

Case Study

Establish Life Cycle Costs for a bid / proposal

Summary

- ▶ The OEM was preparing a bid for the production and sustainment of a Combat Reconnaissance Vehicle (CRV) at an agreed level of operational capability and availability (Readiness).
- ▶ The OEM required a solution to analyse alternative maintenance approaches to optimize the affordability of its platform, in the context of the specified operational usage (mission profile) and environments of the customer.
- ▶ The OEM required a means of validating and communicating their analysis to the customer (Defence).

Outcomes

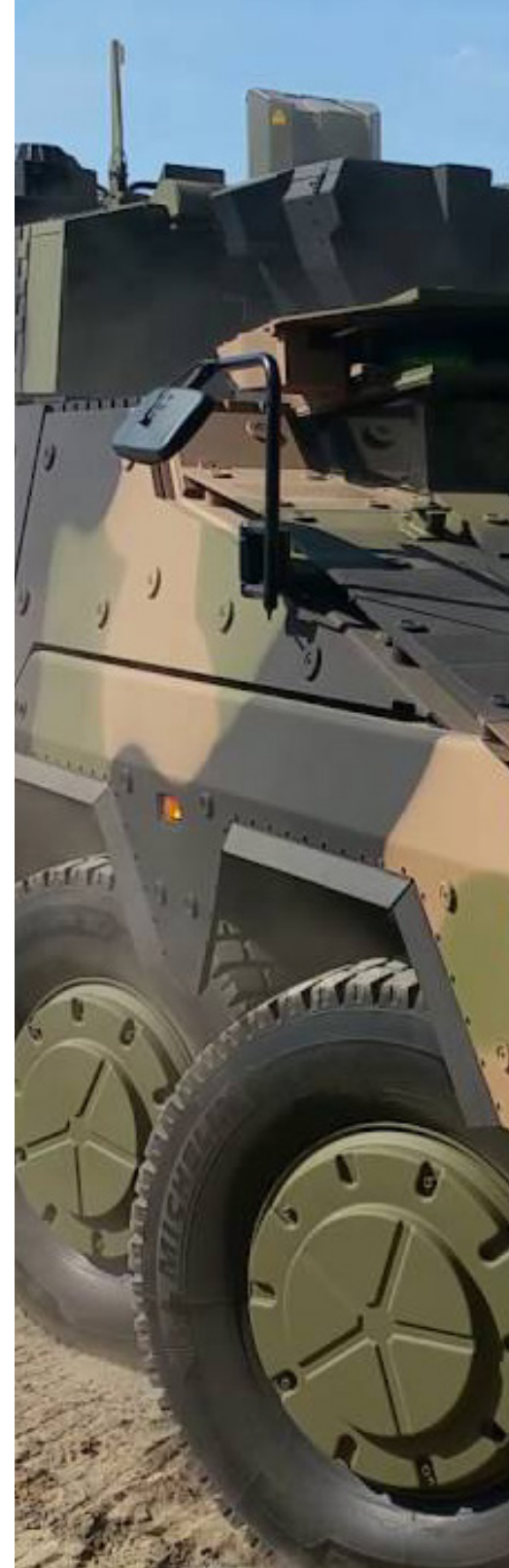
The results of the project included:

1. Analysis solution to model the impact of mission profile / operating environment on maintenance costs
2. Identified potential poor performers in the system based on assumed system reliability
3. Proposed maintenance actions given a system reliability
4. Validation of sustainment approach
5. A knowledge base of failures and maintenance actions that the OEM can reuse across the life of the platform / contract

Process

The OEM analysed the maintenance records for the platform to identify components that were failing more frequently than expected, and used MADe to:

1. Generate a MADe model of the CRV platform
2. Define the expected Mission Profiles / Operating Environments
3. Calculate the expected reliability of the systems
4. Identify the maintenance requirements for the design configuration
5. Conduct trade studies to optimize Readiness and Affordability of the CRV platform based on the impact of configuration / mission profile / operating environment on maintenance costs
6. Conduct technical validation for the recommended maintenance approach
7. Calculate expected maintenance costs of the platform
8. Maintain a knowledge base of failures and associated maintenance actions that can be reused across the life of the platform / contract

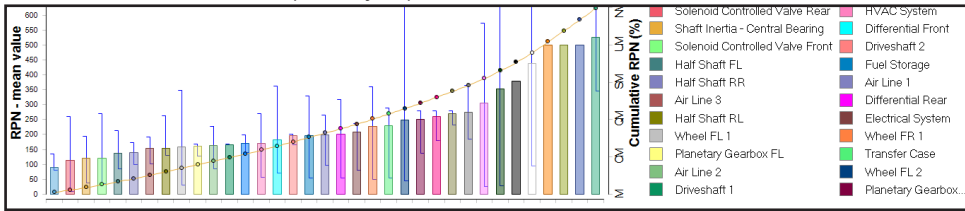


Outputs

MADe was used to generate the following deliverables:

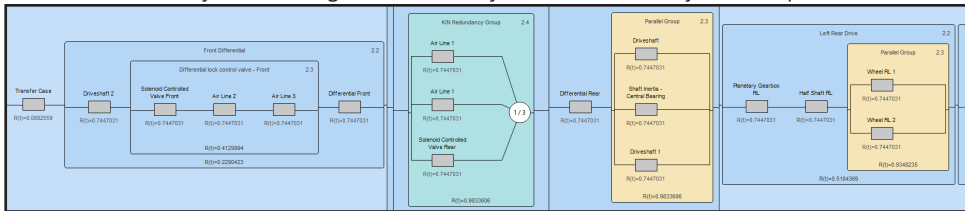
Charting the failures

Graphically represents failure contributors



Reliability Block Diagrams

Reliability Block Diagrams of the systems (to identify PP components)



Reliability Analysis

Sets a reliability for the system to analyse MTTF

Item	Allocated Reliabi...	Allocated Failure...	Allocated MTTF	Duration	State of
Driveline System	0.6500000	1.2422	805017.73	346787.9	
Drive System	0.6500000	1.2422	805017.73	346787.9	
Front Differential	0.9403149	0.1775	5635124.10	346787.9	
Differential lock control	0.9796955	0.0592	16905372.31	346787.9	
Air Line 2	0.9931855	0.0197	50716116.93	346787.9	
Air Line 3	0.9931855	0.0197	50716116.93	346787.9	
Solenoid Control	0.9931855	0.0197	50716116.93	346787.9	

FMEA / FMECA

FMEA report for the systems (automatically) generated from the MADe model

IDENTIFICATION NUMBER	ITEM / FUNCTIONAL IDENTIFICATION (NOMENCLATURE)	FUNCTION	FAILURE MODES AND CAUSES	MISSION PHASE / OPERATIONAL MODE	LOCAL EFFECTS	NEXT HIGHER LEVEL	END EFFECTS	FAILURE DETECTION MEANS	COMPLETION
	Air Filter An air purifying device, removing particles, contaminants from the air.	Refine Gas Contamination Modelled as a resistive device, slightly restricting air flow and removing particles.	High Contamination due to blocking of the Air Filter as a result of siltng caused by contaminated input flow and input flow too slow (resulting in Low Torque and high Force)	1: Patrol 1 2: Litter 1 3: Patrol 2	Refine Gas Contamination High Loss of output	Convert Mechanical - rotational Torque Low (Diesel Engine) Loss of output	Convert Mechanical - linear Force High (APC Platform) Loss of output	Sensing Device	Condition-based Maintenance
	Refine Gas Mass Flow rate	Low Mass Flow rate due to blocking of the Air Filter as a result of siltng caused by contaminated input flow and input flow too slow (resulting in Low Torque and high Force)	1: Patrol 1 2: Litter 1 3: Patrol 2	Refine Gas Mass Flow rate Low Loss of output	Convert Mechanical - rotational Torque Low (Diesel Engine) Loss of output	Convert Mechanical - linear Force High (APC Platform) Loss of output	Operator Observation	Modify Miss	
	Refine Gas Contamination	High Contamination due to blocking of the Air Filter as a result of siltng caused by contaminated input flow and input flow too slow	1: Patrol 1 2: Litter 1 3: Patrol 2	Refine Gas Contamination high	Convert Mechanical - rotational Torque Low (Diesel Engine) Loss of output	Convert Mechanical - linear Force High (APC Platform) Loss of output	Sensing Device	Condition-based Maintenance	

Maintenance Cost Estimate

Provides sustainment parameters to conduct sustainment analysis

