TABLE 8-1. Current engine and maximum permissible cylinder barrel oversize.

Engine manufacturer	Engine series	Max. oversize (in.)
Air Cooled Motors (Franklin)	No oversize for sleeved cylinders.	
	Solid cylinders.....	0.017
Continental Motors	R-670, W-670, R9A....	0.010 to 0.020
		0.005
	GTSIO-520, 550.....	0.015
	All others.....	
Jacobs	All.....	0.015
Kinner	All.....	0.015
Pigman, LeBlond, Rearwin, Ken Royce	All.....	0.025
Lycoming	All.....	0.010 to 0.020
Menasco	All.....	0.010
Pratt & Whitney	R-2800B, C, CA, CB..	0.025
	*R-959 and R-1830....	0.030
	All others.....	0.020
Ranger	6-410 early cyls. 6-390	0.010
	6-410 late cyls. 6-440 (L-440) series..	0.120
Warner	All.....	0.015
Wright	All.....	0.020

*(The above oversize limits correspond to the manufacturer's requirements, except for P&W R-985 and R-1830 series engines.)

NOTE: (Check for latest manufacturer specifications.)

(4) Cylinder barrels which have been plated by an agency whose process is approved by the FAA and which have not been worked beyond maximum permissible limits, will be considered acceptable for installation on certificated engines. It will be the responsibility of the owner or the repairing agency to provide this proof. In some cases, it may be necessary to remove cylinders to determine the amount of oversize since this information may be etched on the mating surface of the cylinder base flange.

8-12. CORROSION. Accomplish corrosion preventive measures for temporary and long-term storage in accordance with the instructions issued by the pertinent engine manufacturer. Avoid the use of solutions which contain strong caustic compounds and all solutions, polishes, cleaners, abrasives, etc., which might possibly promote corrosive action. (Refer to Chapter 6, Corrosion, Inspection, and Protection.)

8-13. ENGINE RUN-IN. After an aircraft engine has been overhauled, it is recommended that the pertinent aircraft engine manufacturer's run-in instructions be followed. Observe the manufacturer's recommendations concerning engine temperatures and other criteria. Repair processes employed during overhaul often necessitate amending the manufacturer's run-in procedures. Follow the approved amended run-in procedures in such instances.

NOTE: Do not run up engines on the ground for long periods of time with the cowling off. The engine will overheat because cylinder cooling has been disrupted.

8-14. COMPRESSION TESTING OF AIRCRAFT ENGINE CYLINDERS. A test to determine the internal condition of the combustion chamber cylinder assembly by ascertaining if any appreciable internal leakage is occurring is compression testing of aircraft engine cylinders. If a cylinder has less than a 60/80 reading on the differential test gauges on a hot engine, and procedures in paragraphs 8-15b(5)(i) and (j) fail to raise the compression reading, the cylinder must be removed and inspected. To determine the cylinder's problem area, have someone hold the propeller at the weak cylinder's top dead center and with compressed air still being applied, listen. If air is heard coming out of the exhaust pipe, the cylinder's exhaust-valve is not seating properly. If air is heard leaking out of the air cleaner/carburetor heat box, the intake valve is leaking. With the oil dipstick removed, and air is rushing out, the piston rings are defective. Remove and repair/overhaul the defective cylinder.

a. Differential Compression Test. The most common type of compression tester currently in use is the differential pressure-type tester. It provides a cross-reference to validate the readings obtained and tends to assure that the cylinder is defective before it is removed. Before beginning a compression test, consider the following points:

(1) When the spark plugs are removed from the engine, identify them to coincide with the cylinder and location from which they were removed. Close examination of the plugs will reveal the actual operating conditions and aid in diagnosing problems within each individual cylinder.

(2) The operating and maintenance records of the engine should be reviewed. Records of previous compression tests are of assistance in determining progressive wear conditions and help to establish the necessary maintenance corrective actions.

b. Differential Pressure Compression Test. The differential pressure tester is designed to check the compression of aircraft engines by measuring the leakage through the cylinders caused by worn or damaged components. The operation of the compression tester is based on the principle that, for any given airflow through a fixed orifice, a constant pressure drop across that orifice will result. The restrictor orifice dimensions in the differential pressure tester should be sized for the particular engine as follows:

(1) For an engine cylinder having less than a 5.00-inch bore; 0.040-inch orifice diameter; .250 inch long; and a 60-degree approach angle.

(2) For an engine cylinder with 5.00 inch bore and over: 0.060 inch orifice diameter, .250 inch long, 60 degree approach angle.

(3) A typical schematic diagram of the differential pressure tester is shown in figure 8-1.

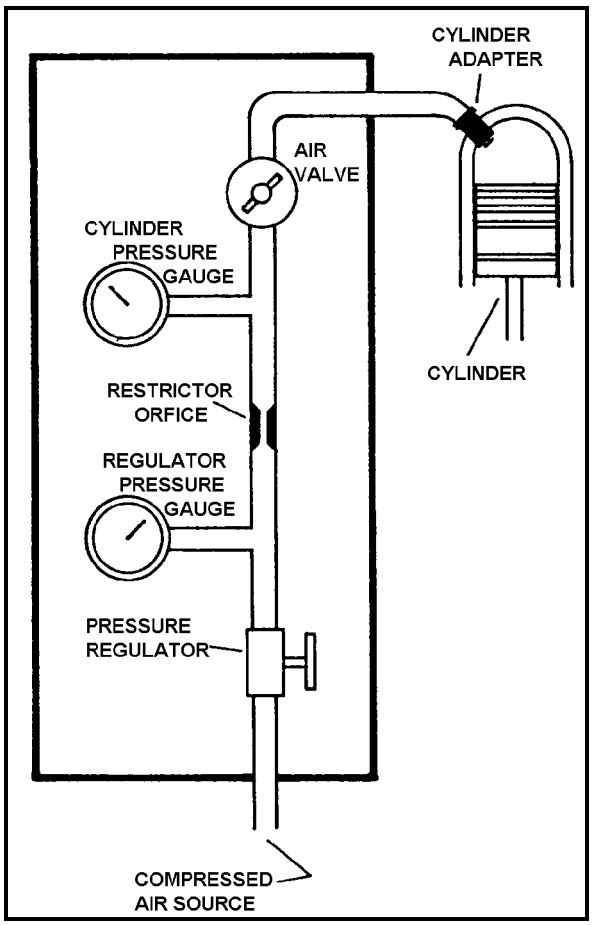

FIGURE 8-1. Schematic of differential pressure compression tester.

(4) As the regulated air pressure is applied to one side of the restrictor orifice with the air valve closed, there will be no leakage on the other side of the orifice and both pressure gauges will read the same. However, when the air valve is opened and leakage through the cylinder increases, the cylinder pressure gauge will record a proportionally lower reading.

(5) While performing the check the following procedures are listed to outline the principles involved, and are intended to supplement the manufacturer's instructions for the particular tester being used.

(a) Perform the compression test as soon as possible after the engine is shut down to ensure that the piston rings, cylinder walls, and other engine parts are well-lubricated.

(b) Remove the most accessible spark plug from each cylinder.

(c) With the air valve closed, apply an external source of clean air (approximately 100 to 120 psi) to the tester.

(d) Install an adapter in the spark plug bushing and connect the compression tester to the cylinder.

(e) Adjust the pressure regulator to obtain a reading of 20 psi on the regulator pressure gauge. At this time, the cylinder pressure gauge should also register 20 psi.

(f) Turn the crankshaft, by hand, in the direction of rotation until the piston (in the cylinder being checked) is coming up on its compression stroke. Slowly open the air valve and pressurize the cylinder to 80 psi.

CAUTION: Care must be exercised in opening the air valve since sufficient air pressure will have built up in the cylinder to cause it to rapidly rotate the propeller if the piston is not at top dead center (TDC).

(g) Continue rotating the engine against this pressure until the piston reaches TDC. Reaching TDC is indicated by a flat spot or sudden decrease in force required to turn the crankshaft. If the crankshaft is rotated too far, back up at least one-half revolution and start over again to eliminate the effect of backlash in the valve operating mechanism and to keep piston rings seated on the lower ring lands.

(h) Open the air valve completely. Check the regulated pressure and readjust, if necessary, to read 80 psi.

(i) Observe the pressure indication of the cylinder pressure gauge. The difference between this pressure and the pressure shown by the regulator pressure gauge is the amount of leakage through the cylinder. A loss in excess of 25 percent of the input air pressure is cause to suspect the cylinder of being defective; however, recheck the readings after operating the engine for at least 3 minutes to allow for sealing of the rings with oil.

(j) If leakage is still occurring after a recheck, it may be possible to correct a low reading. This is accomplished by placing a fiber drift on the rocker arm directly over the valve stem and tapping the drift several times with a hammer to dislodge any foreign material between the valve face and seat.

NOTE: When correcting a low reading in this manner, rotate the propeller so the piston will not be at TDC. This is necessary to prevent the valve from striking the top of the piston in some engines. Rotate the engine before rechecking compression to reseat the valves in the normal manner.

8-15. SPARK PLUGS. The spark plug provides the high-voltage electrical spark to ignite the fuel/air mixture in the cylinder. The types of spark plugs used in different engines will vary with regard to heat range, reach, thread size, and other characteristics required by the particular installation.

a. Heat Range. The heat range of a spark plug is the principal factor governing aircraft performance under various service conditions. The term “heat range” refers to the

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