AWB 20-1 Issue 1 - Spark Plug Care

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Spark Plug Care

Applicability

All piston engine aircraft.

Purpose

The objective of this bulletin is to highlight to personnel involved in engine maintenance the importance of careful inspection of spark plugs to ensure trouble free operation.

Correct maintenance of spark plugs is imperative for reliable operation of any engine. This AWB is to remind maintainers the important aspects of spark plug maintenance, from selection of the correct spark plug through to cleaning and installation techniques. At all times personnel should consult the Instructions for Continuing Airworthiness (ICA) pertaining to the aircraft, engine or spark plug.

Background

There have been several engine failures that have been attributed to internal breakdown of the ceramic nose core insulator and electrodes of spark plugs. Evidence suggests that many of these failures occurred because of poor cleaning, testing, inspection and handling techniques of spark plugs.

Recommendations

Selection

Spark plugs come in many different thread sizes and lengths, heat ranges, electrode types and shielding styles. It is important when selecting a spark plug to choose the correct spark plug for the operating conditions of the aircraft. The Type Certificate Data for the engine lists all the spark plugs that are approved for the engine. It is important to select spark plugs of all the same part number for installation for efficient engine operation.

Currently most spark plug manufacturers do not approve reconditioning of their spark plugs. Most spark plugs are manufactured in such a manner that none of the critical parts can be replaced without destroying the spark plugs integrity.

Cleaning

After removal spark plugs should be degreased using methylethylketone (MEK) or similar. After drying with clean, dry shop air, the spark plugs should be given a preliminary inspection to eliminate those that are obviously unfit for further servicing.

If the spark plug has heavy lead deposits the use of a vibrating cleaner is advised. A common workshop practice is to use either a pick or ground hacksaw blade to loosen lead deposits. This practice should be used with caution since it increases the risk of damaging the ceramic nose core insulator rendering the spark plug unserviceable.

After removal of lead deposits the spark plug should be lightly cleaned with an abrasive compound. Severe abrasive cleaning will erode the electrodes causing premature wear. Always use glass beads, aluminium oxide or similar as an abrasive compound. Silica sand should never be used as an abrasive agent. During the blasting process personnel should wear suitable dust mask to prevent inhalation of abrasive dust.

Either a wire hand brush or a power-driven brush (maximum of 0.005" wire size) can be used to clean the threads on both the shell and the shielding barrel.

NOTE: never wire brush the insulator or the electrodes.

Gapping

The tools and methods used to set spark plug gaps vary greatly. The main precaution is to avoid putting any pressure on the centre electrode, which could in turn crack the ceramic insulator. The gap should be measured by a round wire gauges and gap adjustment is on the ground electrode only. When adjusting spark plug gaps never place the wire gauge between the electrodes during adjustment, as this will place a side load on the centre electrode and crack the ceramic insulator. If the gap is inadvertently set too close no attempt should be made to widen the gap, since this also could damage the ceramic insulator or electrodes.

Throughout the gapping process for massive-electrode spark plugs every effort should be made to ensure that the side of the electrodes are parallel to each other. This will prevent accelerated wear of the electrodes leading to increased gap dimensions.

After gapping, the electrode should be inspected for wear limits. Many spark plug manufacturers have erosion gauges that act as GO/NO GO gauges to measure wear. However the general rule for spark plugs is to replace them when the electrodes are half it's original dimension.

If during any stage of servicing a spark plug is dropped, it should be scrapped immediately. Many flaws

may not be apparent visually or during any stage of the inspection or testing process but could cause failure of the spark plug during operational service.

Inspection and Testing

Inspection should be accomplished with the aid of a magnifying glass (10X or better) in an area with good lighting. The inspection areas are the threads (both the shell and shielding barrel), electrodes, ceramic insulators, shell hex and connector seat. Any spark plug showing signs of deformity, insulator cracking or chipping, excessive electrode erosion, thread damage or any sign of misuse should be discarded. Cavities within the spark plug should be checked for cleanliness and contain no residual abrasive compound or cleaning solvent.

The spark plug should be tested in accordance with instructions of the test unit used. Test units usually require clean, dry shop air supplied at 80-125 psi and are connected to mains power. With both regulated air pressure (appropriate to the gap dimension) and high voltage applied to the spark plug, a consistent spark should be seen through the viewing port. Failure to observe a bright consistent spark means the spark plug is unserviceable and requires replacement.

Removal and Installation

Carefully remove the ignition harness connector, avoiding damage to the wire, terminal sleeve or the barrel insulator. It is generally suggested to use a 6-point socket for spark plug removal and installation, as it provides a greater bearing surface than a 12-point socket.

Prior to installing spark plugs an approved anti-seize compound should be applied to the firing end threads. It should not, however, be applied to the first two threads to prevent the risk of misfiring of the electrodes. Never apply anti-seize to the terminal threads of the shielding barrel.

Most modern spark plugs have a solid copper gasket that requires annealing prior to spark plug installation to ensure a tight, gas sealed fit. The maintainer should check that the spark plug has only one washer, is of correct dimensions and is annealed. If the engine is equipped with a thermocouple probe in the form of a spark plug gasket, a normal gasket is not required.

To equalise electrode wear of spark plugs installed in engines with an even number of cylinders due to constant polarity timing, it is recommended that spark plugs be rotated and not be installed in the same cylinder. Generally spark plugs from even numbered cylinders should be installed in odd numbered cylinders and conversely for spark plugs from removed from odd numbered cylinders should be installed into even numbered cylinders.

The spark plug should then be screwed into the cylinder by hand up to the gasket. If the spark plug fouls

while screwing into the cylinder there is probably carbon or lead deposits on the threads. Use an appropriate thread cleaning tool to ensure removal of deposits. Cleaning thread inserts (helicoils) with a tap is not recommended as permanent damage to the insert may result.

After torquing the spark plug to the appropriate setting, the ignition harness connector can be installed. Care must be observed not to over torque ignition connector, as severe damage to the harness attaching hardware will occur. Many manufacturers recommend the connector be clean and dry, without the use of a lubricant. However, referral to maintenance data may list a lubricant approved for use in that application.

Testing and Cleaning Equipment

Spark plug cleaner/testers are generally the most overlooked piece of equipment in most workshops. Depending on the type of cleaner/tester, the voltage control and pressure gauges should be recalibrated every 12 months or as directed by the manufacturer. As well, to ensure that the abrasive compound is kept clean the compound should be replaced after cleaning about 75 to 100 spark plugs.

Many cleaner/testers have water traps to assure the air supply remains dry, and these traps should be drained daily. Also, when testing spark plugs, air leakage at the adapter is normal, since this supports the control of air pressure and facilitates the exhausting of ionised air generated in the testing process.