

U.S.C.G. Merchant Marine Exam  
Chief Engineer, Limited  
Q606 Gas Turbine Plants  
(Sample Examination)

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

1. Distortion of the combustor liner assembly is evident when you observe which of the following conditions?
- (A) The inner liner bends down into the flow path., and the outer liner lifts up into the flow path
  - (B) Both the inner and outer liner bend into the flow path.
  - (C) The inner liner lifts up into the flow path, and the outer liner bends down into the flow path.
  - (D) Both the inner and outer liner lift up into the flow path.

*If choice C is selected set score to 1.*

2. On a GE LM2500 gas turbine powered vessel you are conducting a borescope inspection of the compressor. What is used on each compressor stage as a reference for indexing the blades?
- (A) The IGV actuator.
  - (B) The locking lug blades.
  - (C) Witness marks center punched on the #1 nozzle and blade.
  - (D) Scribe marks located on the stator and rotor diaphragm.

*If choice B is selected set score to 1.*

3. As shown in the illustration, the HP turbine 2nd stage blades are cooled by convection, with the cooling air being discharged at which of the following? Illustration GT-0011
- (A) Trailing edge slots.
  - (B) Blade tips.
  - (C) Gill holes on the side.
  - (D) Nose holes on the leading edge.

*If choice B is selected set score to 1.*

4. How many stages are in the HP turbine of the GE LM2500 gas turbine engine?
- (A) One
  - (B) Two
  - (C) Three
  - (D) Four

*If choice B is selected set score to 1.*

- 5.** A gas turbine engine's main lube oil system pump check valve serves to maintain system prime and perform what other function?
- (A) To prevent reverse flow of oil through a secured pump
  - (B) To increase system pressure
  - (C) To return oil to the main reduction gear sump
  - (D) None of the above

*If choice A is selected set score to 1.*

- 6.** Which of the following is the most likely cause for the main propulsion gas turbine engine tripping during start up?
- (A) Inlet air ice detection.
  - (B) High oil filter differential pressure.
  - (C) Low sump oil level.
  - (D) Failure to achieve the minimum rpm in a certain period of time.

*If choice D is selected set score to 1.*

- 7.** You are conducting a borescope inspection of the combustor section of a GE LM2500 gas turbine engine. You observe a one square inch hole in the combustor dome where burn through has removed the metal. What would be your course of action?
- (A) Record the damage and continue to operate the engine while monitoring the high-pressure turbine temperatures and nozzle condition.
  - (B) Immediately take the engine out of service.
  - (C) Operate the engine only in an emergency and at reduced load.
  - (D) Make temporary repairs with onboard repair kit to patch hole.

*If choice A is selected set score to 1.*

- 8.** Aboard ship, single-shaft gas turbines are used mostly as prime movers for which of the following applications?
- (A) Auxiliary power units
  - (B) Single-screw ships
  - (C) Multi-screw ships
  - (D) Generators

*If choice D is selected set score to 1.*

**9.** The two basic types of compressors used in gas turbine engines are which of the following?

- (A) Centrifugal and axial.
- (B) Axial and lobe.
- (C) Axial and reciprocating.
- (D) Centrifugal and reciprocating.

*If choice A is selected set score to 1.*

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

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

*If choice D is selected set score to 1.*

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

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

*If choice B is selected set score to 1.*

**12.** An axial compressor stage is represented by which of the following components and in which order?

- (A) One set of rotating vanes, one set of stationary blades.
- (B) One set of rotating blades, two sets of stationary vanes.
- (C) One set of rotating blades, one set of stationary vanes.
- (D) One set of stationary vanes, one set of rotating blades.

*If choice C is selected set score to 1.*

**13.** What is a compressor midspan shroud?

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

*If choice D is selected set score to 1.*

**14.** For shipboard main propulsion application, how does an intercooled-recuperated (ICR) cycle gas turbine configuration compare to a combined cycle gas turbine configuration?

- (A) The combined cycle configuration is lower in efficiency, lighter, and takes up less space.
- (B) The ICR cycle configuration is more efficient, lighter, and takes up less space than a combined cycle configuration.
- (C) The combined cycle configuration is more efficient and takes up less space than an ICR cycle configuration.
- (D) Although the ICR cycle configuration is lower in efficiency, it is lighter and takes up less space than a combined cycle configuration.

*If choice D is selected set score to 1.*

**15.** Why is safety-wiring, or lock wiring of gas turbine parts required?

- (A) Prevent disengagement of parts.
- (B) Prevent corrosion.
- (C) Maintain lubrication.
- (D) Maintain fastener torque.

*If choice A is selected set score to 1.*

**16.** During an operation of a gas turbine equipped with an intercooler and recuperator, a low combustion air temperature to the combustor section could be caused by which of the following?

- (A) Low exhaust temperature.
- (B) High fuel pressure to the combustor section.
- (C) Low water pressure to the intercooler.
- (D) High exhaust temperature.

*If choice A is selected set score to 1.*

**17.** The main thrust bearing directly positions which part(s) of the main reduction gear?

- (A) Bull gear.
- (B) Low-speed pinion.
- (C) High-speed pinion.
- (D) High-speed gear.

*If choice A is selected set score to 1.*

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

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

*If choice A is selected set score to 1.*

**19.** 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 internal reference points.
- (D) The limitations of your equipment.

*If choice B is selected set score to 1.*

**20.** Turbine stages are generally sealed to prevent gas leakage by which of the following methods?

- (A) The flow of the working fluid across the blades.
- (B) Compressed air injected between stages at the nozzles.
- (C) Rotating labyrinths and stationary sealing segments.
- (D) Rotating sealing segments and stationary labyrinths.

*If choice C is selected set score to 1.*

**21.** The term used to describe a gas turbine in which the turbine exhaust passes through a cooler and back to the compressor inlet is which of the following?

- (A) Uni-cycle.
- (B) Twin cycle.
- (C) Open cycle.
- (D) Closed cycle.

*If choice D is selected set score to 1.*

**22.** 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) Probe
- (D) Transducer

*If choice D is selected set score to 1.*

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

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

*If choice D is selected set score to 1.*

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

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

*If choice A is selected set score to 1.*

**25.** The fuel oil service system supply pressure to the marine gas turbine engine shown in the illustration is designed to be regulated at approximately \_\_\_\_\_. Illustration GT-0021

- (A) 30 psig
- (B) 45 psig
- (C) 60 psig
- (D) 75 psig

*If choice B is selected set score to 1.*

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

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

*If choice B is selected set score to 1.*

**27.** For the same amount of available power, how does a low-speed two-stroke diesel engine compare to a recuperated gas turbine configuration?

- (A) The two-stroke diesel engine would burn more fuel and the particulate and nitrogen oxide (NO<sub>x</sub>) levels in the exhaust would be higher than that of a recuperated gas turbine configuration
- (B) The two-stroke diesel engine would burn less fuel and the nitrogen oxide (NO<sub>x</sub>) levels in the exhaust would be much lower than that of a recuperated gas turbine configuration.
- (C) The two-stroke diesel engine would burn more fuel than a recuperated gas turbine; however, the particulate and nitrogen oxide (NO<sub>x</sub>) levels in the exhaust would be lower.
- (D) The two-stroke diesel engine would burn less fuel than a recuperated gas turbine; however, the levels of particulate and nitrogen oxide (NO<sub>x</sub>) levels in the exhaust would be higher.

*If choice D is selected set score to 1.*

**28.** Where are the CO<sub>2</sub> 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) On either side of the PT
- (D) Above the compressor

*If choice A is selected set score to 1.*

**29.** What action should you take if full power vibration limits are exceeded on a gas turbine engine?

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

*If choice A is selected set score to 1.*

**30.** Which of the following components prevent(s) objects smaller than 1/4 inch from entering the engine?

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

*If choice C is selected set score to 1.*

- 31.** On a gas turbine powered vessel equipped with a synchro-self-shifting (SSS) clutch, you are preparing for a power turbine over speed test. What would be an important action to take prior to starting the engine?
- (A) Remove the SSS clutch locking pawls.
  - (B) Calculate the engagement speed of the SSS clutch.
  - (C) Engage the SSS clutch using air pressure.
  - (D) Manually lock-out the SSS clutch from engaging using the special wrench provided.

*If choice D is selected set score to 1.*

- 32.** You are preparing for a borescope inspection of a gas turbine engine. Prior to the inspection it is recommended that you do which of the following?
- (A) Water wash both the compressor and the power turbine.
  - (B) Water wash the power turbine.
  - (C) Water wash the compressor.
  - (D) Not water wash the engine prior to the inspection.

*If choice C is selected set score to 1.*

- 33.** 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) Diffuser assembly.
  - (B) Rotor assembly.
  - (C) Nozzle assembly.
  - (D) Compressor assembly.

*If choice C is selected set score to 1.*

- 34.** The fuel purge valve on the marine gas turbine shown in the illustration is opened \_\_\_\_\_.  
Illustration GT-0017

- (A) automatically with auto sequencing
- (B) manually by the operator
- (C) prior to starting
- (D) all of the above

*If choice D is selected set score to 1.*

- 35.** A compressor blade platform that is tilted or raised may indicate which of the following failures?
- (A) Blade root.
  - (B) Carboloy pad.
  - (C) Midspan damper.
  - (D) Tip clang.

*If choice A is selected set score to 1.*

**36.** To ensure minimum clearance between rotor blade tips and the casing of an axial compressor, manufacturers use which of the following techniques?

- (A) Loosely mounted rotors that expand during use.
- (B) Abrasive coatings in the casing and hardened tips on the blades.
- (C) Metal-sprayed coating of the casing and squealer tips on the blades.
- (D) Closely machined tip to casing clearances.

*If choice C is selected set score to 1.*

**37.** What are the two prime sources of deposits that build up on compressor blades?

- (A) Carbon residue and lube oil mist
- (B) Salt spray and carbon residue
- (C) Lube oil mist and fuel oil spray
- (D) Lube oil mist and salt spray

*If choice D is selected set score to 1.*

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

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

*If choice B is selected set score to 1.*

**39.** How is the HP turbine rotor of the GE LM2500 gas turbine engine cooled?

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

*If choice D is selected set score to 1.*

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

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

*If choice B is selected set score to 1.*

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

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

*If choice B is selected set score to 1.*

**42.** In which of the following ways can compressor surge cause excessive temperatures in the turbine section?

- (A) By providing inadequate secondary air
- (B) By overloading the compressor
- (C) By providing excessive combustion air
- (D) All of the above

*If choice A is selected set score to 1.*

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

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

*If choice D is selected set score to 1.*

**44.** Boyle's law can best be defined as \_\_\_\_\_.

- (A) the volume of an enclosed gas varies inversely with the applied pressure, provided the temperature remains constant
- (B) if the pressure is constant, the volume of an enclosed gas varies indirectly with absolute temperature
- (C) a body at rest tends to remain at rest
- (D) none of the above

*If choice A is selected set score to 1.*

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

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

*If choice A is selected set score to 1.*

**46.** A white-gray powdery deposit can usually be found on which of the following metals?

- (A) Steel.
- (B) Magnesium.
- (C) Magnetite.
- (D) Aluminum.

*If choice D is selected set score to 1.*

**47.** Assuming you maintain the same power output, how will a decrease in the compressor inlet air temperature effect a gas turbine engine's efficiency and fuel consumption?

- (A) Efficiency will increase and fuel consumption will decrease.
- (B) Efficiency will decrease and fuel consumption will increase.
- (C) Efficiency and fuel consumption will not be effected by a change in inlet air temperature.
- (D) Efficiency and fuel consumption will both increase.

*If choice A is selected set score to 1.*

**48.** What type of metallurgical failure does Item A represent in the illustration? Illustration GT-0014

- (A) Rupture.
- (B) Radial cracking.
- (C) Creep.
- (D) Axial cracking.

*If choice B is selected set score to 1.*

**49.** Which of the following is true concerning the main engine lube oil system of the marine gas turbine shown in the illustration? Illustration GT-0024

- (A) The system includes a single combined lube oil supply and scavenge pump.
- (B) The line shaft bearing lubrication system is provided for by the LOSCA.
- (C) Lubrication is provided for the main reduction gears through the transfer gearbox.
- (D) All of the above.

*If choice A is selected set score to 1.*

**50.** The secondary passages on the gas turbine engine fuel nozzles shown in the illustration are designed to open at approximately what pressure? Illustration GT-0005

- (A) 30 psig
- (B) 130 psig
- (C) 230 psig
- (D) 330 psig

*If choice D is selected set score to 1.*

**51.** What is the designed compressor pressure ratio of the gas turbine compressor rotor shown in the illustration? Illustration GT-0004

- (A) 10 to 1
- (B) 12 to 1
- (C) 16 to 1
- (D) 20 to 1

*If choice C is selected set score to 1.*

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

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

*If choice D is selected set score to 1.*

**53.** A reddish-colored oxide usually forms on which of the following metals?

- (A) Aluminum.
- (B) Steel.
- (C) Chromium.
- (D) Magnesium.

*If choice B is selected set score to 1.*

**54.** On a gas turbine powered vessel, what is the last step after an off-line water wash?

- (A) Open the variable stator vanes.
- (B) Start the engine to dry it out.
- (C) Release the gas generator brake.
- (D) Secure the starting system.

*If choice B is selected set score to 1.*

**55.** When performing a static check to determine tooth contact, you should use which of the following compounds to coat the gear teeth?

- (A) Copper sulfate.
- (B) An indelible marker.
- (C) Prussian blue.
- (D) Persian blue.

*If choice C is selected set score to 1.*

**56.** On the marine gas turbine engine shown in the illustration, what temperature should be carefully monitored following a shutdown for an engine fire? Illustration GT-0016

- (A) power turbine inlet
- (B) fuel manifold
- (C) combustor liner
- (D) compressor discharge

*If choice A is selected set score to 1.*

**57.** Your first step in response to a gas turbine engine high lube oil sump temperature alarm would be which of the following?

- (A) Check the oil filter differential pressure.
- (B) De-couple the engine from the main reduction gear.
- (C) Check the oil pressure to the sump.
- (D) Reduce engine speed.

*If choice D is selected set score to 1.*

**58.** Provisions for avoiding the buildup of ice on the intake air surfaces of a gas turbine plant can be found where?

- (A) In the stack intake ducting.
- (B) In the inlet duct frame at the inlet to the engine.
- (C) In the exhaust and intake ducting.
- (D) Both A & B.

*If choice D is selected set score to 1.*

**59.** On marine gas turbines equipped with fuel oil nozzles as shown in the illustration, the minimum fuel oil manifold pressure for proper operation should be \_\_\_\_\_. Illustration GT-0005

- (A) 40-80 psi
- (B) 80-200 psi
- (C) 200-300 psi
- (D) 300-500 psi

*If choice B is selected set score to 1.*

**60.** In the marine gas turbine engine shown in the illustration, the 9th stage bleed air is used for which of the following? Illustration GT-0017

- (A) Compressor balance piston cavity pressurization.
- (B) High-pressure turbine 2nd stage nozzle cooling.
- (C) Sump pressurization and cooling.
- (D) Power turbine cooling.

*If choice D is selected set score to 1.*

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

- (A) To transfer high-speed gas turbine rotation to low-speed propeller rotation.
- (B) To reduce gas turbine speed to engage the clutch.
- (C) To transfer low-speed gas turbine rotation to high-speed propeller rotation.
- (D) To increase gas turbine speed to engage the clutch.

*If choice A is selected set score to 1.*

**62.** You are conducting a borescope inspection of the compressor section of a GE LM2500 gas turbine. In stage four, you see a slight tilt to one blade and the blade platform is raised higher than the other blades. What could be a cause of this condition and what would be your course of action?

- (A) Condition could be the result of blade root failure. Engine should be taken out of service until condition can be evaluated.
- (B) FOD damage could cause this condition. Engine can be operated at full load until next scheduled maintenance.
- (C) Metal fatigue could cause this condition. Engine can be operated but gas generator speed should be reduced.
- (D) Ice damage could cause this condition. Blade tilt should be corrected using special tool provided, then engine will be safe to operate.

*If choice A is selected set score to 1.*

**63.** Compressor tip clang can be usually attributed to which of the following operating conditions?

- (A) Compressor stall.
- (B) Overloading.
- (C) Continuous high-power operation.
- (D) Continuous low-power operation.

*If choice A is selected set score to 1.*

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

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

*If choice C is selected set score to 1.*

**65.** What type of combustor is used by the GE LM2500 gas turbine engine?

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

*If choice D is selected set score to 1.*

**66.** Before combustion can occur, the combustion air must be delivered to the combustor at a high-pressure and low-velocity. High-velocity, low-pressure air is converted to high-pressure, low-velocity air at what part of a centrifugal-type compressor?

- (A) Impeller.
- (B) Diffuser.
- (C) Inlet plenum.
- (D) Turning vanes.

*If choice B is selected set score to 1.*

**67.** How many fuel igniters would be installed on the marine gas turbine engine shown in the illustration? Illustration GT-0017

- (A) 1
- (B) 2
- (C) 3
- (D) 4

*If choice B is selected set score to 1.*

**68.** 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) seal the circumferential dovetails
- (B) provide close vane to rotor and blade to stator case clearances
- (C) control air flow through the compressor
- (D) ensure protection for the gearbox adapter when removing or replacing the bearings

*If choice B is selected set score to 1.*

**69.** Which of the following conditions will NOT be the result of a build-up of deposits in a gas turbine compressor?

- (A) Increased combustion gas temperatures.
- (B) Restricted air flow.
- (C) Reduced fuel consumption.
- (D) Turbine blade corrosion.

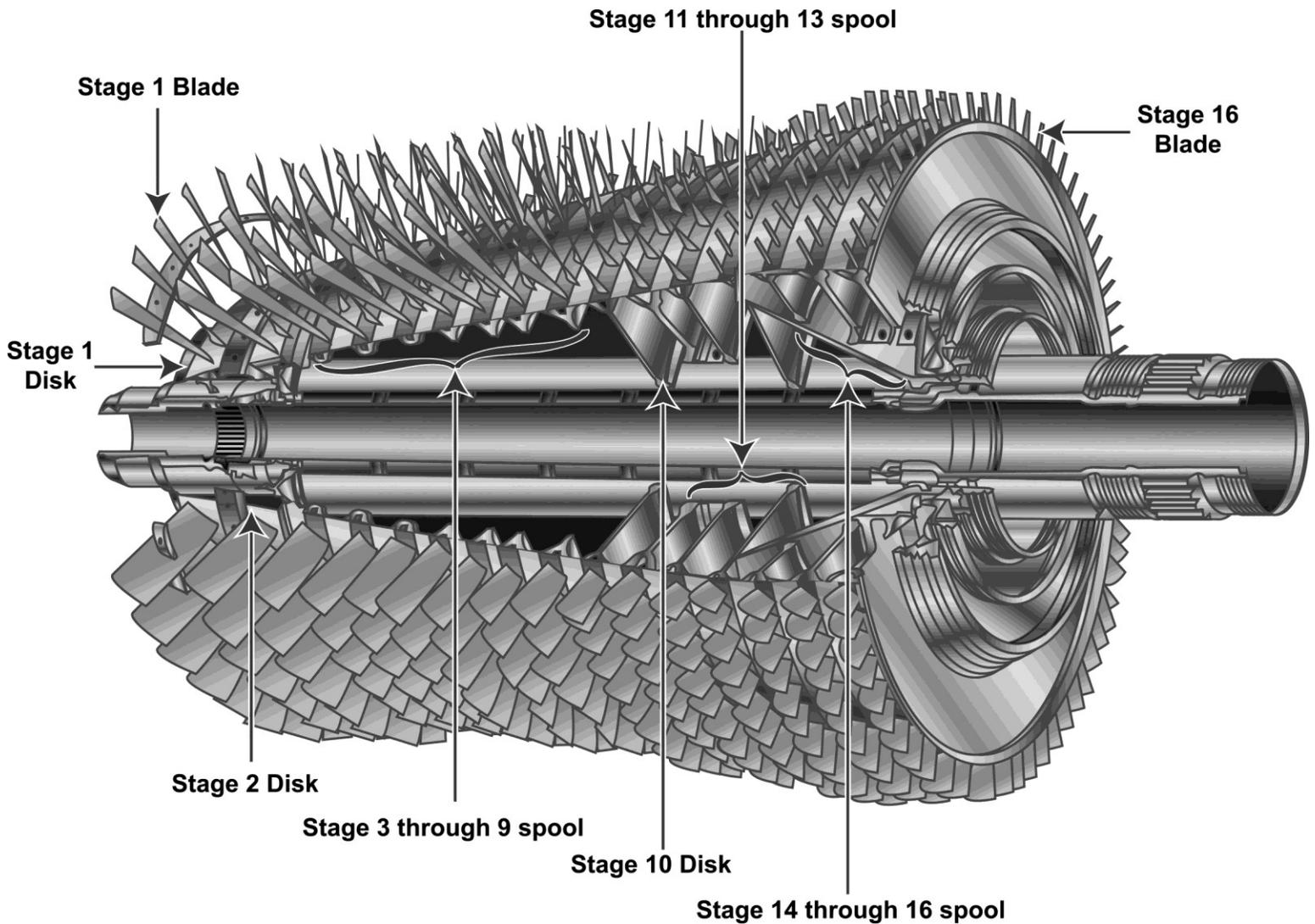
*If choice C is selected set score to 1.*

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

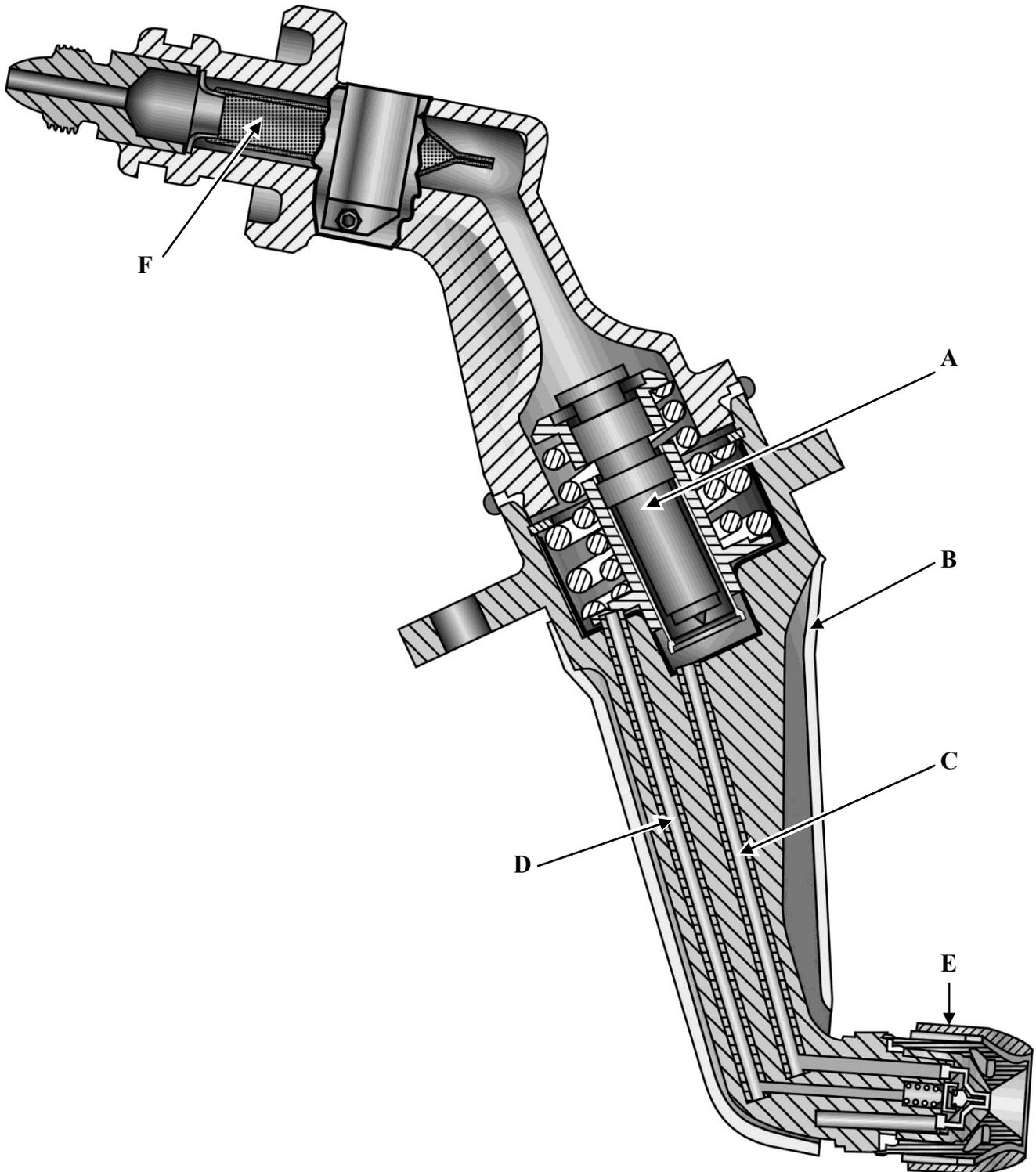
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## GT-0004



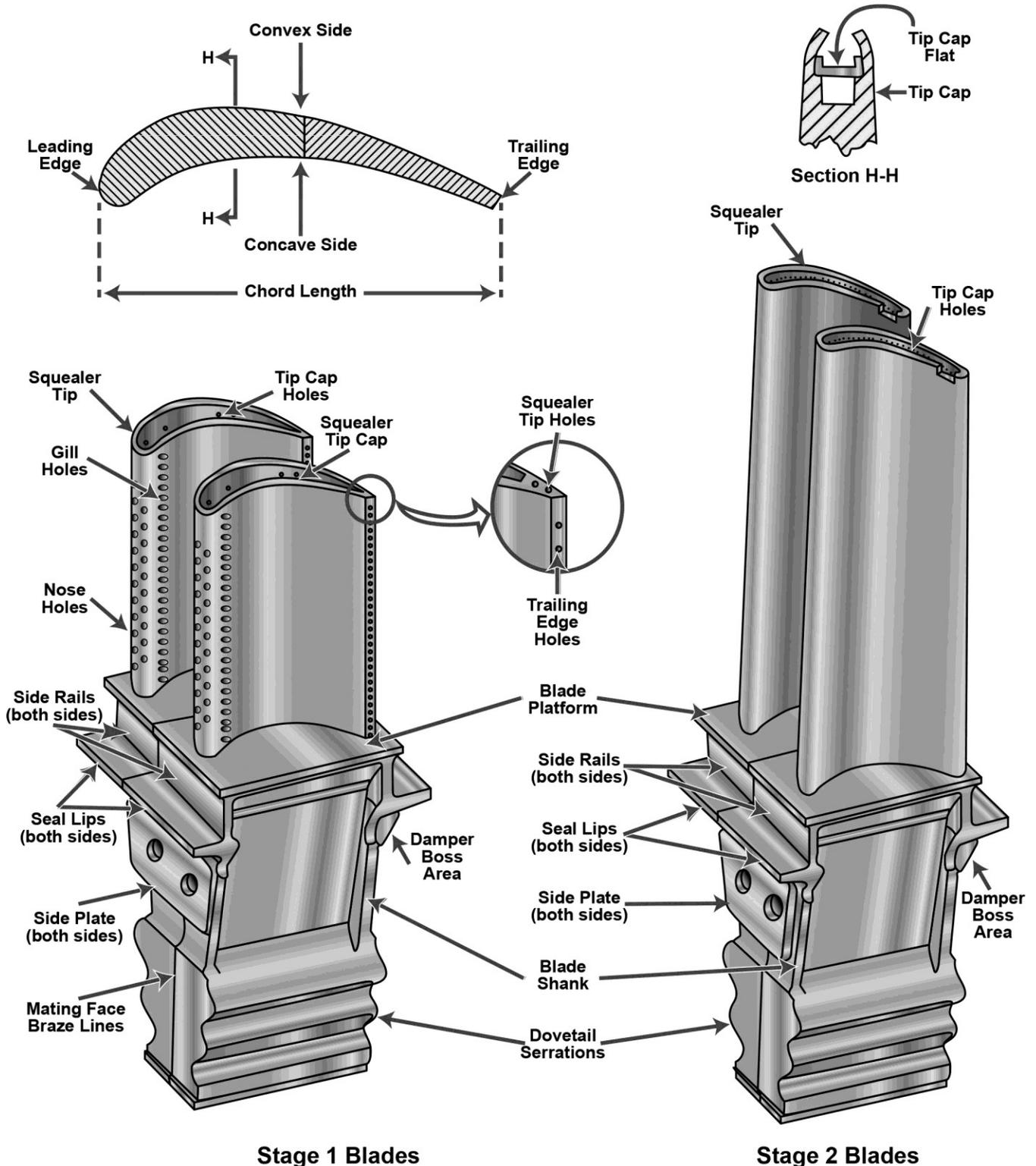
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## GT-0005



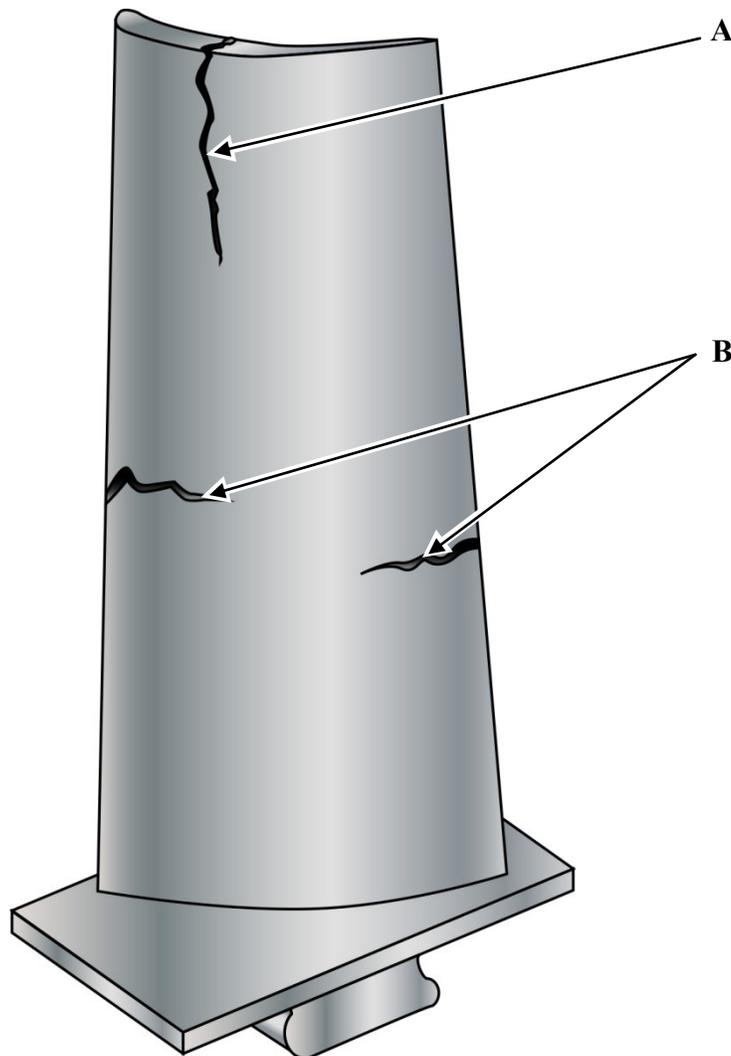
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## GT-0011



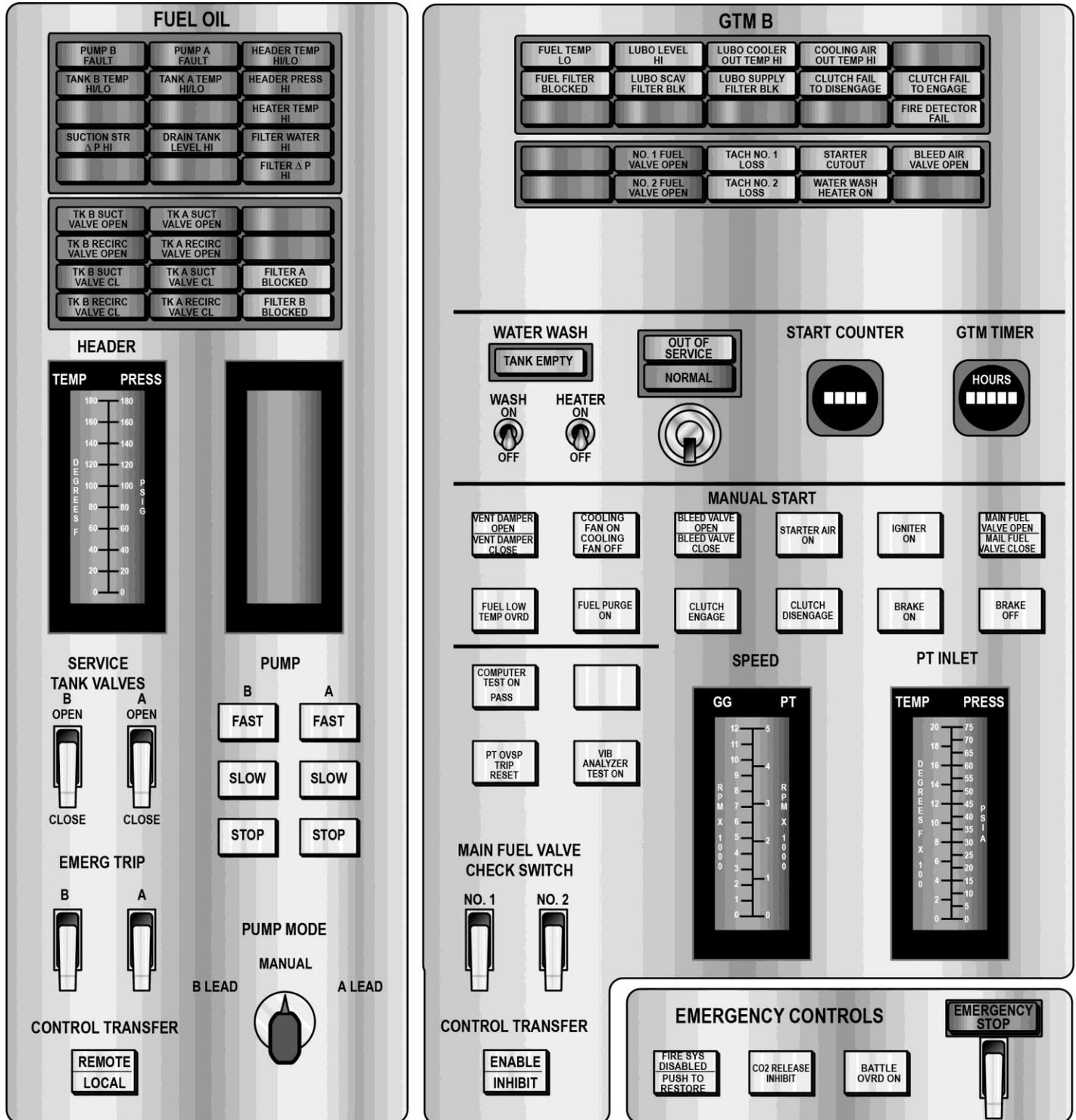
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## GT-0014



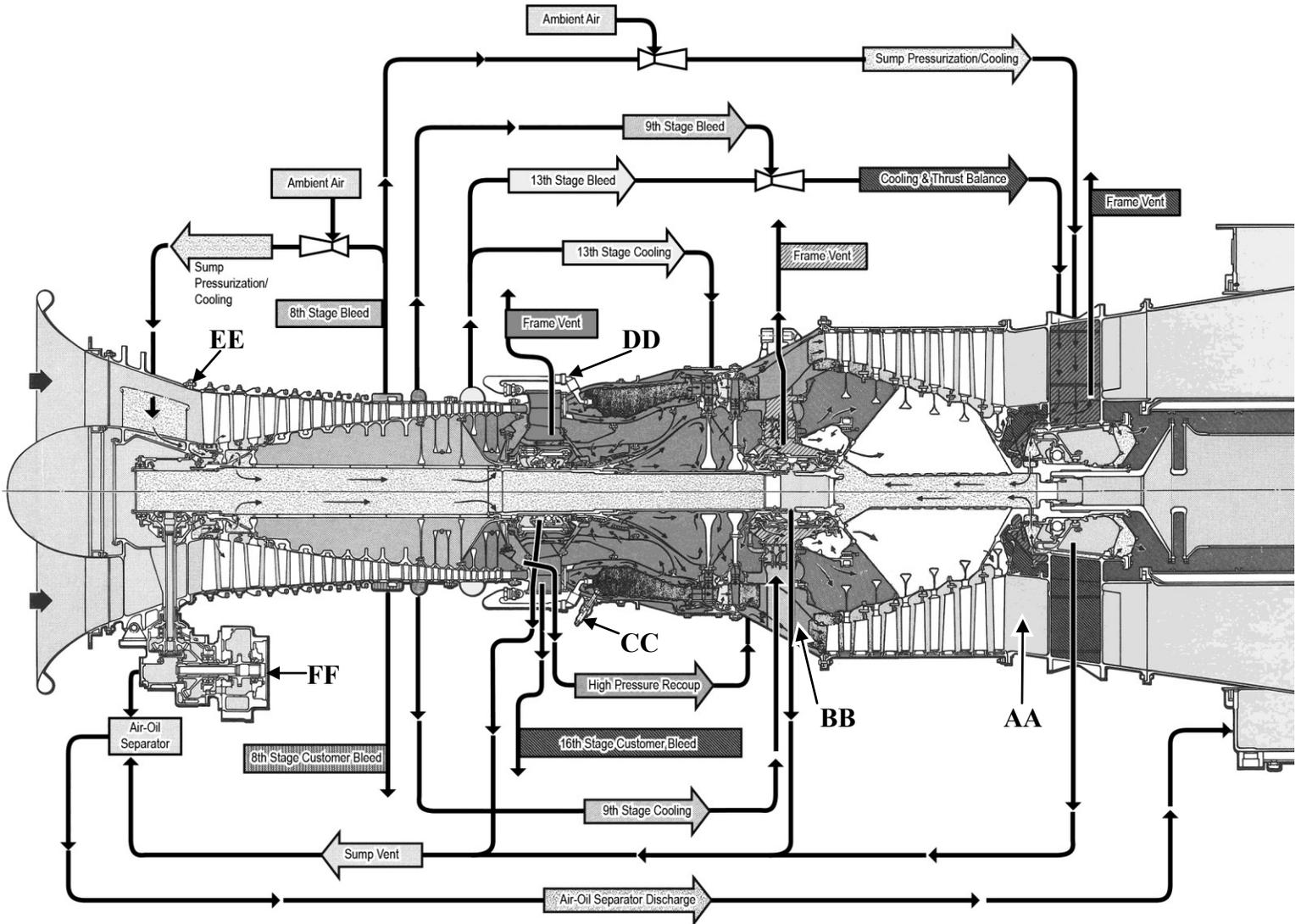
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## GT-0016



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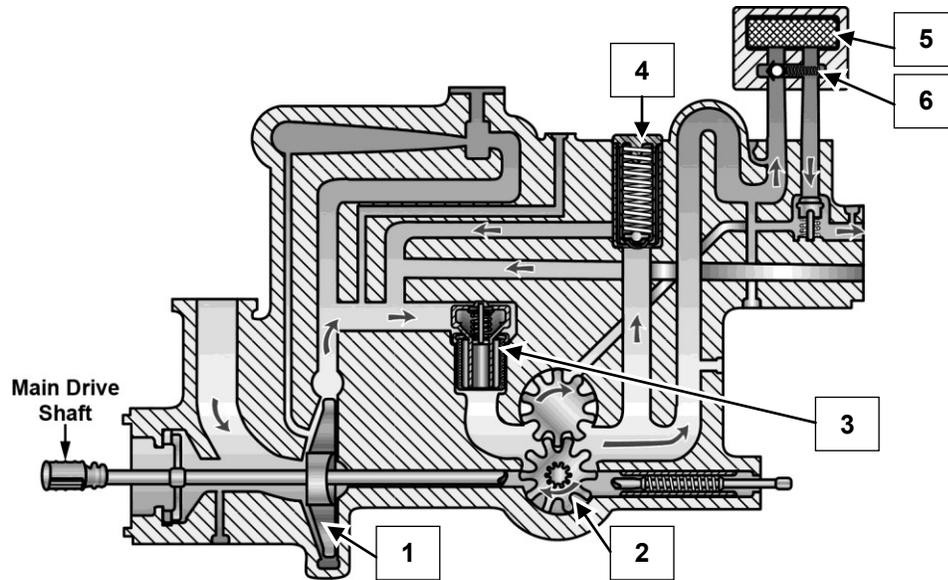
## GT-0017



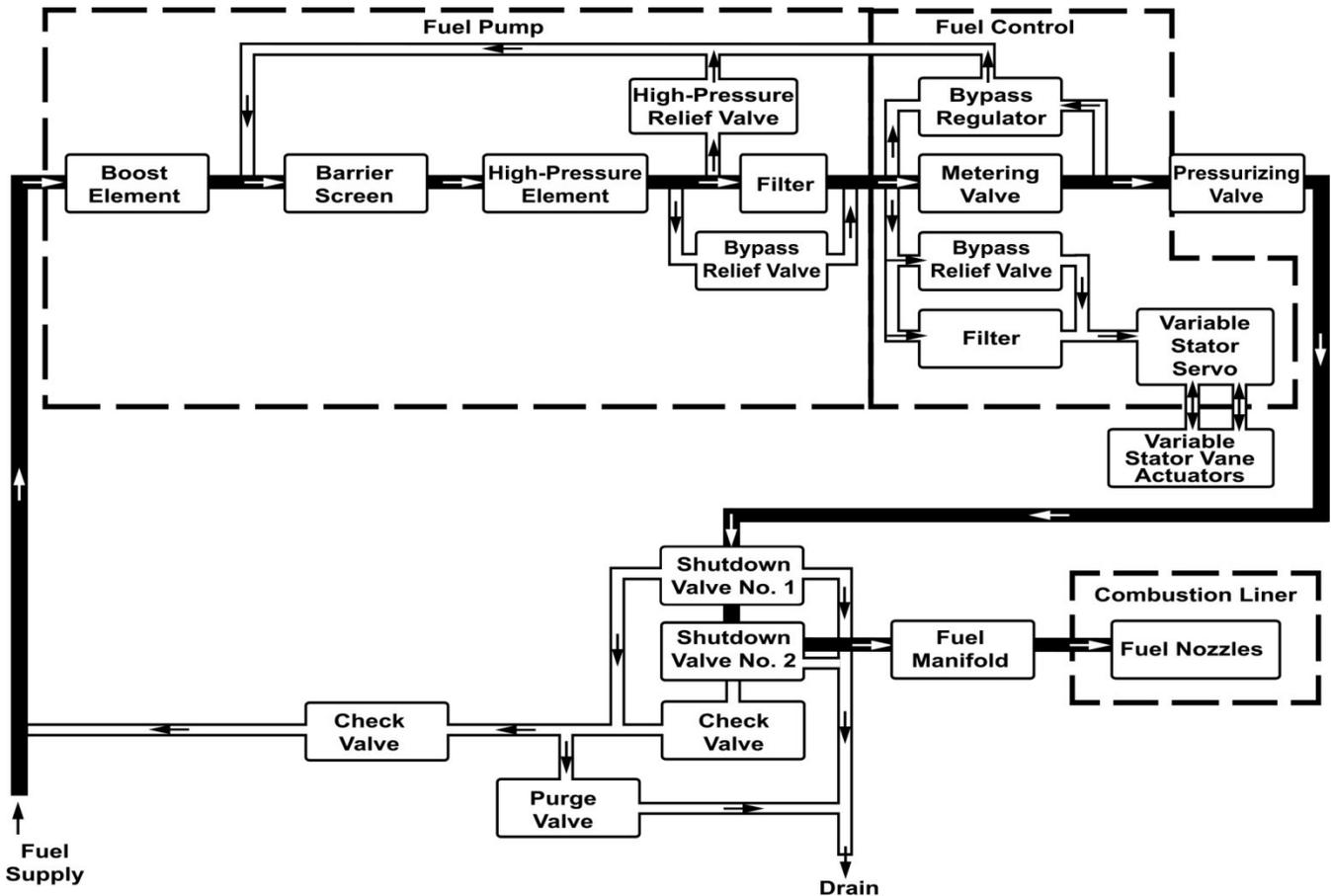
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## GT-0021

A



B



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