

2. One of the test crew should quickly use a grease pencil to mark an area of the exhaust stacks approximately an inch from the flange that attaches the stacks to the cylinders.
3. Check the marks on the stacks. If one or more of the exhaust stacks with a grease mark has NOT been burned to a grayish-white color and the mark on the stack still retains most of the original color of the grease pencil, the “cold cylinder” has been identified.

2.19.3.2 Probable causes of the cold cylinder problem are: (1) defective spark plugs, (2) ignition leads, or (3) a cracked distributor in one of the magnetos. To detect if the spark plugs are bad, switch both plugs to another cylinder. If the grease pencil proves the problem moved to the new cylinder, the spark plugs are bad. If the problem remains with the original cylinder, the ignition lead or magneto is bad.

2.19.4 Carburetor Heat.

2.19.4.1 The FAA strongly recommends that all amateur builders using a carbureted engine install a carburetor heat, or “carb heat,” system that complies with the engine manufacturer’s recommendation. If no recommendation is available, we suggest a carb heat system for a sea-level engine. A conventional venturi should be designed so that it will provide a 90 °F increase in the venturi at 75 percent power. For altitude engines using a conventional venturi carburetor, 120 °F increase in venturi temperature at 75 percent power will prevent or eliminate icing. Remember: Too little carb heat will have no effect on carburetor icing, and too much carb heat will cause an overly rich mixture which will reduce power and may shut down the engine.

2.19.4.2 During the engine tests, make numerous checks of the carb heat system. To avoid overly rich mixtures from oversized carb heat ducts, ensure that the carb heat duct is the same size as the inlet of the carburetor.

2.19.4.3 Be certain there is a positive reduction in rpm each time “carb heat” is applied. If there is no reduction, or the rpm drop is less than expected, check the carb heat control in the cockpit and on the carb heat air box for full travel. Also, check for air leaks in the “scat tube” connecting the heat muff to the carburetor air box.

2.19.5 Fuel Flow. A fuel flow and unusable fuel check is a field test to ensure the aircraft engine will get enough fuel to run properly, even if the aircraft is in a steep climb or stall attitude, and is accomplished in the following manner:

2.19.5.1 Place the aircraft’s nose at an angle 5 degrees above the highest anticipated climb angle. The easiest and safest way to do this with a conventional gear aircraft is to dig a hole and place the aircraft’s tail in it. For a nose gear aircraft, build a ramp to raise the nose gear to the proper angle.

- 2.19.5.2** Make sure the aircraft is tied-down and chocked. With minimum fuel in the tanks, disconnect the fuel line to the carburetor. The fuel flow with a gravity flow system should be 150 percent of the fuel consumption of the engine at full throttle. With a fuel system that is pressurized, the fuel flow should be at least 125 percent. When the fuel stops flowing, the remaining fuel is the “unusable fuel” quantity.
- 2.19.5.3** The formula for fuel flow rate for a gravity-feed fuel system is 0.55 times engine horsepower (hp) times 1.50. This gives a fuel flow rate in pounds of fuel per hour. Divide the pounds-per-hour number by 60 to calculate pounds per minute, and divide again by 6 to calculate gallons per minute. To get gallons per hour for Avgas divide pounds per hour by 6; or multiply gallons per minute by 60. For a pressurized system, substitute 1.25 for 1.50 to calculate the fuel flow rate.
- 2.19.5.4** The fuel consumption rate of most modern engines is about 0.55 pounds per hour per brake hp. Figure 2-8, 100 Hp Fuel Flow Rate Chart, illustrates the results of this calculation for a 100 hp engine:

Figure 2-8. 100 Hp Fuel Flow Rate Chart

If your fuel is...	Then the fuel flow rate for a 100 hp engine is...		
	Pounds per hour	Pounds per minute	Gallons per hour
Gravity feed	82.5	1.38*	13.75
Pressurized	68.75	1.15*	11.49*
*-rounded to the nearest 100 th .			

- 2.19.6** Changing Fuel Flow or Pressure. If the aircraft’s fuel flow rate is less than planned, there is a volume or pressure problem. An increase in the fuel flow volume may necessitate installation of larger fuel line fittings on the fuel tanks, fuel selector, and carburetor in addition to larger internal diameter fuel lines. To increase fuel pressure, install an electrically driven or engine-driven mechanical fuel pump prior to the first flight.
- 2.19.7** Compression Check. When the engine run-in procedures have been completed, perform an additional differential compression check on the engine and record the findings. If a cylinder has less than a 60/80 reading on the differential test gauges on a hot engine, that cylinder is suspect. Have someone hold the propeller at the weak cylinder’s top dead center and with compressed air applied, listen. If air is heard coming out of the exhaust pipe, the exhaust valve is not seating properly. If air is heard coming out of the air cleaner/carb heat air box, the intake valve is bad. When the oil dipstick is removed and air rushes out, the piston rings are the problem.