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Failure Analysis of Fuel Pressure Supply from an Aircraft Engine

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Abstract : This paper studies a failure case of a fuel pressure supply tube from an aircraft engine. Multiple fracture cases of the fuel pressure control tube from aircraft engines have been reported. The studied set was composed of the mentioned tube, a welded connecting pipe, where the fracture has been produced, and a union nut. The fracture has been produced in one most critical zones of the tube, in a region next to the supporting body of the union nut to the connector. The tube material was X6CrNiTi18-10, an austenitic stainless steel. Chemical composition was determined using an X-Ray fluorescence spectrometer (XRF) and combustion equipment. Furthermore, the material has been mechanical, by hardness test, and microstructural characterized using a stereomicroscope and an optical microscope. The results confirmed that it is within specifications. To determine the macrofractographic features, a visual examination and a stereo microscope of the tube fracture surface have been carried out. The results revealed a tube plastic macrodeformation, surface damaged, and signs of a possible corrosion process. Fracture surface was also inspected by scanning electron microscopy (FE-SEM), equipped with a microanalysis system by X-ray dispersive energy (EDX), to determine the microfractographic features in order to find out the failure mechanism involved in the fracture. Fatigue striations, which are typical from a progressive fracture by a fatigue mechanism, have been observed. The origin of the fracture has been placed in defects located on the outer wall of the tube, leading to a final overload fracture.

Keywords : aircraft engine, fatigue, FE-SEM, fractography, fracture, fuel tube, microstructure, stainless steel
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