TRACK 1: STRUCTURES AND MECHANICAL SYSTEMS

"SMEARING FAILURE OF ROLLING ELEMENT BEARINGS"

BY
ME4 HUANG GUOQUAN
REPUBLIC OF SINGAPORE AIR FORCE

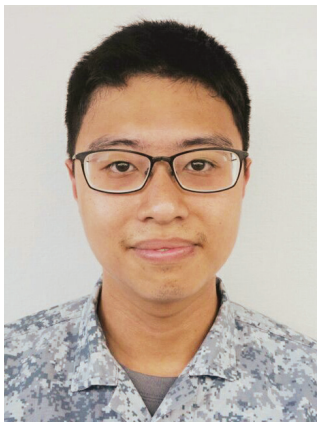
ABSTRACT

The onset of scuffing which is the nature of smearing was studied using a mini-traction rig that allows the usage of a new contra-rotation method. The method decouples the entrainment and sliding speed to provide a harsh condition. Tests were conducted using a ball-on-disc setup with different loads and a step function of increasing sliding speed. Studies were conducted to understand the influence of increased real surface roughness from R_a of 5 nm to 150 nm and the quality of 5 fully formulated aviation oils with additives.

The critical total temperature, frictional intensity power (FPI) and friction power (FP) were calculated using the recorded friction coefficients. Higher roughness led to improved scuffing resistance with the increment of critical total temperature from 175°C to 300°C. For the FPI and FP, the rough surface produced a narrower band of values even though there was no critical value obtained.

For the 5 fully formulated aviation oils, the Turbine Oil (TO), Standard turbine oil (STD), High Thermal Stability turbine oil (HTS), EE turbine oil (EE) and Helicopter Gearbox oil were tested. All 5 oils showed improvement in scuffing resistance. The critical total temperature for TO, STD, HTS and EE oils were 192°C, 226°C, 208°Cand 209°C respectively with no critical FPI and FP values. The critical total temperature of the Helicopter Gearbox oil was found to be 275°C and the FPI and FP were found to be 200 MW/m^2 and 17 W respectively.

BIOGRAPHY OF SPEAKER



ME4 Huang Guoquan is an Air Force Engineer. He joined the RSAF in 2010 and worked on the maintenance of weapon systems on-board the RSAF's fleet of AH-64 Apache. ME4 Huang graduated from Imperial College London with Master of Science in Advanced Mechanical Engineering with Merit, and Bachelor of Engineering (Mechanical Engineering) from Nanyang Technological University with First Class Honours.