AWB 24-1 Issue 1 - Starter generator electrical discharge damage

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Starter generator electrical discharge damage

Applicability

All PT6A engine starter generator installations.

Background

Recent reports on a world wide basis has identified a problem with TRW/Lucas starter generators fitted to PT6A engines that have caused a significant number of in-flight engine shut downs (IFSD).

The PT6A IFSD event resulted from electrical current from the starter generator output shaft discharging into the engine accessory drive train. The electrical discharge resulted in pitting of the accessory drive gears and the #1 engine bearing. The pitting of the bearing resulted in bearing failure and subsequent engine failure. To date, world wide, there has been 17 PT6A electrical discharge damage (EDD) related #1 bearing engine failures resulting in an IFSD.

Cause of EDD

EDD results from electrical current from the S/G output shaft discharging into the engine through the engine accessory drive train. There are two types of S/G armature defects that could result in current being applied to the S/G output shaft:

The most common, and preventable is armature leakage. Armature leakage can occur simply from the accumulation of brush dust. A build up of brush dust can provide a track between the commutator and the shaft. The periodic field cleaning and resistance check detailed in the Lucas S/G Maintenance Manual is a simple and effective response to brush dust.

The second type of defect is a hard short or a high resistance to earth caused by an insulation breakdown. A breakdown of the insulation in the commutator or in the lamination slots could cause this type of failure. The periodic field cleaning and resistance check detailed in the Lucas S/G Maintenance Manual may also provide an indication of armature insulation breakdown.

The effect of EDD

Examination of failed engines has shown that the most common result of EDD is complete failure of the #1 bearing. Bearing failure was found to have originated from electrical discharge pits. The pits initiated spalling of the bearing. The spalling creates vibration and overheating leading to fatigue failure of the bearing.

Prevention of EDD

The most probable cause of EDD is S/G armature leakage or a breakdown in the S/G armature or commutator insulation. The periodic field cleaning and resistance check detailed in the Lucas S/G Maintenance Manual could prevent and/or detect armature leakage or insulation breakdown.

Recommendations

CASA suggests that:
With respect to starter generator maintenance:

1. Operators revise the aircraft maintenance program to carry out starter generator brush checks, resistance checks and brush dust cleaning in accordance with the requirements described in the Lucas Starter Generator maintenance manual.
2. Where brush change and overhaul limits have been escalated within an operators maintenance program, that escalation be reassessed in light of the starter generator manufacturers recommendations.
3. the prudent operator should follow the recommendations of the starter generator manufacturer and use genuine parts.

With respect to an oil system monitoring program.

1. Operators revise their maintenance program to incorporate requirements that where a starter generator was removed for other than scheduled maintenance; to comply with the requirements of the applicable PWC Service Bulletin detailing the oil filter patch check inspection.