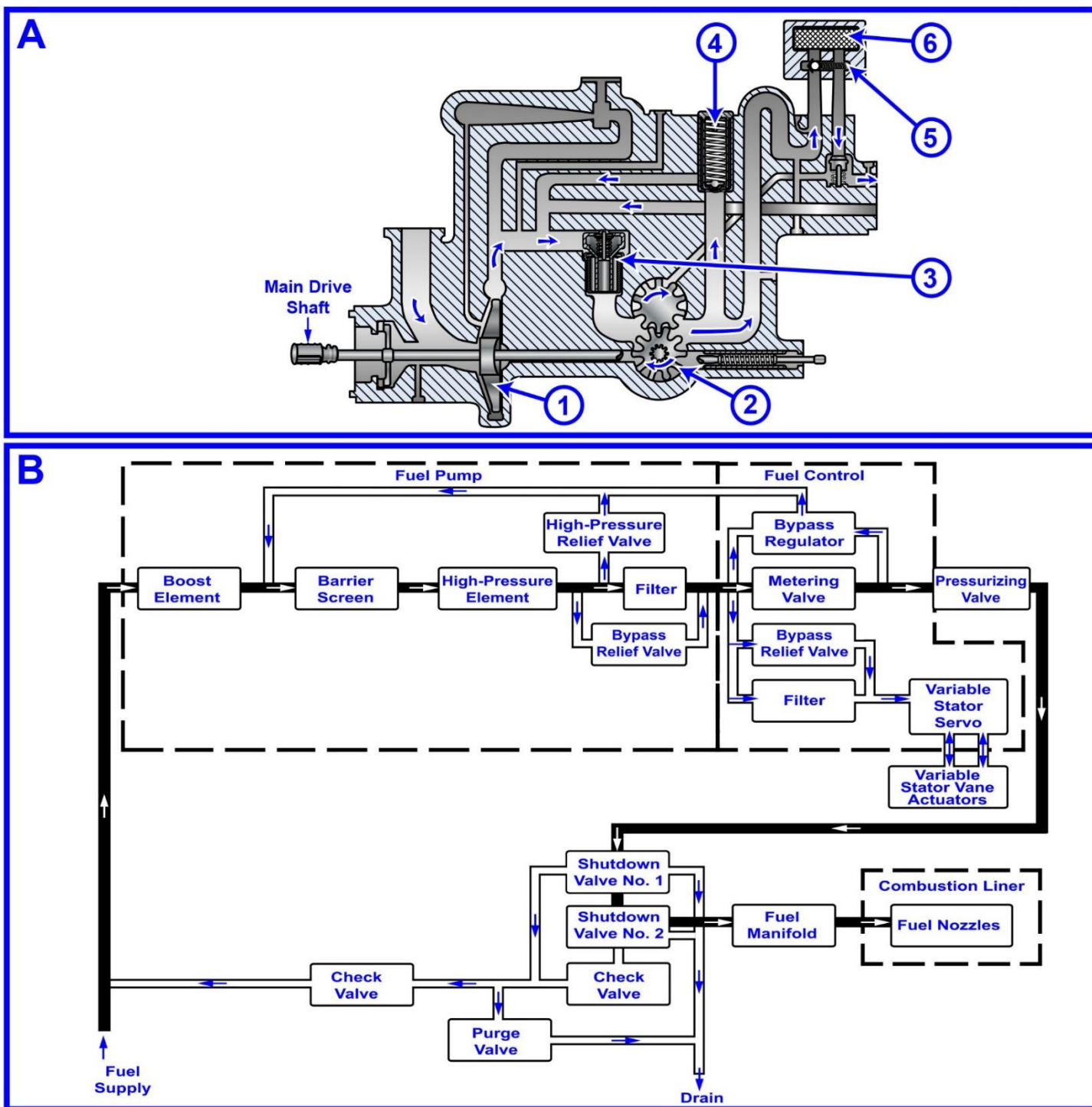
GT-0018



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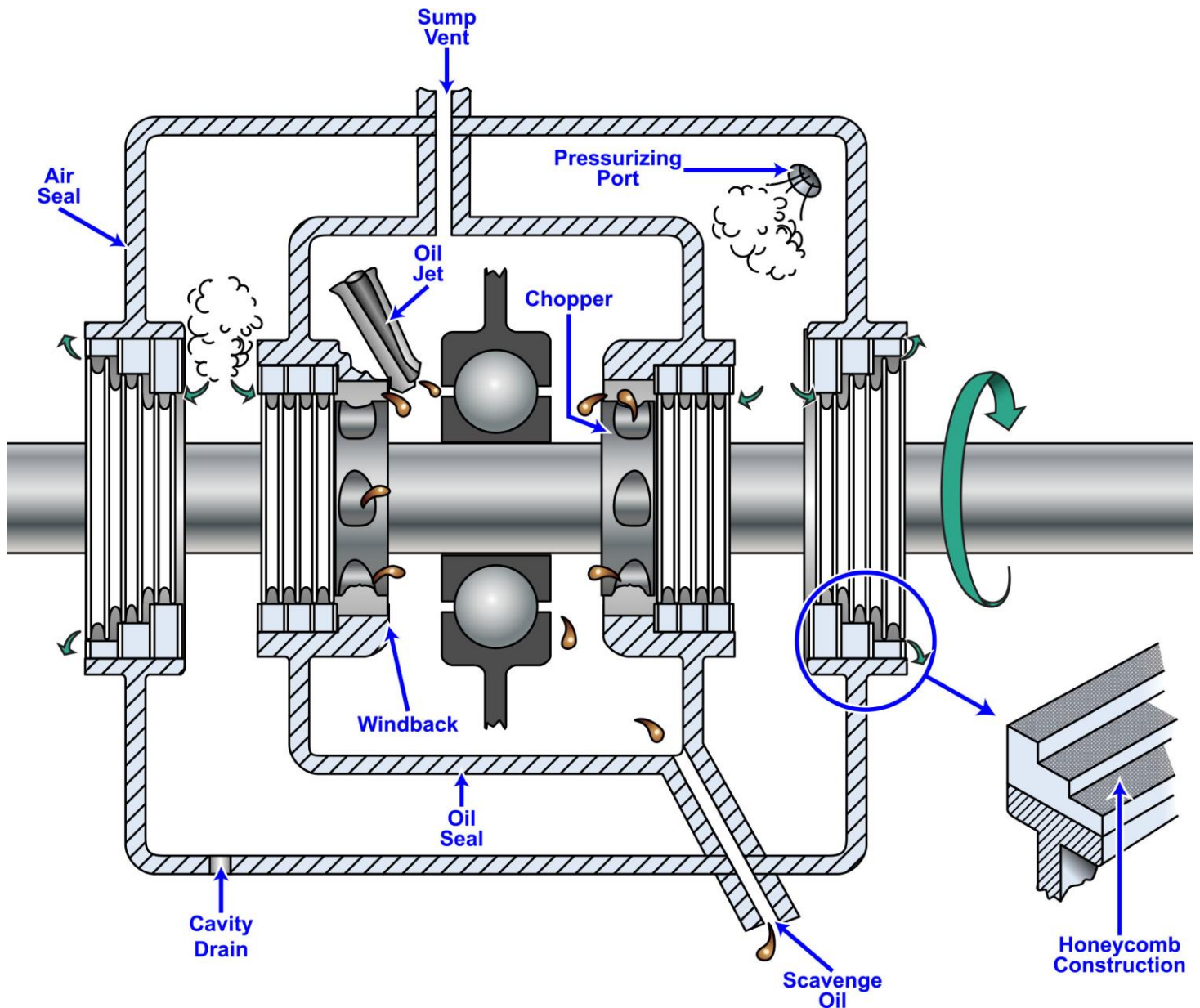
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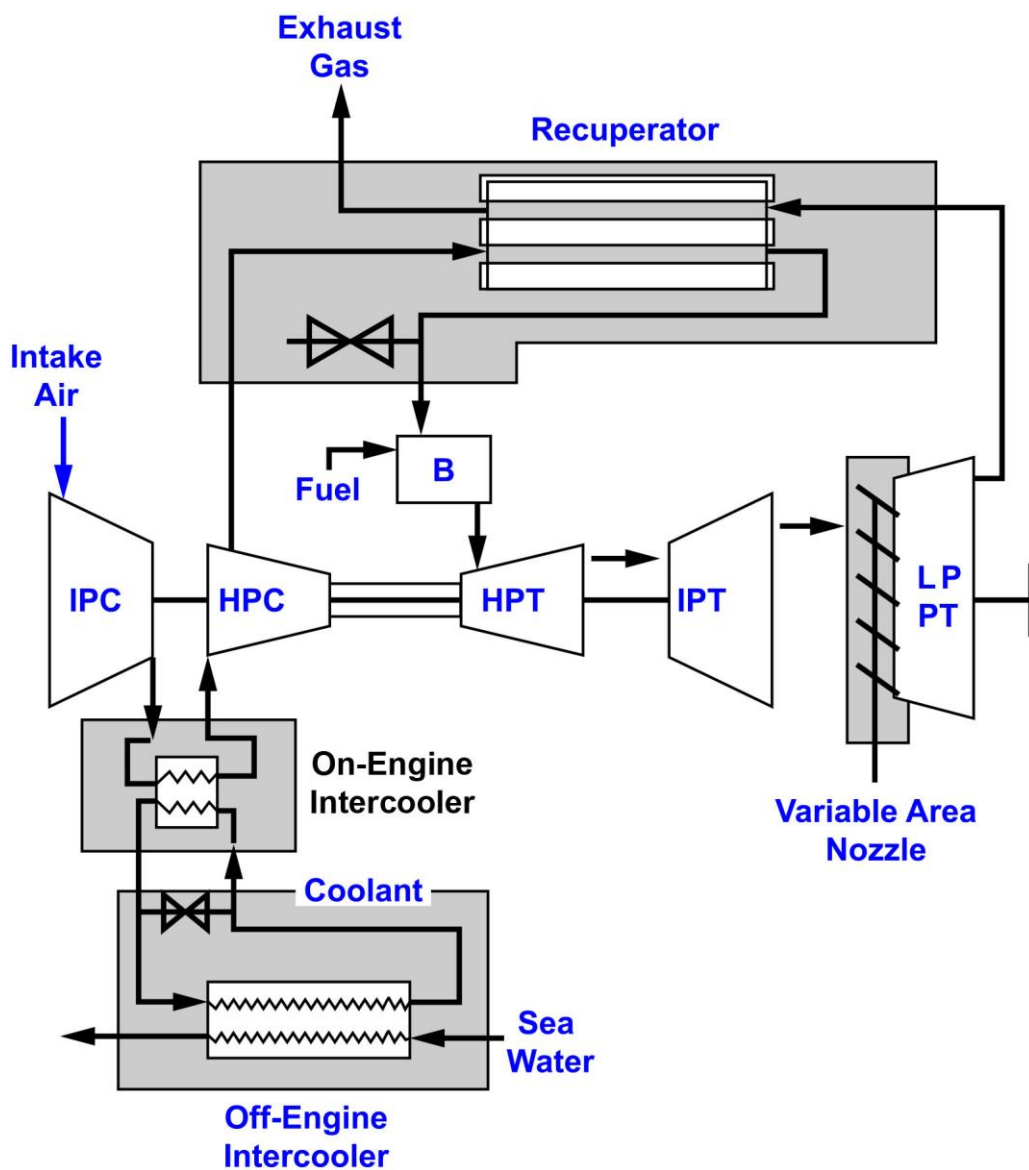
GT-0023



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GT-0026



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