

The in-service fatigue fracture mechanisms for the I-stage low-pressure compressor disk of the aircraft engine D30KU-154

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Abstract

This paper contains the in-service fatigue fracture analysis for the first stage low-pressure compressor disk of the aircraft engines D30KU-154. Based on the results of the fractographic investigation on collapsed compressor disks the fatigue crack initiation and propagation mechanisms were established. It is shown that the crack initiation in the rim part of the compressor disk is due to a high frequency loading that leads to very high cycle fatigue fracture. The total fatigue life of the compressor disk is determined by simultaneous action of low amplitude loading due to blades vibration, and high amplitude loading due to flight cycle (centrifugal forces). To study the in-service fracture of the compressor disk the numerical simulation of the stress state in the damaged zone under corresponding loading conditions was evaluated. The estimation of fatigue life and crack path predictions were performed based on the multi-regime fatigue fracture model proposed by the authors.

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