ABSTRACT

Maintenance cost is the major portion of the life cycle cost. Scheduled maintenance is planned to avoid failures and unscheduled maintenance arises out of failures. Accordingly, both over maintenance and under maintenance will result in downtime. Failures may result in different risky events. In this regard, it is required to plan the maintenance considering risk and reliability to reduce the maintenance cost resulting in reduced life cycle cost.

Four important objective are set as: (i) development of a methodology for reducing the lifecycle cost of helicopter components through improvement of select reliability and maintainability parameters, (ii) development of a methodology for risk and reliability based maintenance schedule planning, (iii) development of a methodology for dynamic risk and reliability assessment for maintenance schedule planning, and (iv) development of a methodology to update the maintenance schedule periodically based on operational feedback**.** The first objective is addressed by reducing maintenance effort and improving reliability of the components based on the operational data. The second objective is addressed by selecting maintenance significant items and planning maintenance schedule based on the assessment of risk and reliability. The third objective is addressed through assessing the change of risk and reliability with time to facilitate maintenance planning. The fourth objective is addressed through updating the maintenance schedule incorporating operational feedback.

In fulfilling the research objectives, the thesis has contributed in the broad domain of risk, reliability and maintainability. This thesis has proposed (i) a methodology to reduce the life cycle cost of the helicopter components based on operational data, (ii) a methodology to improve maintenance man-hour per flight hour (MMH/FH), (iii) a methodology for selection of maintenance significant items (MSI) based on risk priority number (RPN), (iv) a methodology for risk and reliability based maintenance planning, (v) an integrated methodology for safety analysis, maintenance planning, reliability requirement and availability attainment, (vi) a mathematical model to assess the dynamicity in the risk and reliability based on similar component data to facilitate maintenance planning, and (vii) a mathematical model for updation of maintenance schedule based on repair, replacement and dependent failure mode degradation and maintenance cost.

Different case studies are presented to demonstrate the proposed methodologies based on the data from a contemporary helicopter.
Keywords: Reliability, Maintainability, Life Cycle Cost, Helicopter, Maintenance Man Hour, Time between Overhaul, Condition Monitoring