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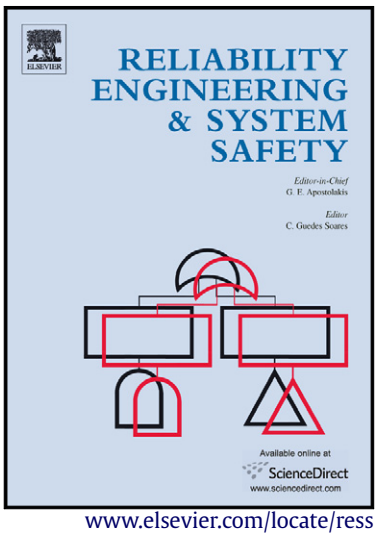

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Probabilistic Common Cause Failures in Phased-Mission Systems

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Abstract

Probabilistic common cause failures (PCCFs) in a system are failures of multiple system components with the same or different probabilities due to a shared root cause or shock. They can contribute greatly to the overall system failure probability. Therefore, it is significant to incorporate effects of PCCFs into system reliability analysis. To the best of our knowledge, no research has been done on the reliability analysis of phased-mission systems (PMSs) subject to PCCFs. In this paper, we propose an explicit method and an implicit method to analyze reliability of PMSs with PCCFs caused by external shocks. Both methods are illustrated through detailed analyses of a wireless sensor network example. Both space and computational complexities as well as advantages are discussed and compared for the two proposed methods.

Keywords: probabilistic common cause failure; phased-mission system; reliability; wireless sensor network.

Acronyms

ACP	Application communication phase
BDD	Binary decision diagram
CC	Common cause
CCF	Common cause failure
DCCF	Deterministic common cause failure
ICP	Infrastructure communication phase

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