CHAPTER-VII

CONCLUSIONS AND RECOMMENDATIONS

Reliability studies have been carried out on the engines of armoured fighting vehicles and on the thirteen subsystems of military aircraft, and the results have been given in the form of tables and graphs. Following conclusions are drawn based on the results produced.

7.1 ARMoured FIGHTING VEHICLE ENGINES

1. Model-B engines are found to be the most reliable, while the overhauled engines the least reliable over a life span of 3000 km.

2. Model-B engines exhibit the largest mean life, while overhauled engines exhibit the shortest mean life. In the former case, the value of failure density turns out to be lower than that of the later case.

3. Failure rate increases with life (km) with increasing rate for original and model-B engines, while it increases with decreasing rate for model-A and overhauled engines.

4. Model-B engines are found in aggressive wear of life, while overhauled engines are found in the initial stage of wear out life.

5. 63.2% of the population of model-B engines fail after relatively larger life time than the overhauled engines.

6. The mean life of model-B engines is found to be the longest and is the shortest for overhauled engines.

7. Life time spread about mean life time is found to be the minimum in case of model-B engines, while it is the maximum in case of overhauled engines.

8. Stabilizing period at which failure rates become almost constant is found to be the largest in case of model-B engines and is the smallest in case of overhauled engines.
Model-B engines reveal longest life than the overhauled engines because 10% of the population of former engines fail after 753 km, while the later engines fail at 272 km.

Model-B engines are found to be the most reliable, while overhauled engines are found the least reliable.

Relatively more maintenance facilities are required for overhauled engines as compared to the least required in case of model-B engines.

Number of spares required are also found to be the maximum in case of overhauled engines, while in case of model-B engines the requirement is minimum.

7.2 MILITARY AIRCRAFT

Air conditioning subsystem of the military aircraft is found to be the most reliable, while the wireless subsystem is found the least reliable.

Air conditioning subsystem is found to have the longest life, while the wireless subsystem is having the shortest life.

Fuel plant, canopy operation, brake operation, radio compass subsystems are found to exhibit early life failures, while the aircraft structure, flight control, hydraulic control, air conditioning, power plant, under carriage, electrical control and wireless subsystems exhibit the start of wear out life.

63.2% of the population of the air conditioning subsystem fails at the life time of 104.3 hr and that of wireless subsystem fails at 37.07 hr.

Mean life is found to be the longest in case of air conditioning subsystem and the shortest in case of wireless subsystem.

The spread of life time about the mean life is found to be relatively more in case of fuel plant subsystem as compared to wireless subsystem.
The stabilization period is found to be the longest in case of air conditioning subsystem and the smallest for the wireless subsystem.

10% of population of air conditioning subsystem fails at the life time 11.48 hr. and is found to be the largest, while for brake operation subsystem it is noticed to be 5.82 hr. and is observed to be the minimum.

The air conditioning subsystem is found to be relatively more reliable and the wireless subsystem is observed to be the least reliable among all the subsystems.

Failure occurs most frequently in case of wireless subsystem as compared to canopy operation subsystem where it occurs least frequently.

Maintenance facilities and spares are required more vigorously for wireless subsystem in comparison to other subsystems, for the desired availability of 0.95 and other specified requirements. The annual requirement of spares is found to be the maximum for wireless subsystem and the minimum for air conditioning subsystem.

The software developed is general in nature and, thus, can be used for analyzing other types of failure data i.e. ungrouped, grouped, censored data of type-I & II etc. for any mechanical systems whose distribution could be matched in Weibull distribution form.

**7.3 RECOMMENDATIONS**

Life expectancy and reliability as determined numerically and shown through Tables 6.1.1-6.1.5 & Tables 6.2.1-6.2.13 for armoured vehicle engines and military aircraft subsystems, respectively would prove to be of great use in the reliability based design of the systems. Further these results may be implemented to yield fullest and most effective utilization of these military systems.
2. Annual spares requirement strategy as estimated and shown through Tables 6.1.7 & 6.2.15 for armoured vehicle engines and military aircraft subsystems, respectively may be implemented, if one desires to achieve optimal utilization of spares and overhauls of failed military systems.