

**PROCESS MAPPING AND
PERFORMANCE MEASUREMENT IN
AVIATION MAINTENANCE**

By

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Dedicated
to my
Father

CERTIFICATE

This is to certify that Ph D Thesis titled “*Process Mapping and Performance Measurement in Aviation Maintenance*” submitted by **V. R. S. Raju** in partial fulfillment of the requirements for the award of the degree of Doctor of Philosophy, is a bonafide work of the researcher, carried out by him under our supervision and guidance. The Thesis meets the standards of IIT Delhi for the award of the degree of Ph.D. The work is original and no part of the thesis has been submitted in part or in full by any researcher for the award of the degree of Ph. D.

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ABSTRACT

There has been a paradigm shift in the perception of maintenance in the business process. From a necessary evil in the early 1900, maintenance has now become an integral part of the business process. The value addition by maintenance is being well appreciated in terms of the revenue generated and in improving the operational availability of aircraft.

Every aircraft would require organizational ('O') level maintenance to be carried out before every flight. Intermediate ('I') and Depot ('D') level maintenance is carried out at stipulated periodicities. This study analyzes the types and level of maintenance required for military fighters. A detailed review of current research in the fields of maintenance, and aircraft maintenance in particular is carried out to identify research gaps. Gaps in the area of military aircraft maintenance, process mapping of aircraft maintenance and performance measurement techniques to measure military aircraft maintenance are also identified. Process mapping and performance measurement of military aircraft maintenance were formulated as the research objectives. The objectives were considered to address specific problems in the Indian Air Force (IAF).

As most air forces in the world operate bought out aircraft or a mix of bought out and indigenous aircraft, a detailed study on military aircraft fleet management is carried out by action research. A model to estimate fleet size based on stipulated mean time between maintenance (MTBM), mean restoration time (MRT), the aircraft utilization rate and the desired operational availability is developed and termed as MODFS. Problems encountered during operations and induction of new fleet of aircraft

for the first overhaul was identified. A model for non uniform aircraft utilization and staggered induction for overhaul is developed and termed as 'FLY-MAX' model. The advantages of the developed FLY-MAX model over the existing 'follow-the-aircraft' (FTA) method of overhaul task calculation are presented.

What cannot be measured cannot be managed effectively to achieve business goals. In aviation, maintenance performance measurement and maintenance management are the key factors to maintain high operational availability. This study addresses these issues by carrying out maintenance process mapping of maintenance, repair and overhaul (MRO) of a contemporary military fighter aircraft. The process mapping is carried out using activity diagrams and customized process maps. The developed activity diagrams for 'O', 'I' and 'D' level maintenance are termed as 'ACTDIM-O', 'ACTDIM-I' and 'ACTDIM-D' respectively. The customized 'PROMAP-D' is developed by representing work stations as nodes and directed line segments to indicate work flow. The advantages of this new process map, over the conventional activity diagrams are explained in detail. Based on the process maps, the bottlenecks in MRO and impediments in maintenance of military fighters are identified and recommendations are made to overcome the bottlenecks and to enhance the maintenance effectiveness. Different maintenance performance indicators (MPIs) appropriate to military aircraft maintenance performance measurement are developed and presented. The research contributions and novelty of this study are discussed in the last chapter.

Keywords: *Aviation maintenance, process mapping, performance measurement, military fighter aircraft, fleet management*

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