MADe - Bid & Proposal Development

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Engineering based sustainment budget calculations for concept solutions

Key benefits

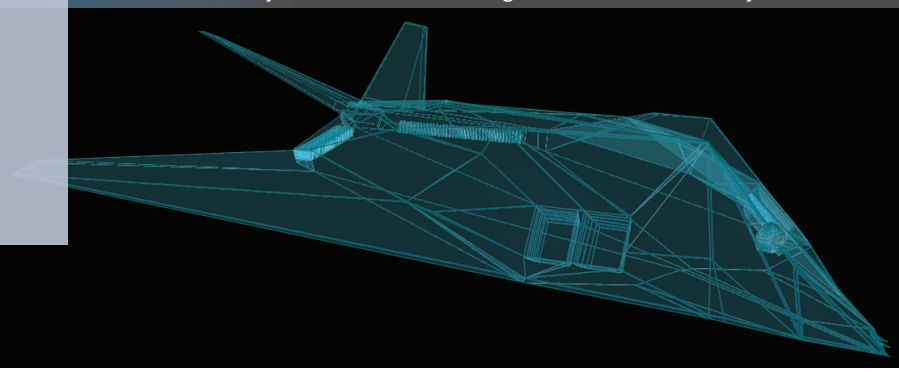
- Understand the cost impacts of design configuration & mission profile
- Concurrent (Model-based) risk Identification and mitigation
- Technical validation for budget forecasts
- Structured / automated analysis workflows

Key features

- Integrated analyses to support trade studies
- Automated technical validation of trade studies
- Standardized analysis workflows
- Industry Standard data taxonomies

The Problem: Safety / mission critical systems are selected on the combination of technical capability with the projected total cost of ownership for the solution. To successfully bid for these projects, OEMs must establish and justify the expected lifecycle costs for their solution based on inter-dependent decisions on the design configuration, expected usage cycles and operating environments, and the recommended maintenance approach. This process should also generate data to support a range of specific metrics to enhance the bid (e.g. Maintenance Cost per Operating Hour, MTBM, etc.).

Solution:
A decision support solution (process and tools) that integrates the analysis capabilities required to determine the costs of alternate maintenance approaches to ensure Availability and Safety. To ensure the accuracy of the budget estimation for a proposal, the solution must be practical and cost effective for system engineering and extensible across the design process. This requires model based (digital) simulation with standardized analysis workflows and data structures, a high degree of automation, and the ability to integrate with related engineering applications (e.g. PLM). Ideally any model developed in the bid process should be readily extensible into design / sustainment analysis across the lifecycle.



Solution Requirements:

A model-based estimation process for availability & cost projections that aligns with the systems engineering / concept design phase to establish and validate maintenance & life cycle costs for a project proposal, this requires the ability to:

- Identify and analyze risks and factors that impact safety / availability / life-cycle cost
- Identify and validate the optimal maintenance approach for critical risks
- Analyze the impact of alternate usage cycles and operating environments
- Estimate maintenance requirements and budget for the solution

How MADe supports proposal development

MADe enables the user to rapidly model solution functions, risks and reliability to:

- Identify the risk & factors that can lead to failures and when they could occur (FBD, RBD)
- Define how, where and how long systems are intended to be used (MPD, ESI)
- Establish the optimal maintenance approach and its associated costs (MCE)
- Generate analysis outputs to validate technical and safety requirements
- Assess decision accuracy and configuration manage the estimates (Annotations)

How MADe provides validation

MADe uses a combined simulation model of the asset to compare alternate sustainment operating concepts.
The model supports the following validation outcomes:

- Technical: reconcile functional capability with customer requirements
- Safety: evidence the safety case (FMECA / FTA / RBD / RCM)
- Budget: estimates are supported by engineering calculations analysis

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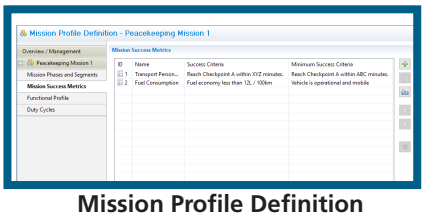
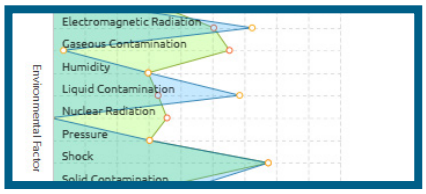
MADe Proposal Development Analysis Workflow

Define
How and where system will be used

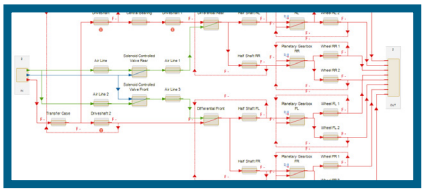


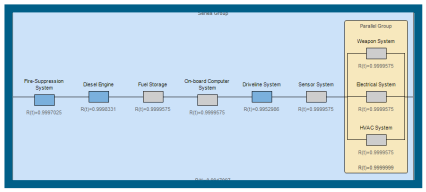
Mission Profile Definition



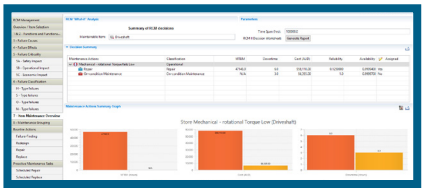
Environment Loading

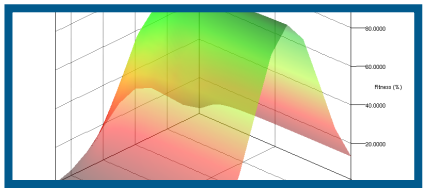
Model
Identify potential failures and when they will occur


Functional / Failure Analysis

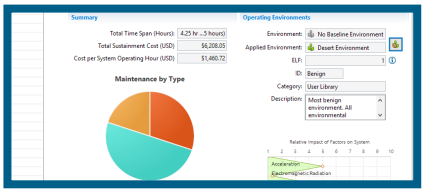

Reliability Analysis

Analyze / Mitigate
Identify optimal failure mitigation approach

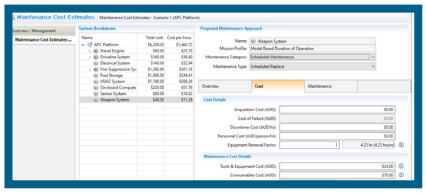

Reliability Centered Maintenance


CBM Design

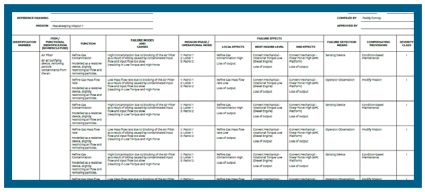
Calculate
Generate expected maintenance costs for the solution

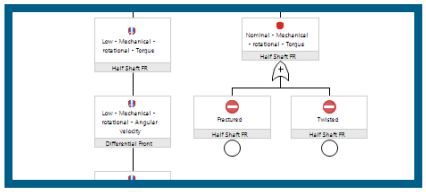


Maintenance Cost Estimate


Maintenance Action Reports

Validate
Technical analyses

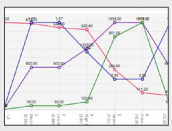

FMEA / FMECA

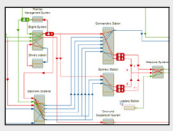


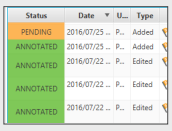
Fault Tree Analysis

MADe Functionality Overview

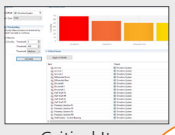
Modelling


Use Cases


Functional Block Diagram



Data Quality Analysis


Critical Item Analysis

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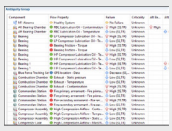
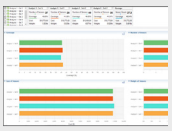
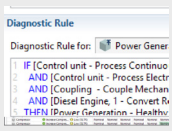
Sensor Set Design

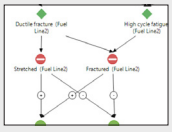

Fault Detection and Isolation


Diagnostics Optimisation

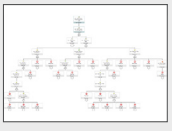


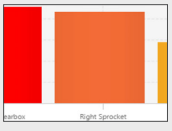
Model Based Diagnostic Rules

Safety and Reliability Asssesment



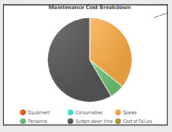
Failure Diagram


Fault Tree Analysis

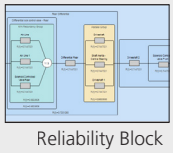

Criticality Analysis


FMEA / FMECA

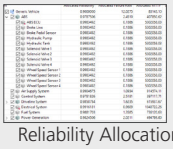
RAM



Maintenance Estimates


Reliability Block Diagram


RCM


Reliability Allocation

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