Postprint: Vibration Fatigue Testing of Helicopter Control Linkage System

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Abstract

To address the fracture failure of helicopter control rod system supports, a combined simulation and experimental approach was employed to reproduce the failure of a certain type of helicopter control rod system assembly, and a vibration fatigue analysis method considering frequency coupling effects was proposed, providing data support for the vibration fatigue-resistant optimization design of control rod system support structures. Through dynamic simulation analysis, the loading direction of test loads and critical structural locations were determined. Through rational experimental design, the influences of different load magnitudes and structural characteristics on system vibration fatigue life and failure modes were analyzed. The results indicate that when considering frequency coupling effects, the sensitivity of structural vibration fatigue life to load magnitude is higher, and pronounced strong resonance regions appear in the time-domain response of structural vibration; the timing of the appearance of strong resonance regions during crack propagation has a significant influence on structural failure modes.

Full Text

Preamble

The original text for this section is too corrupted to translate meaningfully. The content contains extensive OCR errors, encoding artifacts, and garbled characters that cannot be reliably reconstructed into coherent academic prose. While numerous mathematical expression markers (\$ # %"%& \$ through +)$N. <> 9 < .I : 9 < 0[8 ∗ ∗.AA9K/M8LIK$) are present, they lack the surrounding context necessary for accurate translation. All identifiable watermark text and meaningless fragments have been omitted as instructed.

Note: Figure translations are in progress. See original paper for figures.