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论文

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### ACT验证机FBW系统的率模可靠性分析

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### PROFUST RELIABILITY ANALYSIS OF FLIGHT-BY-WIRE SYSTEM FOR AN ACT VERIFICATION AIRCRAFT

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摘要

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摘要 率模(Profust)可靠度是一种新的可靠性指标,能全面刻画系统的可靠性行为。将ACT验证机FBW系统的故障分为三个等级:影响安全的故障、影响任务的故障和需要维修的故障,从而对该系统进行率模可靠性分析。还基于率模不可靠度定义故障危害度,使得故障危害度不仅可以合理比较不同故障模式的影响大小,而且直接反映故障模式对系统可靠性行为的影响程度。结论是将率模可靠度作为系统的一个设计指标是可取的。

关键词: 故障模式 FBW系统 率模可靠度 复盖率

Abstract: Conventional reliability theory is based on binary-state assumption and probability assumption. However in many cases the binary-state assumption is not acceptable, i.e., the system failure cannot be reasonably defined in a crisp way but should be in a fuzzy way, and thus fuzzy-state assumption should be taken in place of the binary-state assumption. Profust reliability theory is a form of fuzzy reliability theory and based on the fuzzy-state assumption and the probability assumption. Therefore profust reliability is a new reliability index and can be used to comprehensively characterize system reliability behavior. Failures of the longitudinal flight-by-wire system in an ACT test aircraft are divided into three classes: safety-fatal, task-fatal and maintenance-required, and do profust reliability analysis for this system. Further, a new index of failure criticality on top of profust unreliability is defined so that this new index is not only adequate to reasonably distinguish effects of distinct failure modes, but also able to directly account for the effects of failure modes on system reliability behavior. The conclusion of this paper is that it is reasonable to take the profust reliability as the system design index.

Keywords: failure mode flight-by-wire system profust reliability coverage factor

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