

# MADe RAM

MADe RAM is used to identify potential issues in system design and determine criticality and reliability from part/LRU to the system level.

MADe RAM enables reliability, availability and maintainability engineers (RAM) to conduct their analyses concurrently with the design process.

## BENEFITS SUMMARY

system level assessment based on aggregated data (part, component, sub-system)

system reliability calculations and analysis based on specific failure modes

system availability calculations and analysis based on specific failure modes

automated fault tree generation and analysis capability

configurable visualisation tools (graphs)

automated reporting / compliance to customizable report templates

integration with other IT applications / systems

## MADe RAM (Reliability Availability and Maintainability)

Complex engineering systems used in aerospace, defence, offshore, marine and other applications are mission or safety critical and generally operate under harsh environmental and usage conditions.

As these systems become increasingly complex (multi-domain, hierarchical) engineers performing the RAM function require advanced technology tools to assess system failure data and provide analysis for decision support for design and supportability constraints. It is important to be able to establish and maintain system data for multiple configurations of a platform efficiently and cost effectively.

Key issues in the current RAM process for complex systems that MADe RAM solves include:

- data quality – ensuring that failure concept and functional descriptions used for FMEA / FMECA are consistent, with standardised taxonomies
- data integrity – ensuring that all system dependencies are accurately mapped across domains and hierarchies
- data currency – system data are made available to RAM engineers concurrently with the concept, functional design, initial and detailed design stages and for storing of operational data.
- data usability – optimising workflows and reducing design costs using a standardised system model that can integrate with other analysis tools and reporting systems

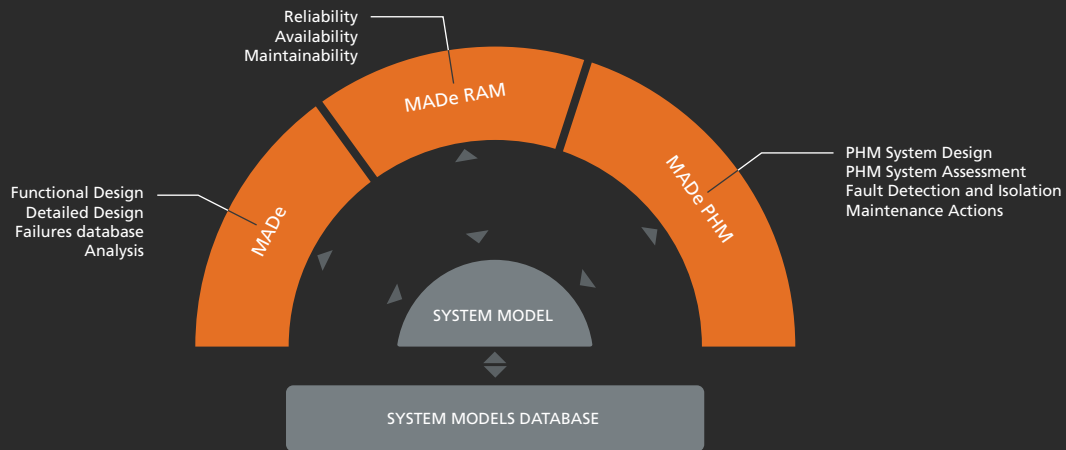
## What is MADe RAM?

MADe RAM offers next generation software tools used for engineers performing the RAM function for mission and safety critical systems.

Using MADe system models and failures data, MADe RAM provides the capability to conduct criticality analysis and thresh-holding, RCM assessments, reliability assessments, Fault Tree generation, availability and maintainability modelling and analysis.

MADe RAM can be used at all stages of the design process (concept, configuration, detail, technology refresh, upgrade) and is optimised for RAM engineers that are using aggregated data to analyse complex, integrated, multi-domain systems (mechanical, hydraulic, electronic).

# The MADe Suite



## Why use MADe RAM?

As mission and safety critical systems become increasingly complex, engineers require advanced technology tools to generate and manage failure data and provide analysis for decision support.

With the trend towards 'performance based contracting' (or 'contracting for availability') the importance of the RAM function continues to rise. It is important to establish and maintain system data for multiple configurations of a platform efficiently and cost effectively and to ensure the quality of data used to assess the total ownership cost of a system.

MADe RAM provides the tools to model system level failure responses generated by specific failure modes originating at lower level hierarchies.

### Reliability / RCM

MADe RAM uses the causal paths from component failure through the system hierarchy to determine the impact of each component failure mode on system reliability and then calculates overall system reliability.

Graphical analysis tools are provided to identify and assess the most effective way to improve system reliability.

### Availability

MADe RAM estimates system availability and enables the user to compare the impact of various components and their failure modes on system availability.

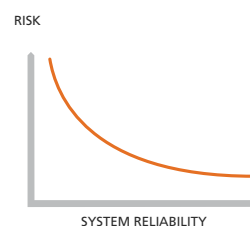
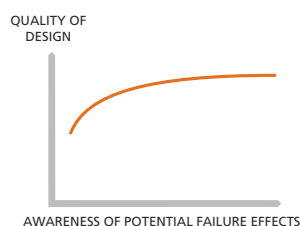
### Maintenance

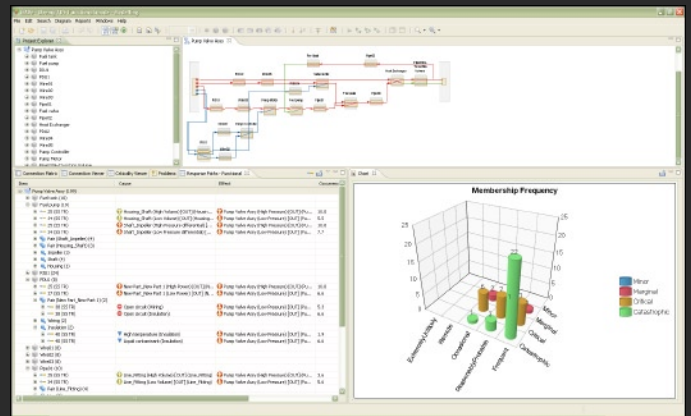
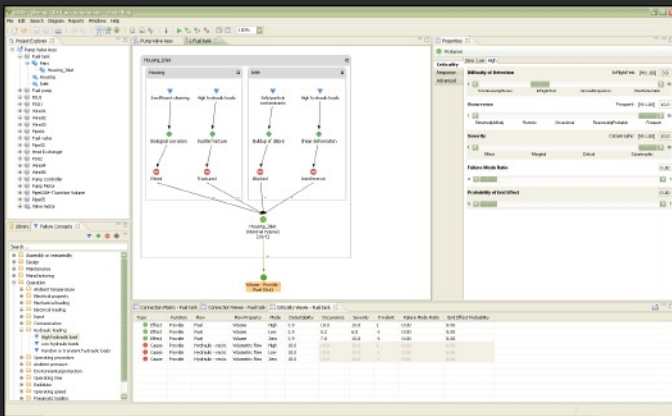
MADe RAM provides the engineer with a standardised framework for specifying maintenance and monitoring methods for system components. A summary of required maintenance actions and associated monitoring requirements are reported in tandem with the FMECA report or as a separate Maintenance Action report.

### Fault Trees

Fuzzy Cognitive Mapping (FCM) analysis is used to identify the propagation paths of failures from bottom-up through the system. Using this pathing data a top-down view of events leading to specific system failures is constructed.

MADe can automatically generate Fault Trees, identify cut-sets, display cut-set probability of occurrence and provide the overall probability of the end-effect.





**Benefit Summary**

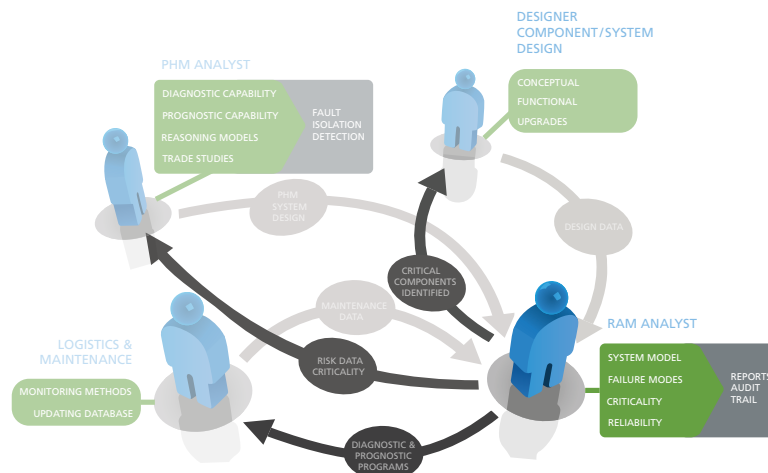
Key benefits of MADE RAM include:

- system level assessment based on aggregated data (part, component, sub-system)
- system reliability calculations
- system availability calculations
- fault tree analysis capability
- configurable visualisation tools (graphs)
- automated reporting, customizable report templates
- facilitate integration with other IT applications / systems

**Feature Summary**

Key features of MADE RAM include:

- integrates directly with MADE system model
- automated export protocols for failures data (XML, CSV) to other analysis & decision support tools
- detailed failures databases optimised for RAM function based on parts, components, assemblies and systems
- extensible & reusable library of parts, components and systems
- a structured framework for modelling system functional dependencies



**MADe RAM (Enterprise version)**

MADe RAM can be customised to meet the specific internal processes of a client, including configuration management, design approvals, knowledge management, PLM and QA.

Customisable features include user access rights (e.g. design authority), data segmentation (internally or from the supply chain) and reporting formats.

For enterprise implementations, specific application program interfaces can also be developed or provided to facilitate automated legacy data capture (e.g. CAD data), ensuring that the data MADE RAM generates integrates with the organisation tool suite of other engineering tools.



### MADe software

PHM Technology provides data generation and decision support tools that enable designers and discipline specific engineers to achieve concurrent engineering.

The Maintenance Aware Design environment ('MADe') is an integrated suite of software tools designed to meet the practical engineering requirements of design, RAM and PHM.

The other modules that make up the MADe suite are:

- MADe is used to model and analyse system behaviour in response to potential failures – provides a system model that can be used to generate FMEA and FMECA data for design, RAM and PHM
- MADe PHM (Prognostics and Health Management) used to design and assess diagnostic, prognostic and health management systems and capabilities

MADe offers significant engineering, productivity and process improvements over existing customer solutions, and can be implemented on a single user, network or supply chain basis.

### PHM Technology Services

PHM Technology provides value-added support and integrated services to ensure that the implementation of MADe for projects, programs and organisations is successful and that customer goals are met.

The services provided by PHM Technology and its technical partners include:

- Project Management
- Data Migration
- Training
- Technology Consulting
- Solutions Delivery
- Customer Support

### Company Overview

PHM Technology (est. 2006) is an advanced engineering technology company that has developed a range of decision support tools for complex engineering systems that are mission / safety critical.

While MADe is a stand-alone application, enterprise versions can be customised to meet the specific process requirements and protocols of OEMs and their supply chains.

The first customer for MADe was the Joint Project Office of the JSF program.

MADe has users in the EU, UK and US.

### Quality Products and Services

PHM Technology understands that its customers require reliable long term software solutions to support complex business and engineering needs.

PHM Technology is committed to delivering high quality software products and services to its customers.



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