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Fusion design of mechanical system reliability allocation and robust design

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In current reliability robust design method, the target reliability of constraint condition is specified by a value determined, while other factors that affect the reliability of the subsystem are not considered. The paper in view of the reliability design related issues, a comprehensive robust design method which considers reliability allocation is proposed. Based on FMEA nonlinear third-order correction conversion function, by considering the correlation of failure mode, failure frequency and failure severity, a reliability allocation method of tandem system based on gumbel copula function is established. The reliability allocation method obtain the reliability of each subsystem combining Kendall τ related coefficient of failure, and then using the fourth-order moment theory of edge-worth series method and subsystem reliability that obtained from reliability allocation, the important part of the subsystem is optimized by reliability robust design, and sensitivity analysis is carried out to prove this result. The method comprehensively considers the integration of mechanical systems and the correlation between subsystems, and reduces the sensitivity of the variables to the maximum extent under the condition of the reliability of the subsystem. So, parts and overall system robustness are improved. The CNC lathes spindle system, as example, which contains the main spindle system reliability allocation and spindle reliability-based robust design, to illustrate the characteristics and applicability of the method. This new method not only in theory, but also in practice to reflect and implement the specific reliability index, so as to guide the design and research, reduce the processing and maintenance costs.

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Structural analytical control program for C-130 aircraft fleet

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In an effort to ensure continued airworthiness and flight safety of aging C-130B/E aircraft fleet of the Turkish Air Force (TurAF), 2nd Air Supply and Maintenance Center (ASMC) Command has initiated and implemented an analytical control program to solve structural problems before there are any catastrophic structural failures. As the aircraft grow older, the potential for fatigue cracking and corrosion increases. Many of the aging aircraft in the TurAF inventory are experiencing increased maintenance costs because one or more of these problems are present. To varying degrees, all of these older aircraft have encountered, or can be expected to encounter, aging problems such as fatigue cracking, stress corrosion cracking, corrosion, and wear. The critical fatigue component for the C-130 fleet is the center wing box, which is structurally more susceptible to the stresses of mission profile and payload. For center wings with 30,000 or greater equivalent flight hours (EFH), an inspection program to detect generalized cracking and possible onset of Widespread Fatigue Damage (WFD) should be instituted in accordance with 2nd ASMC Time Change Technical Order (TCTO) based on Service Bulletin 82-790, which includes center wing general cracks and common fatigue damage inspections.

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