AUSTRALIAN MISSILE CORPORATION

APPLYING DIGITAL ENGINEERING TO SUPPORT THE INTRODUCTION INTO SERVICE OF COMPLEX GWEO SYSTEMS

BACKGROUND

GWEO CAPABILITY

Test & Evaluation (T&E)

- GWEO Enterprise to deliver effective capability to meet the warfighting needs of the ADF
- Australian GWEO Plan has established an objective to grow and mature Defence's T&E capability
- Enable Guided Weapon (GW) system acquisition and sovereign production, support and sustainment of weapons

Development of an Air Domain GWEO Environmental Test Capability

- Support qualification, certification, and on-going support of GWEO
- Safety and Suitability for Service (S3) captive air carriage testing of GWEO products
- Increased weapon inventory availability
- Increased weapon system interchangeability
- Greater weapon performance reliability
- Reduced safety risk to the war fighter



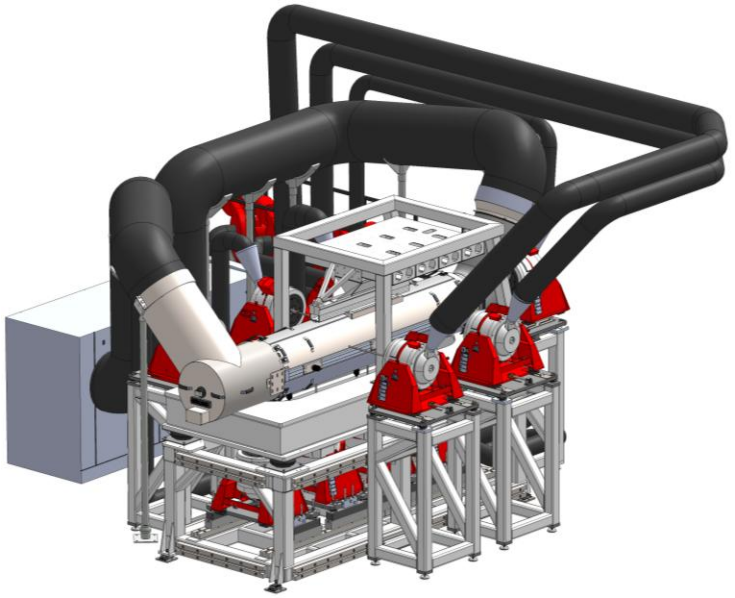
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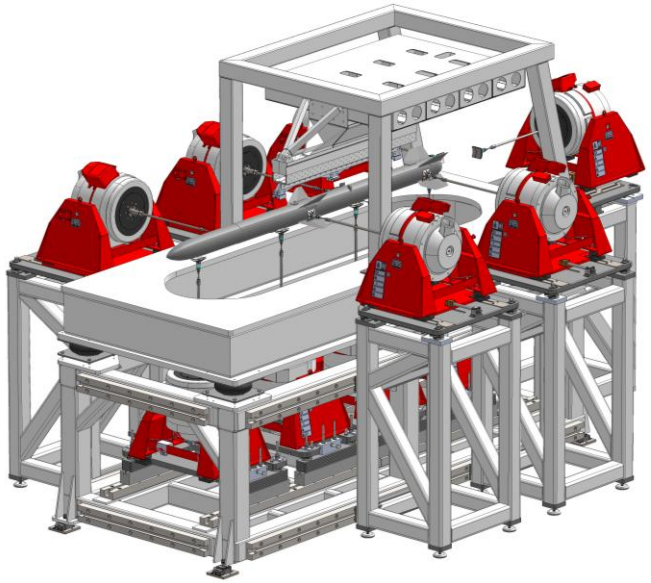
BACKGROUND

MIMOVS

Multiple-Input, Multiple-Output Vibration System

- Partner with CoA for design, procurement, manufacture, integration and delivery of MIMOVS
- Recreate vibration exposure during transport, captive-carriage, launch, and free-flight
- MIMO vibration shakers excite a test item in multiple axes to enable a more realistic and higher fidelity test
- Simultaneous vibration and thermal testing across a range of weapon systems





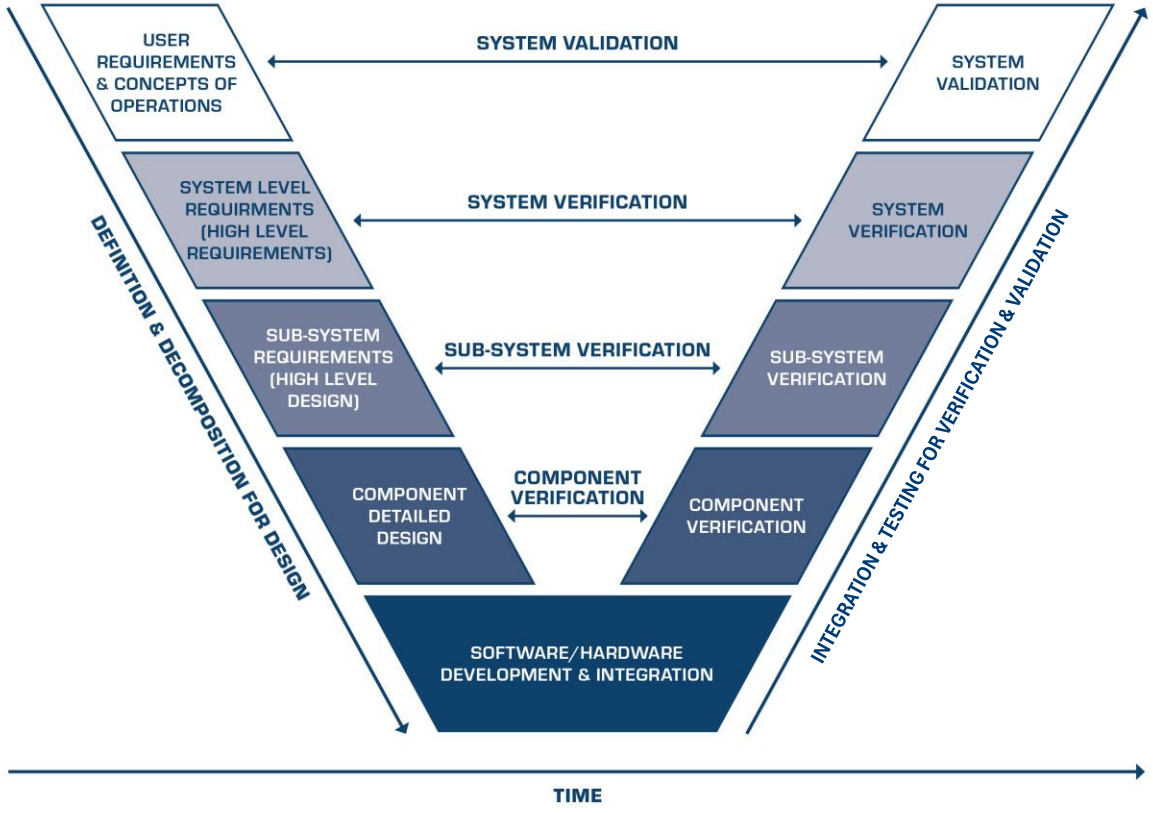
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DESIGN APPROACH

SYSTEMS ENGINEERING

Speed to Capability

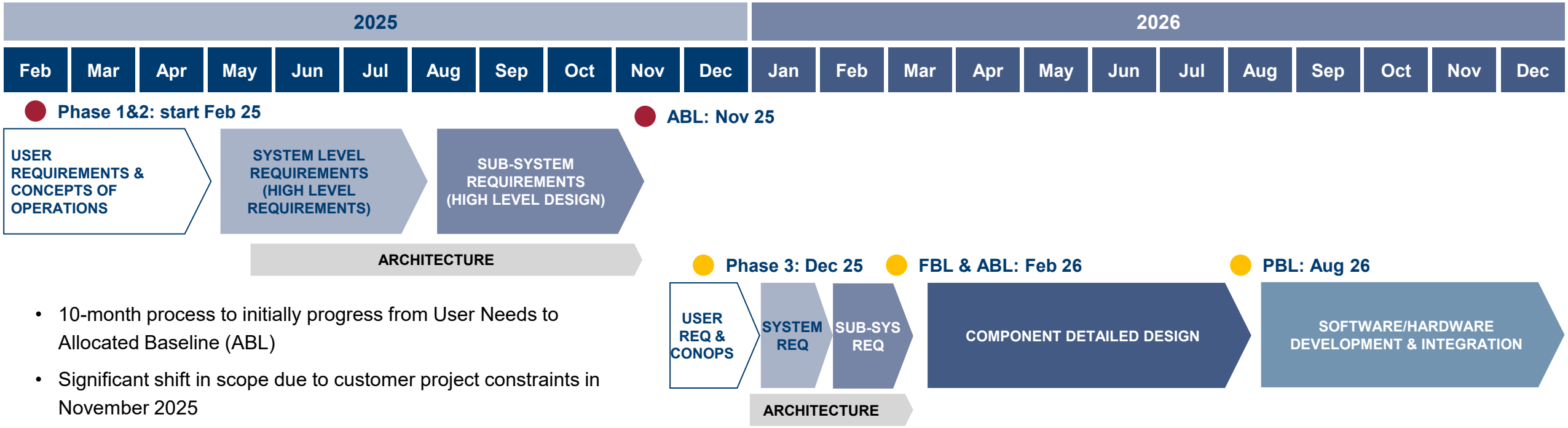
- Tailored Systems Engineering approach, paired with Digital Engineering to address
  - Technology novelty
  - Wide scope
  - Integration with existing facilities
- Case Study on methods to improve project lifecycles and positively impact collaboration between Defence and industry
  - Approach taken
  - Benefits to MIMOVS project
  - Key lessons and takeaways



Vee-Diagram – Systems Engineering Approach

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PROJECT TIMELINE



- 10-month process to initially progress from User Needs to Allocated Baseline (ABL)
- Significant shift in scope due to customer project constraints in November 2025
- Completed a system redesign in 3 months, made possible by MBSE and Digital Tools

NEEDS, REQUIREMENTS, AND ARCHITECTURE

MBSE BENEFITS

Requirements Management

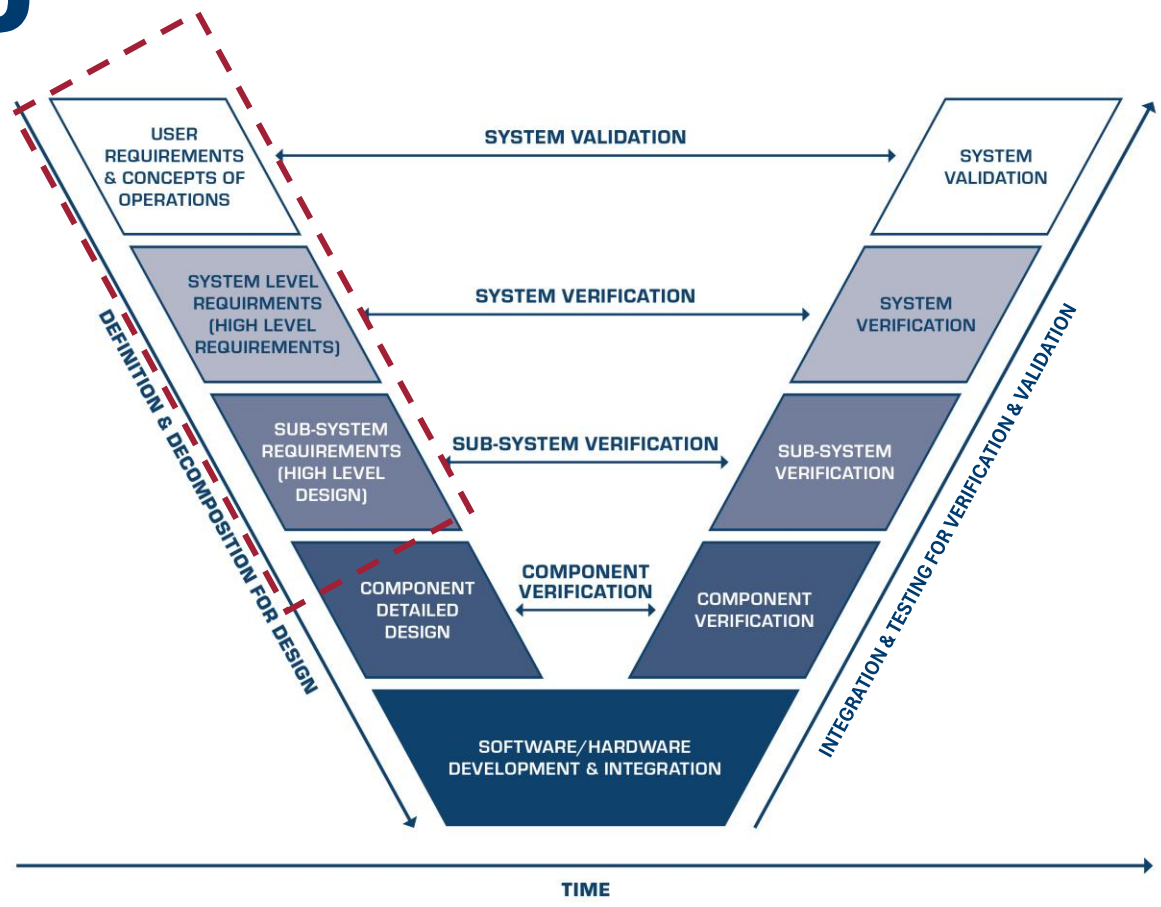
- Efficient change management
- Decision and change register in the same tool
- Allows for baselining and configuration management

Traceability

- Allocation of functionality to systems and subsystems
- Traceability from stakeholder needs down to subsystem requirements to assess specification completeness

Stakeholder Communication

- Accessible model for stakeholder review and input
- Held design reviews in the live model for elaboration in session



Vee-Diagram – Systems Engineering Approach

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DETAILED DESIGN

MBSE BENEFITS

Collaboration

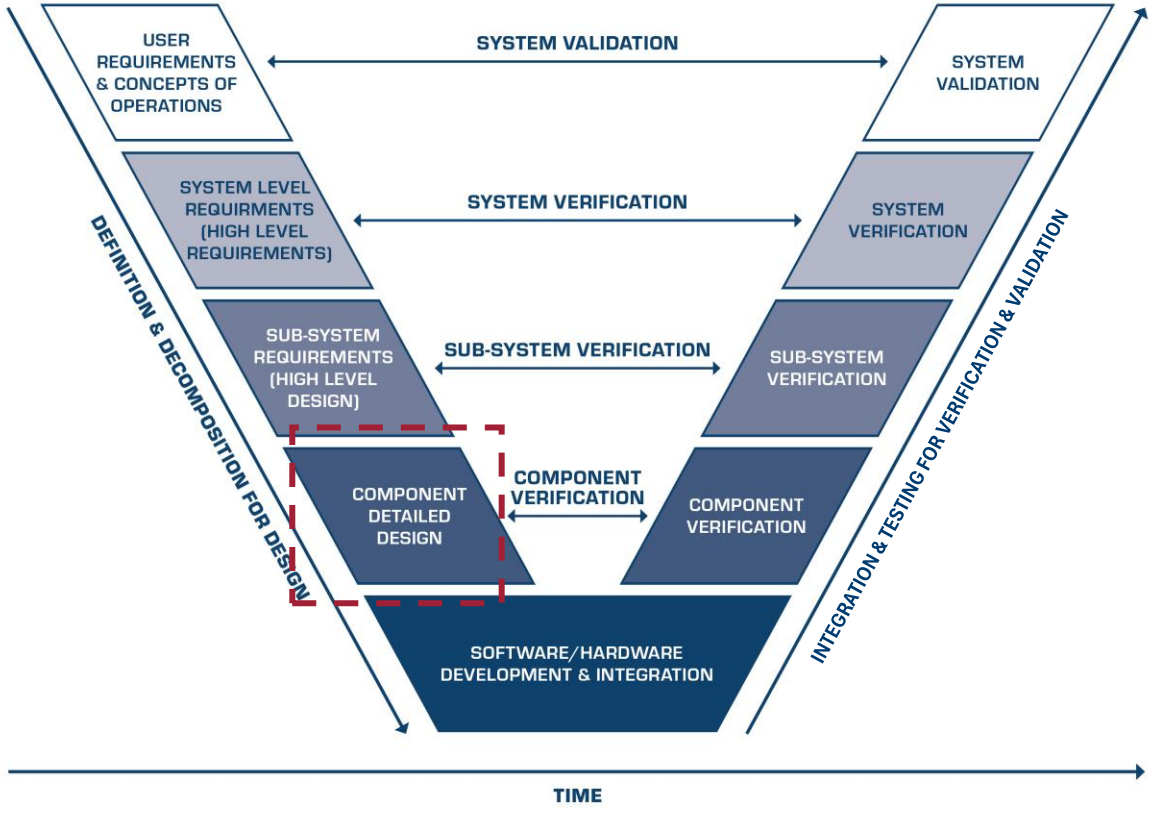
- Single source of truth beneficial for collaboration
- Allocated risks, requirements, and design decisions expedited design activities
- Interface definition and control – both internal and external to the system
- Balance between sharing live information and static exports

Adaptability to Changes

- New information constantly being discovered
- Ease of updates and changes

Simulation and Analysis

- Focus on burning down risks and unknowns through desktop analyses and simulations
- Designing in parallel and reusing elements



Vee-Diagram – Systems Engineering Approach

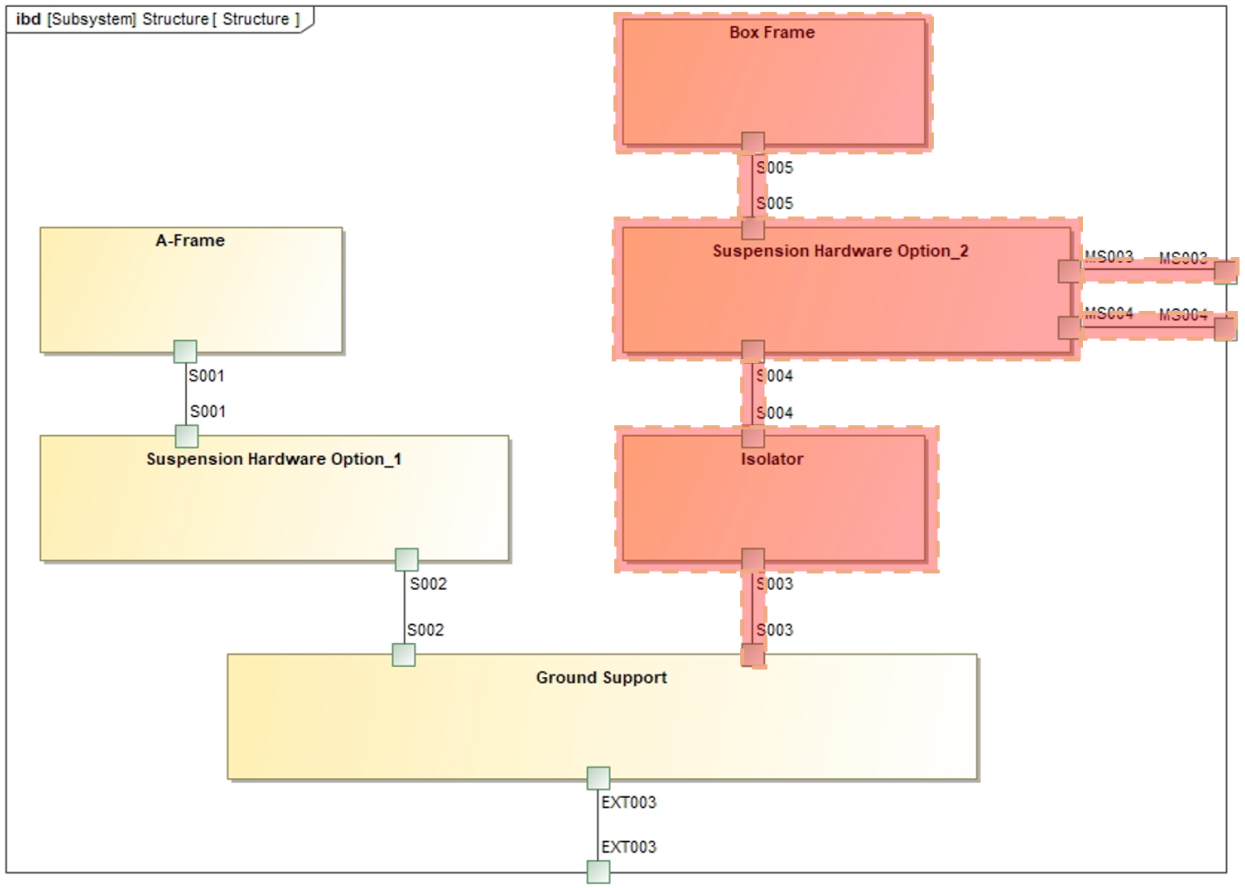
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TRADE STUDIES

EXAMPLE

Parallel Design Efforts

- Investigated three methods for addressing impedance control
- Designed system architecture with different filterable configurations
- Identification of equipment and interfaces for each configuration
- Analysis of each design separately
- Completion of trade-off analyses
- Possible future upgrades and iterations of MIMOVS



Configuration filters in Internal Block Diagram

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DEVELOPMENT

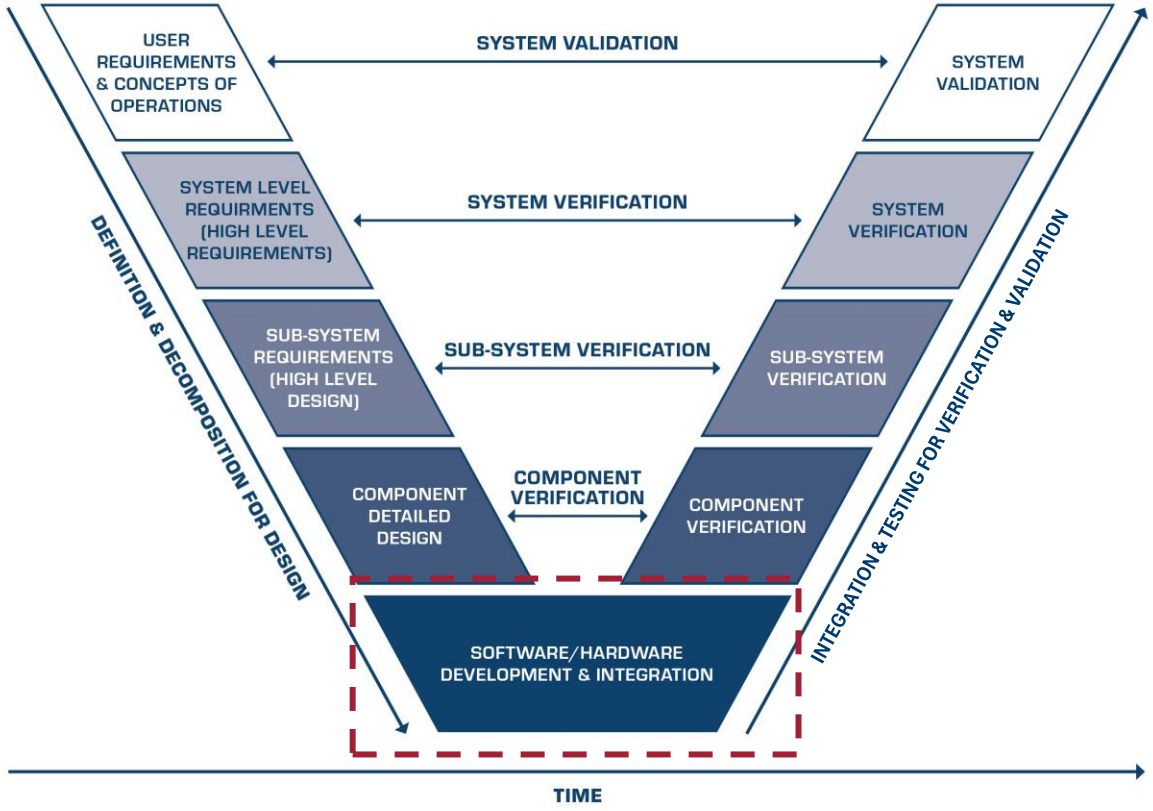
MBSE BENEFITS

Information Management

- Product Lifecycle Management Tool used to capture System hierarchy from System to Component level
- Capture design characteristics and calculate size, weight, and power envelopes for integration into facilities
- Customisable to improve overall situational awareness

Cost and Time Efficiency

- Development of Mission, Support and Enabling in parallel to facilitate System Operation
- Risks and integration steps could be found in the model to assist plan and procedure development



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RISK MANAGEMENT

EXAMPLE

Safety and Technical Risks

- Technical: technology of the system itself
- Discussed in design reviews
- Conduct of early test and evaluation activities
- Safety: personnel, environment, surrounding equipment
- Design decisions, equipment selection, support of system design
- Traceable to design elements to facilitate communication with external suppliers and designers

Risk Rating: Very High, High, Medium, Very Low, Low **Residual Risk Rating:** Very Low, Low, Medium, High, Eliminated

#	Risk ID	Status	Likelihood	Consequence	Risk Rating	Treatment Type	Residual Likelihood	Residual Consequence	Residual Risk Rating
1	TR-08	On Watchlist	Occasional	Moderate	Low (B3)	Monitor	Occasional	Moderate	Low (B3)
2	TR-07	Draft	Occasional	Major	Medium (D3)	Reduce/Mitigate	Improbable	Major	Low (C2)
3	TR-12	Draft	Occasional	Critical	High (D3)				N/A
4	TR-05	Draft	Occasional	Catastrophic	High (E3)	Reduce/Mitigate	Rare	Catastrophic	Low (E1)
5	TR-20	Transferred	Occasional	Catastrophic	High (E3)				N/A
6	TR-10	Draft	Improbable	Catastrophic	Medium (E2)	Reduce/Mitigate	Rare	Catastrophic	Low (E1)
7	TR-09	Draft	Probable	Major	High (C4)	Avoid	Improbable	Major	Low (C2)
8	TR-19	Draft	Improbable	Catastrophic	Medium (E2)				N/A
9	TR-13	Draft	Occasional	Critical	High (D3)				N/A
10	TR-01	Draft	Occasional	Major	Medium (D3)	Reduce/Mitigate	Improbable	Major	Low (C2)
11	TR-11	Draft	Probable	Critical	High (D4)	Avoid	Rare	Critical	Low (D1)
12	TR-06	Draft	Improbable	Critical	Medium (D2)	Reduce/Mitigate	Rare	Critical	Low (D1)
13	TR-14	Draft	Occasional	Critical	High (D3)				N/A
14	TR-03	Closed	Improbable	Moderate	Very Low (B2)	Accept	Improbable	Moderate	Very Low (B2)
15	TR-04	Closed	Occasional	Critical	High (D3)	Avoid	Rare	Critical	Low (D1)
16	TR-02	Realised/Issue	Improbable	Critical	Medium (D2)	Reduce/Mitigate	Rare	Critical	Low (D1)

Technical Risk Tracking Matrix

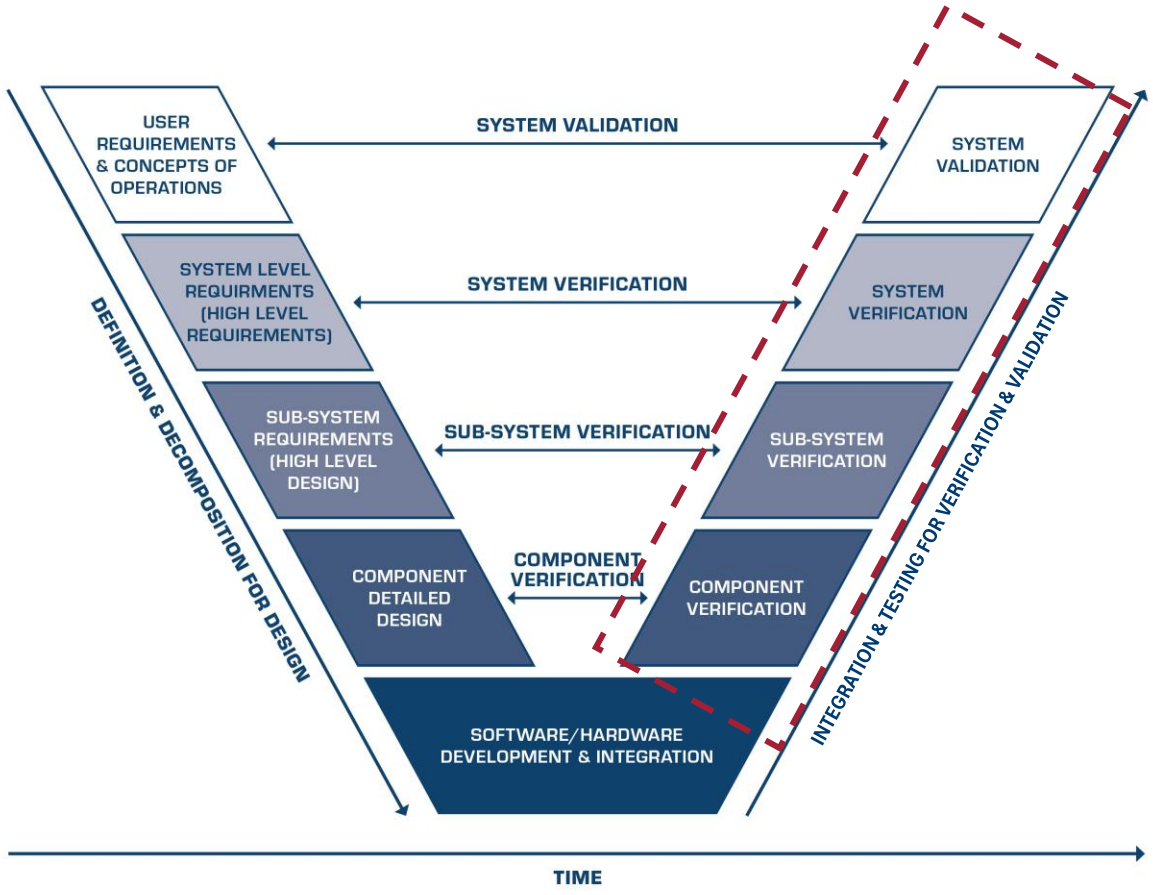
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VERIFICATION AND VALIDATION

MBSE BENEFITS

Verification and Validation

- Verification methods and approaches fundamentally linked to requirements
- Enabled tracking of verification status through integration and testing activities
- Focus on verification throughout design process
- Tools facilitate efficient reporting



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KEY TAKEAWAYS



Digital Engineering is not magic

- High effort for set up, usage and management
- Deliberate decision for entire project lifecycle
- Appropriate training and customisation



Design waits for no one

- Be flexible and adaptable in decision making
- Return to review information and update where possible
- Manage change appropriately



Avoid Sacrificing Quality

- Tailor rather than remove steps in standardised, best-practice processes



Consider Spiral Methodologies

- Improve speed to capability
- Parallel efforts, test & evaluation
- Manage critical path