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Leadership Through Systems Engineering

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Alan Pentz, Tim Eveleigh, Thomas Holzer, Shahryar Sarkani, *A Risk Based Service Life Extension (SLEP) Approach to Operate Aging Aircraft Beyond Their Original Design Lives*

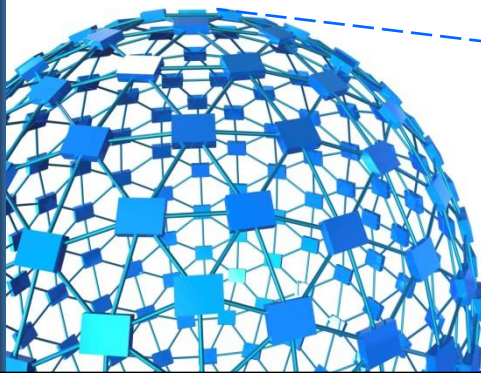
Abstract: With today's uncertain funding climate (including sequestration), decision makers face severe budgetary impacts that will ripple through all aspects of the Department of Defense (DoD). This climate calls for reuse, reset, and reclamation strategies of structural hardware. To meet war fighting capabilities, the DoD extends programs beyond their design service lives to meet critical requirements. This puts programs at risk of catastrophic failure and/or overburdened costs.

Based on GAO reports, the DoD expects to encounter shortfalls in aircraft inventories due to the continued JSF cost and schedule problems. Options considered for future budgets and funding are on the order of billions of dollars. As an example, extension of the F-18 program from 8,600 to 10,000 hours includes procurement of 100 new aircraft that will only use a fraction of its capability (Office, 2010). DoD leadership has yet to establish a position for future requirements in light of JSF issues and there's desire for improved sensitivity analysis to improve decision-making.

Fleet life management practices of structural components (ex. gas turbine engines) follow a "Safe-Life" approach where parts are retired before the detection of a statistical minimum probability that only 1 in 1000 (B.1) components or 1 in 740 (-3σ) will developed a detectable crack at retirement (Immarigeon, Beres, Au, Fahr, & Wallace, 2003). To date, SLEPs haven't explored risk based approaches to extending lives beyond their predicted "Safe-Life." Rather they look toward buying new or repairing to near new condition for equipment that has reached its life limit. Research suggests that there is large variability in usage to provide a basis for service life extension without procuring new hardware or repairing equipment to a "zero mile/zero hour" level within original specifications per the definition of recapitalization (Department of Defense, 2008).

This presentation provides an overview of the probabilistic risk methodology, evaluation of sensitivities and mission history, and impacts toward total ownership costs to allow leaders to make risk based decisions. Recommendations for future studies, pilot programs, etc. will be included to improve future policy and define best practices.

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