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F111 Engine Compressor Disc Cracking – A Case Study Of The Use Of Fractography To Determine Fleet Safety

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ABSTRACT: In August, 1999, two separate incidences of "unusual" cracking were found by routine liquid penetrant non destructive inspection in F111 engine (TF30) titanium alloy compressor discs in quick succession. Cracking occurred in the tie rod holes of the discs which had never previously been reported. Due to the potentially serious consequences of in-flight failure of engine compressor discs, the fleet was grounded until the nature and significance of the cracking was determined. The cracks were forced fractured and subjected to fractographic analysis, the information from which providing the "key" in determining the cause and significance of the cracking and the likelihood of fleetwide implications. The analysis was interesting due to the unusual aspect ratio of one of the cracks, and the presence of cadmium which it was thought may have been significant in the incidence of cracking. Fractography and metallography was also used to aid in the development of a suitably sensitive eddy current non destructive inspection technique for specific inspection of tie rod holes in compressor discs during future overhauls. This paper will describe the circumstances of the incidences of cracking, the safety concerns, the details of fractographic analysis, and the development of the eddy current procedure.