



TIDEWATER ASNE

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DIRECTORATE (NAVSEA 05)

17 March 2021



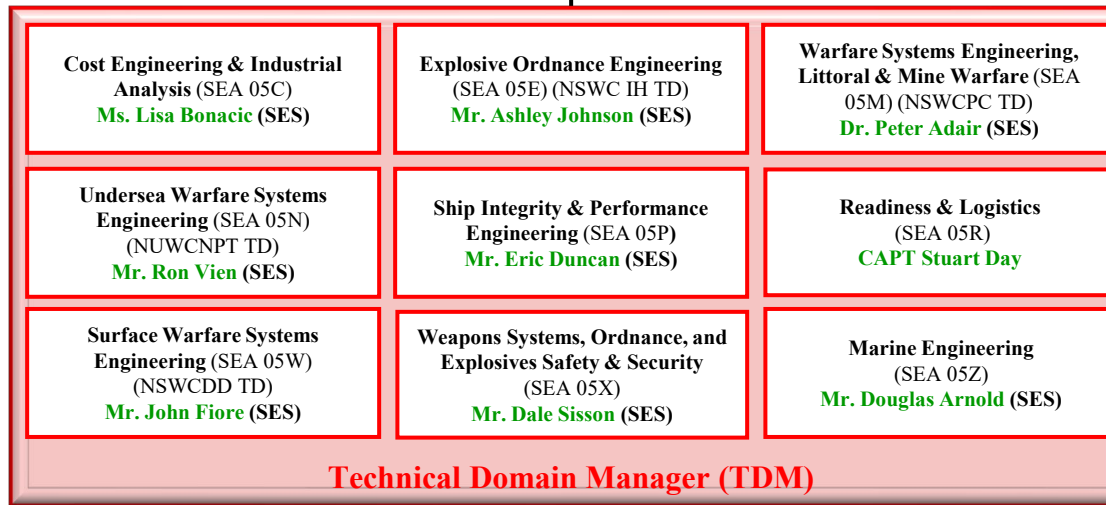
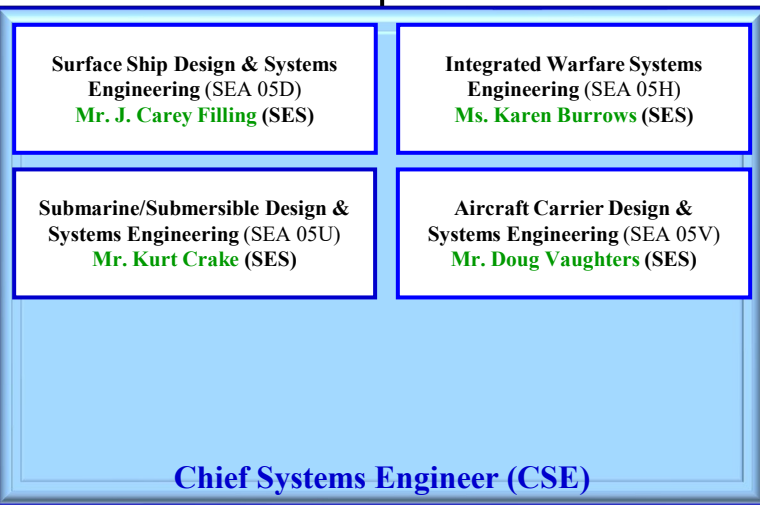
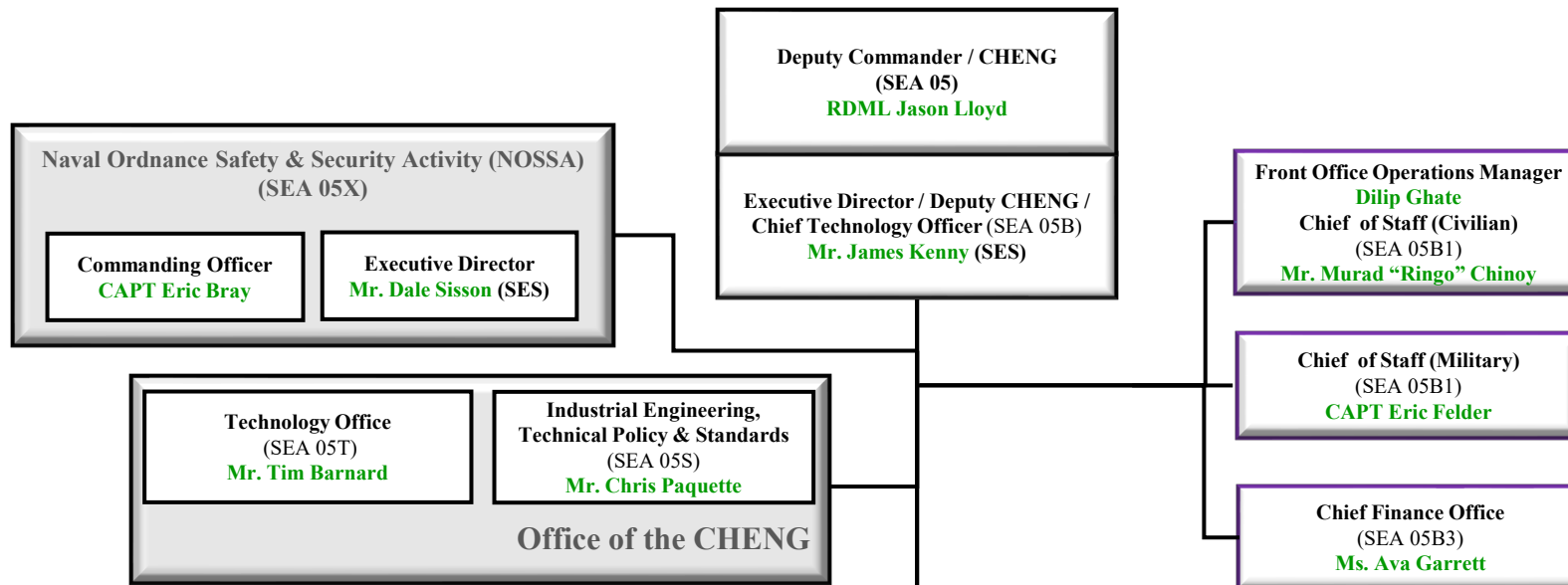
Campaign Plan to Expand the Advantage 3.0 Strategic Framework



ONE NAVSEA
THE FORCE BEHIND THE FLEET

Technically
Competent Leaders
and Innovators





NAVSEA 05 - What we Do

Technical Domain Managers Focused on Major Systems / Components

COST ENGINEERING & INDUSTRIAL ANALYSIS **SEA 05C**

Navy's technical authority for cost engineering and industrial base analysis for ships, ship-related combat systems, and weapons.

WARFARE SYSTEMS ENGINEERING

SEA 05E (EXPLOSIVE ORDNANCE)

SEA 05M (LITTORAL & MINE)

SEA 05N (UNDERSEA)

SEA 05W (SURFACE)

Navy's technical authority in the field of warfare systems engineering, combat systems, and weapons

SHIP INTEGRITY & PERFORMANCE ENGINEERING **SEA 05P**

Navy's technical authority for signatures and susceptibility, vulnerability, shock, damage control and firefighting, ChemBio defense, ship and submarine structural integrity, structural deep submergence systems, corrosion control, metallic and non-metallic materials, welding, fuels and lubricants, environmental protection, weights, stability, hydrodynamics, and arrangements.

MARINE ENGINEERING

SEA 05Z

Navy's technical authority for machinery systems for submarines, surface ships, and aircraft carriers, including propulsion, electrical, and auxiliary systems.

READINESS & LOGISTICS

SEA 05R

Delivers product support through people, processes, and technologies to enable affordable Fleet readiness.

WEAPONS & ORDNANCE SAFETY

SEA 05X

Navy's technical authority for Weapon System and Explosives Safety ashore and afloat

Chief Systems Engineers Focused on Ship Types / Classes

SURFACE SHIP DESIGN & SYSTEMS ENGINEERING

SEA 05D

Navy's technical authority for naval surface ship design and total ship integration, ship synthesis and ship design tools, naval ship acquisition systems engineering, ship requirements definition, ship concept development, and ship concept validation.

SUBMARINE/SUBMERSIBLE DESIGN & SYSTEMS ENGINEERING

SEA 05U

Navy's technical authority for acquisition and in-service submarine, submersible, and submarine rescue design and systems in partnership with nuclear propulsion authority NAVSEA 08 and the Strategic Systems Program.

AIRCRAFT CARRIER DESIGN AND SYSTEMS ENGINEERING

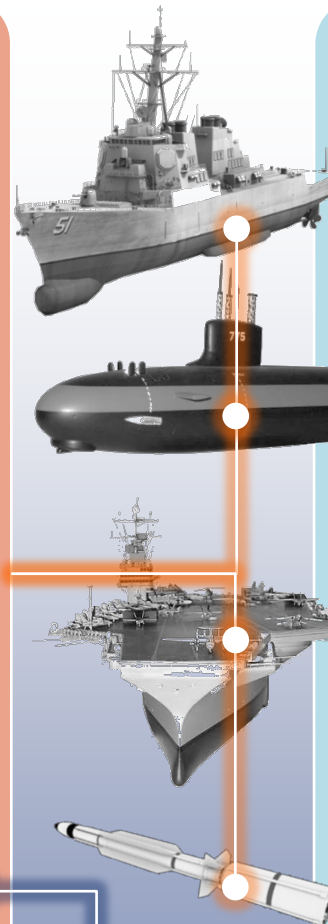
SEA 05V

Navy's technical authority for aircraft carrier research and development, design, planning, construction, overhaul, in-service engineering, inactivation, testing, and emergent technical issues.

INTEGRATED WARFARE SYSTEMS ENGINEERING

SEA 05H

Navy's technical authority for ship warfare systems and interior communications and related human systems integration and test & evaluation including interoperability.



INDUSTRIAL ENG, TECH POLICY & STANDARDS (SEA 05S)

Develops and maintains NAVSEA technical policy guidance and standards, and provides governance for technical authority.

TECHNOLOGY OFFICE (SEA 05T)

Serves as the program authority for assigned research & development programs.

Technical Authority is the **authority, responsibility, and accountability** to establish, monitor, and approve **technical standards, tools, and processes** in conformance to higher authority policy, requirements, architectures and standards.

Technical Authority Functions

- Support Program Managers and the Fleet by providing best value engineering and technical products
- Provide technically feasible options and identify associated risks
- Remain Independent of programmatic authority
- Provide checks and balances to ensure safety, reliability, and interoperability with accurate cost estimates

TA Role in Evaluating Advanced Technology

- Navy has a long history of full-scale prototype land based test facilities
 - USS NAUTILUS (first nuclear submarine) engine room was built in the Idaho desert and tested prior to building the boat
 - Multiple ship classes use full-scale land based test facilities to evaluate the performance of systems and train crews
 - Most recently, ZUMWALT, ARLEIGH BURKE, and COLUMBIA classes
- Risk Reduction via Proactive Management
 - Actively manage and lead component system development.
 - The prototypical components have gone through preliminary, concept, and detailed design reviews
 - Direct oversight by technical authority during production and testing
- Risk Reduction via system and component modeling and testing:
 - Developmental Testing - Mockups, test beds
 - Engineering design models (hardware and software) on numerous components with significant testing and technical document validation
 - System Protection models – physical and digital
 - Evaluate integrated systems in a ship prototypical environment
 - Test sites utilized in greater complexity and scale over time
- Full-scale test sites offer an opportunity to test equipment and software upgrades or troubleshoot problems as the fleet ages in a safe environment

TA Role in Additive Manufacturing

- **Tech Authority**

- Develop Technical publications for repeatable AM processes
- Release Guidance describing AM approval processes
- Collaborate with industrial base
- *To Date: Tech Pub for metal AM process; Over 500 Approved parts; 230 TDPs available to fleet*

- **Afloat/Undersea Deployment**

- Explore how to deploy and integrate advanced/additive manufacturing equipment surface and subsurface
- Provide in-service engineering support
- *Advanced manufacturing equipment installations on 8 ships; 4 submarines deployed with AM; over 4000 parts printed afloat; 50+ Sailors trained*

- **Digital Integration**

- Identify file securing/transiting/storage solutions, including parts repository
- 'Apollo Lab': Surface fleet able to reach back electronically to CONUS engineering support
- Explore topology optimization and generative design
- Development of digital manufacturing enclave to enable networked AM equipment – shoreside demo in CY2021

- **Supply System integration**

- Incorporate components into logistics databases to enable part provisioning, tracking and 'buy or print' decisions
- *81 AM parts have NSNs; initial cost avoidance and lead time metrics generated for afloat components*

- **Innovation challenges**

- Leverage HacktheMachine to cost-effectively find AM solutions



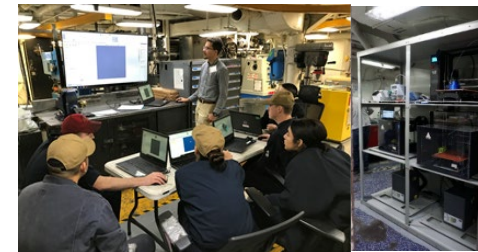
DSO valve installed on CVN-75



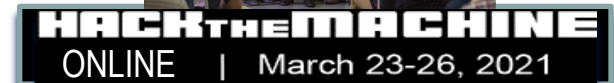
Component designed with lattice structure



Example qualification build plate



LEFT: AM training on-board CVN-71. RIGHT: 3D printers on CVN-69

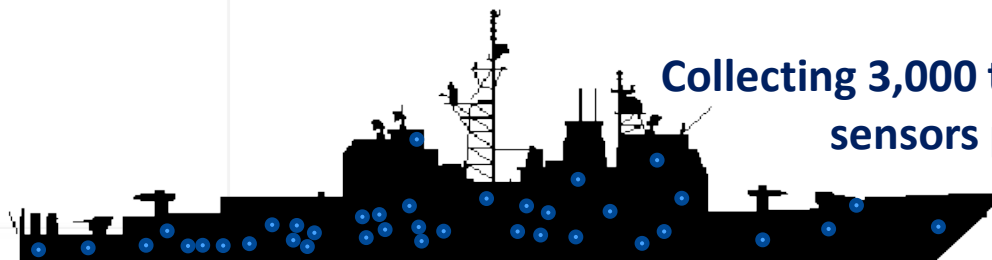


TA Role in Advanced Machinery – CBM+

Condition Based Maintenance + is a system that collects machinery condition data that is transmitted for shore analysis and scheduling of condition based maintenance

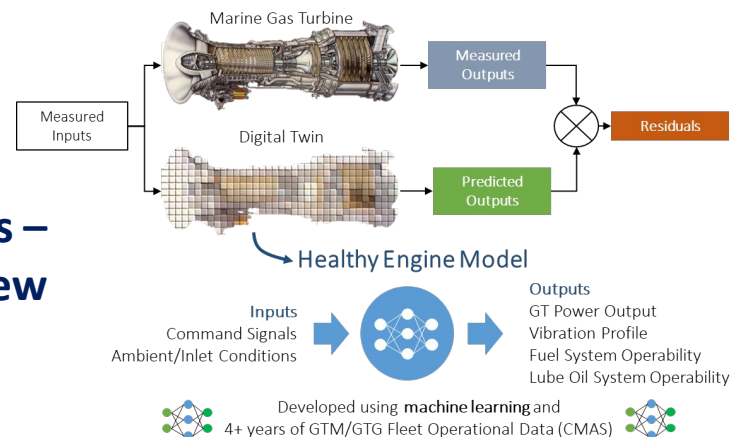


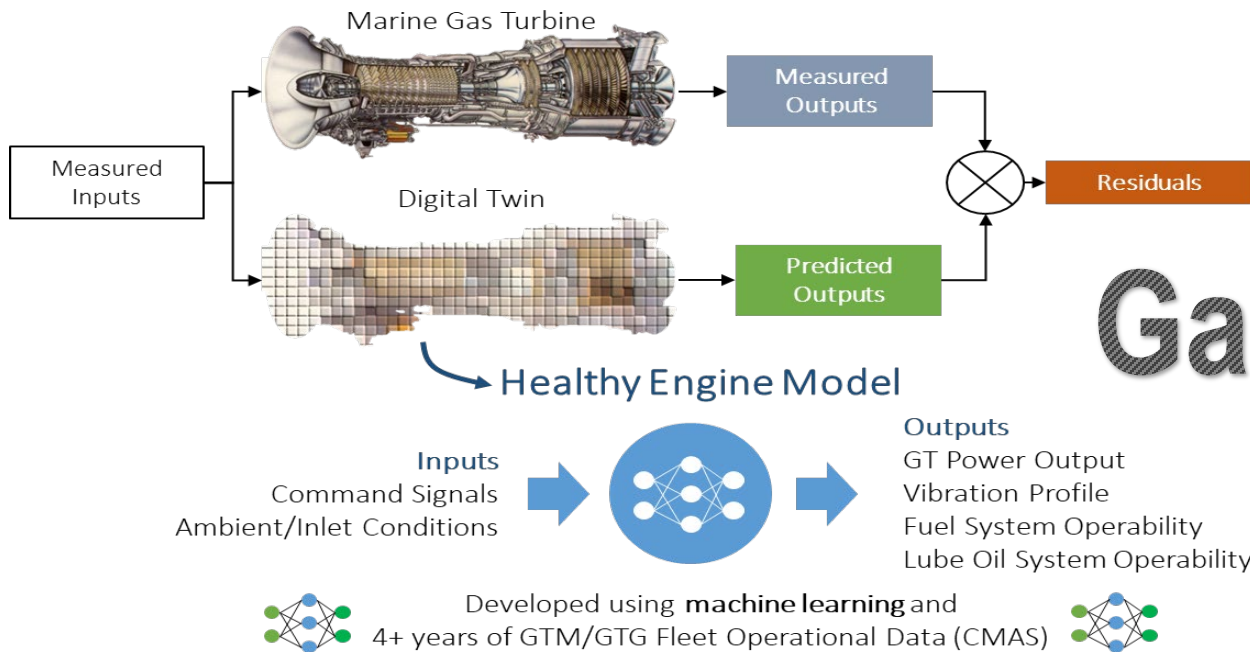
Installed on **92 of 177** surface ships across 5 surface ship classes: DDG-51 Class, CG-47 Class, LCS class, LPD-17 Class and LSD class



Collecting **3,000 to 5,000** sensors per ship

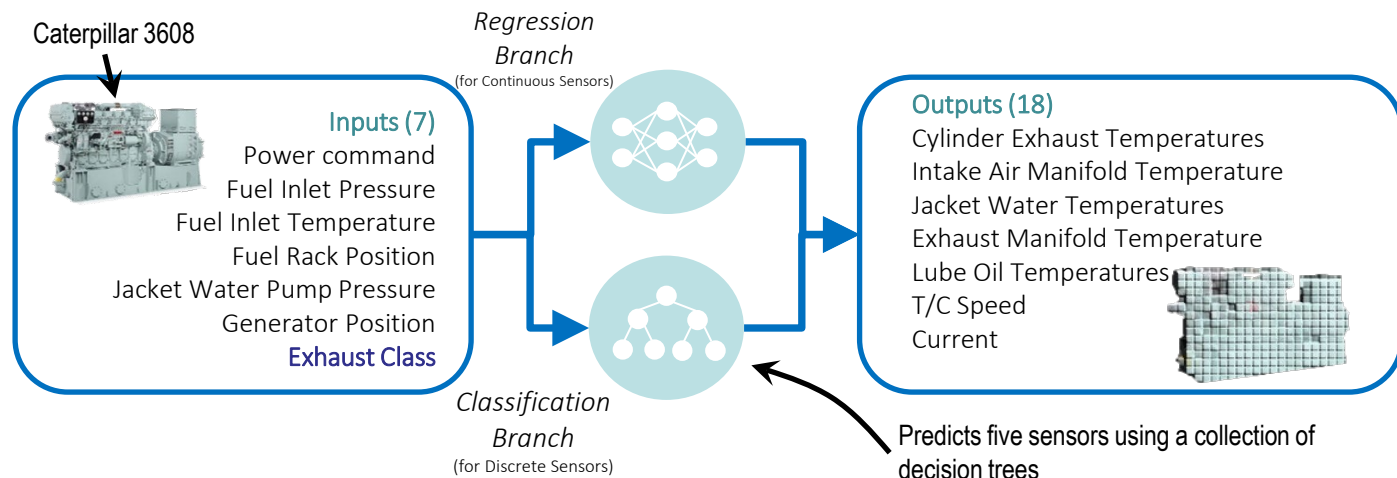
Digital Twin automates data analysis – Automatically flags deviations for review



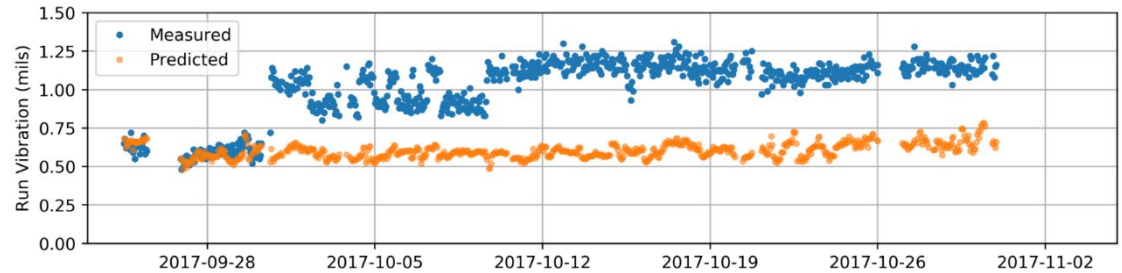
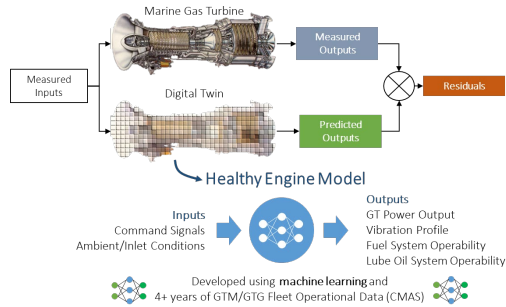


Gas Turbines

Diesels



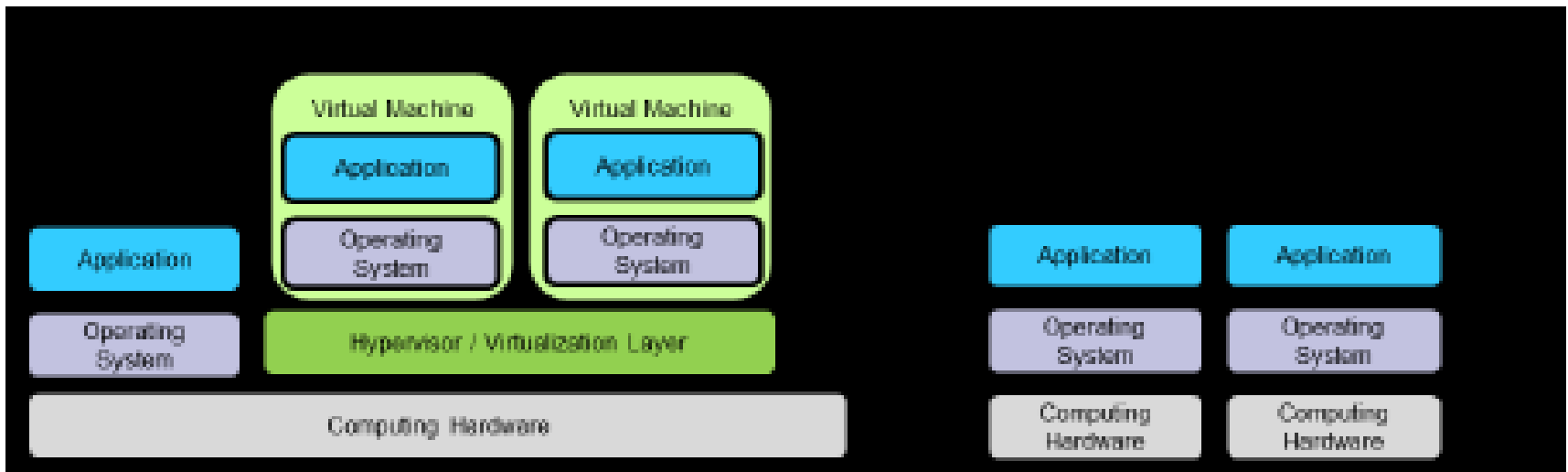
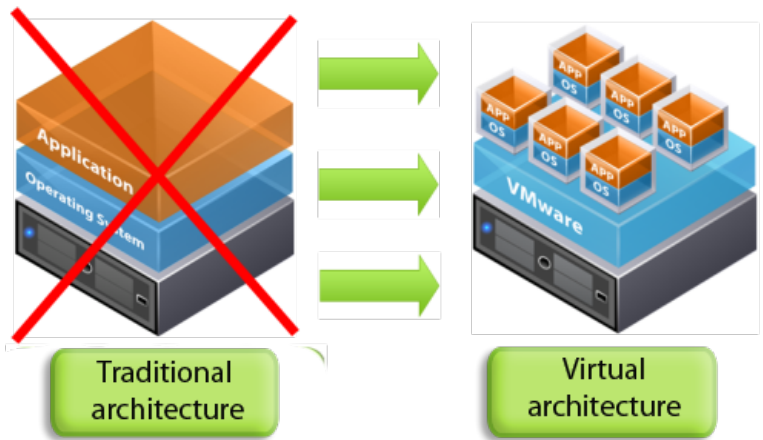
TA Role in Advanced Machinery – CBM+



Engine	Date	Problem	Detectable in Start Analysis	Detectable by HEM in trend	Detectable in GTM Dashboard	Faults not Observable	Insufficient Data
DDG 80 GTG NR3	11/26/2018	CO for bearing failure	✓				
DDG 82 GTM 1A	1/14/2019	CO for high vibes		✓	✓		
DDG 86 GTM 2B	6/2019	Trim balanced		✓	✓		
DDG 96 GTG NR3	8/28/2018	CO for strut wear	✓	✓			
DDG 96 GTM 2A	4/2/2018	Erroneous FMV position		✓			
DDG 102 GTG NR3	3/20/2018	Damaged bearing	✓				
DDG 104 GTG NR1	10/18/2018	Engine imbalance					✓
DDG 105 GTG NR3	8/20/2018	Failed LO pump					✓
DDG 107 GTM 1B	7/25/2018	Deteriorated starter				✓	
DDG 109 GTM 1A	4/12/2018	Loss of DFC		✓			
DDG 110 GTM 2A	7/2/2018	Accelerometer OOC			✓		
DDG 111 GTM 1A	12/5/2018	CO for high speed stall			✓		
DDG 112 GTM 1B	2/16/2018	VSV system repairs					✓
DDG 114 GTM 2A	3/5/2019	Uncommanded shutdown				✓	

64% OF UNSCHEDULED CHANGE-OUTS DETECTABLE BY DIGITAL TWIN

Virtualization – The next frontier



Remember

Technical Authority provides the checks and balances to ensure that quality products, that meet validated operational capability needs, are delivered to the Fleet

This supports all engineers working on NAVSEA ships and systems having clear standards as well as a path to seek clarification or propose an alternate standard to design, build, operate, maintain and modernize our ships and systems.



Questions?

empowered diversity

iteration over production

passionate leadership

warfighter-driven culture

open-minded

remove barriers

collaboration

solve problems

Athena

energy

embrace new ideas

high velocity learning

inoculate organizational antibodies



accelerators

ideas

fail fast

enthusiasm

think different

white space

open communication

progress over perfection

TANG

support

clear purpose

Crazy 8's

innovation

permission-less

open minded learning culture

challenge status quo

networked