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DIELECTRIC TESTING OF SPARK PLUGS

PURPOSE

This report provides information on instrumentation and procedure for the dielectric testing of aircraft piston engine spark plugs to determine their functional condition.

SCOPE

This report describes a method of determining the dielectric integrity of a spark plug by subjecting the insulation in the plug to voltage stress.

1. INTRODUCTION

1.1 This test is considered applicable where more comprehensive information about the condition of the spark plug is desired. It may be used by manufacturers and testing facilities to determine functional integrity of new or used spark plugs.

1.2 A spark plug contains a high voltage insulator used in a special application. From an electrical standpoint, successful operation is dependent upon its ability to withstand high voltage impressed on it. In general, so far as testing is concerned, sparking between the electrodes is incidental. If the insulator in the spark plug will withstand the electrical strain imposed by subjecting it to high voltage, a spark can occur between the electrodes in the presence of engine operating pressures when the gaps are within the limits of 0.010 in. (0.25 mm) to 0.030 in. (0.75 mm).

2. DESCRIPTION OF EQUIPMENT

Basically, the test equipment consists of a pneumatic or immersive-type device that will prevent sparking across the air gap while subjecting the spark plug insulator to an electrical stress from a voltage source. Included in the electrical device is a means of detecting electrical faults in the spark plug.

2.1 Quenching of the air gap may be accomplished by alternate means. One is by positioning the spark plug in a dielectric fluid such that gap and approximately 0.250 in. (6 mm) of insulator adjacent to the air gap is immersed. Another means consists of a pressure chamber into which the spark plug is inserted for test. This chamber is equipped with a pressure regulator, control valve, pressure gauges and a source of dry compressed gas (air, carbon dioxide or nitrogen). Figure 1 illustrates a schematic for such a device.

2.2 In conjunction with the spark quenching device described in 2.1 is an electrical device as illustrated in Fig. 2, consisting of a high voltage transformer, voltage control, meter, indicating lights and controls to electrically stress the spark plug insulator and, at the same time, indicate any electrical leakage or breakdown of the spark plug insulator. A voltage control and voltmeter are provided to permit adjustment of the input voltage. Operation is from 110 volt, 60 hertz true sinusoidal voltage.

3. TEST PREPARATION

3.1 Before testing, spark plugs should be prepared as follows:

a. Remove oil and grease.
b. Dry thoroughly in oven at 250°F (120°C) to 350°F (180°C) for not less than 4 hours.

4. TEST PROCEDURE

4.1 The recommended test voltage applied to the spark plug is 9000 volts (RMS) obtained by adjusting the primary voltage control. The meter should read approximately 98 volts for 9000 volts (RMS) output using the 110 to 10,000 volt transformer. A calibration check of the transformer output should be made for proper operating potential.

4.2 Install the spark plug in the test fixture and connect the appropriate spark plug lead. Pressurize the chamber to approximately 450 psi (3.1 MPa).

4.3 To energize the electrical system, press the test switch (SW 1). Indicator light (PL) will indicate that power is being supplied to the auto-transformer. The test switch should be held down for one minute. If, during this period, the output neon lamp (NE) does not glow, the spark plug is considered good. If the output neon lamp (NE) does glow, the spark plug is faulty or shorted internally. A steady glow indicates flashover in the barrel or a break in insulator.

4.4 The following precautionary measures should be taken:

a. To be certain that the "output" neon lamp is functioning properly, a satisfactory check can be made by grounding the spark plug lead with the system inoperative. Energize the system and increase the primary voltage (as shown on the voltmeter) to a point where "glowing" of the neon lamp begins. Complete but not intense lighting should occur between 50 and 55 volts. If a higher voltage is required, the neon bulb should be replaced or any other malfunction should be corrected.

b. The adjustable auto-transformer should be examined occasionally for excessive wear on the winding which may be caused by a worn brush. Blackened or corroded contact surfaces should be cleaned with crocus cloth or very fine sand paper to insure proper contact. Loose particles should be removed from the windings with low pressure air stream.

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