

## **Fun Test**

**Gasoline-powered, spark-fired, fixed-timing, four-stroke, internal combustion engines:**

- 1) Your engine is operating at 24" MP and 2400 RPM. Increasing the fuel flow with the mixture knob may:
  - A) Reduce CHTs
  - B) Increase CHTs
  - C) Neither A or B
  - D) Either A or B
  
- 2) During which stroke(s) are both exhaust and intake valves open?
  - A) Intake
  - B) Compression
  - C) Combustion (power)
  - D) Exhaust
  - E) A & D
  
- 3) The spark event occurs during which stroke?
  - A) Intake
  - B) Compression
  - C) Combustion (power)
  - D) Exhaust
  
- 4) Your six-cylinder engine is operating normally during a maintenance check on the left mag only at 2000 rpm. How many sparks happen in one minute?
  - A) 600
  - B) 1000
  - C) 2000
  - D) 8000
  - E) none of the above
  
- 5) Your engine is operating normally with the mixture set to peak EGT and burning 100 lbs of gasoline per hour (about 17 gph). How much air is going through the throttle each hour?
  - A) Not enough data to answer the question
  - B) 600 lbs of air
  - C) 1490 lbs of air
  - D) 1200 lbs of air
  - E) 149 lbs of air
  
- 6) Lead in fuel cushions and lubricates valves
  - A) True
  - B) False

- 7) Valves, valve guides and valve seats run hottest between peak and 50dF ROP.
- A) True
  - B) False
- 8) For any given MP & RPM, changing the mixture so that the EGT becomes hotter will always make the exhaust valve temperature increase.
- A) True
  - B) False
- 9) The pilot adds fuel to a best power mixture and observes that the CHTs drop. The primary reason the CHTs drop is because the extra fuel vaporizes and cools the cylinder heads.
- A) True
  - B) False
- 10) The pilot is operating LOP. He further reduces fuel flow and observes that the CHTs drop. The primary reason the CHTs drop is that the increased amount of air accepts radiated heat from the cylinder heads.
- A) True
  - B) False
- 11) After takeoff from Houston, flying behind an IO-520BB, at 1000 feet MSL the RPM's are reduced to 2500 and the MP reduced to 25" MP. The result is:
- A) The power has been reduced to METO
  - B) The CHT's will decrease since power has been decreased
  - C) CHT's will rise as a result of the leaning effect of reducing the throttle from full open
  - D) The effective timing has been advanced resulting in a CHT rise
  - E) Both C & D above
- 12) The highest CHT's are experienced at which fuel/air mixture:
- A) FULL rich (250dF ROP)
  - B) Best Power (75-80dF ROP)
  - C) Approximately 30-50dF ROP
  - D) AT peak EGT
  - E) 25dF LOP
- 13) 25 degrees Lean of Peak is a cooler EGT than 25 degrees rich of peak.
- A) True
  - B) False
- 14) You have just installed GAMI's fuel injectors to balance the Fuel:Air ratios on your engine. On the first flight, you record that all six cylinders peak within .3 gph of each other, but that there is a spread of 80dF between the raw EGT values among the six EGTs.
- A) You should call GAMI to report that your new nozzles are not balanced
  - B) This is not abnormal
  - C) This is an indication that there is an induction leak
  - D) A or C above

- 15) You have a C-182 (carbureted). The primary reason the engine runs rough is:
- A) The air distribution is not even on the left and right sides of the engine
  - B) The fuel/air mixtures are not even
  - C) NO carbureted engine can be run LOP
  - D) A & B above
  - E) A, B & C above
- 16) You notice on run-up that the engine runs rough on the right Mag. The engine monitor shows no rise in the EGT on the #3 cylinder on the left mag and the #3 EGT bars disappear down to the CHT reading on the right mag. You aggressively ground lean at 1700 rpms for 30 seconds and try again to no avail --the problem remains. What's the likely problem?
- A) Nothing. Make the flight anyway; it's only running a little rough.
  - B) The #3 plug being run by the left mag is dead.
  - C) The #3 plug being run by the right mag is dead.
  - D) The lead from the left mag to the plug is bad.
  - E) The EGT probe has failed.
- 17) In cruise at 10,500 feet, with everything normal with the mixture operating at 10F LOP, you notice a slight roughness in the engine. The engine monitor indicates the #6 EGT is pegged high. NO changes in the mixture or MP or RPM change the very high, off the scale reading.
- A) The #6 exhaust valve has failed and the burning gasses are leaking into the exhaust stacks.
  - B) The #6 fuel injector is partially plugged.
  - C) The #6 EGT probe has failed.
  - D) The #6 CHT probe has failed.
  - E) A or B above.
- 18) Your mechanic has admonished you to never run too lean.
- A) He is recommending that you use only half of the mixture charts in your POH.
  - B) He would be more correct to say that you should never run not lean enough.
  - C) LOP mixtures burn valves and fuel is cheap.
  - D) You might consider a new A&P.
  - E) A, B & D are true.
- 19) Ground leaning:
- A) Helps keep plugs cleaner at these low power settings.
  - B) Should only be done at high altitude airports.
  - C) Is bad because the higher heat of the leaner mixture burns the valves.
  - D) Should only be a normal procedure in radial engines.
- 20) If you ground lean aggressively:
- A) Do NOT do the run-up leaned out.
  - B) The leaned run-up will be more diagnostic for ignition problems.
  - C) Will promote detonation.
  - D) Increases lead deposits on the plugs.

- 21) While operating at a high power setting the pilot wants to find out where peak EGT is. He should:
- A) Lean very slowly from ROP through peak EGT to lean of peak, This is the best method since peak will be able to be identified more accurately.
  - B) Lean very slowly from ROP through peak EGT down to lean of peak because this keeps CHTs lower and is safer at high power settings.
  - C) Move quickly and directly to the lean side of peak so as not to stay in the dangerous area near and slightly rich of peak EGT, allow things to stabilize while well LOP, then approach peak from the lean side. CHTs will stay cooler.
  - D) Never operate an internal combustion engine of any kind lean of peak EGT at high power. It will shorten engine life, increase deposits on the piston heads, makes the valves run hotter, and causes detonation.
- 22) The engine in your new A36 Bonanza runs rough when LOP. Only one of these answers is ALWAYS true under this circumstance. Which is it?
- A) You are experiencing lean misfire.
  - B) You have Slick magnetos.
  - C) The horsepower outputs of the cylinders are not uniform.
  - D) The IO-550 is not designed to run LOP.
  - E) You have an induction leak.
- 23) You have fixed timing magnetos. Compared to running rich of peak EGT, when running an engine lean of peak EGT, the internal cylinder pressures are lower, the CHTs run cooler and there is less stress on the engine.
- A) True
  - B) False
- 24) As a result of the physical configuration, the combustion event is different in radials than flat engines.
- A) True
  - B) False
- 25) TCM and Lycoming operating manuals have historically recommended leaning to 25-50dF ROP as well as at peak EGT.
- A) This is a good practice since it is recommended by the manufacturer.
  - B) The engine has the best chance to make TBO when operated in this fashion.
  - C) The CHT's are lower, the carbon deposits are lower, stresses are lower at this mixture than at any LOP mixture.
  - D) The fuel:air ratios are better balanced at this mixture setting.
  - E) None of the above.

Name: \_\_\_\_\_

# FUN TEST ANSWER SHEET

Circle the correct answer

1) A B C D E

2) A B C D E

3) A B C D E

4) A B C D E

5) A B C D E

6) A B C D E

7) A B C D E

8) A B C D E

9) A B C D E

10) A B C D E

11) A B C D E

12) A B C D E

13) A B C D E

14) A B C D E

15) A B C D E

16) A B C D E

17) A B C D E

18) A B C D E

19) A B C D E

20) A B C D E

21) A B C D E

22) A B C D E

23) A B C D E

24) A B C D E

25) A B C D E