Digitally connected solutions for empowering the modern Navy

The Connected Maintainer Environment

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Overview

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- Problem Statement
- Connected Maintainer Environment
- Features
- Benefits
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- Examples
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- Conclusion
- Q/A

Trey Taylor

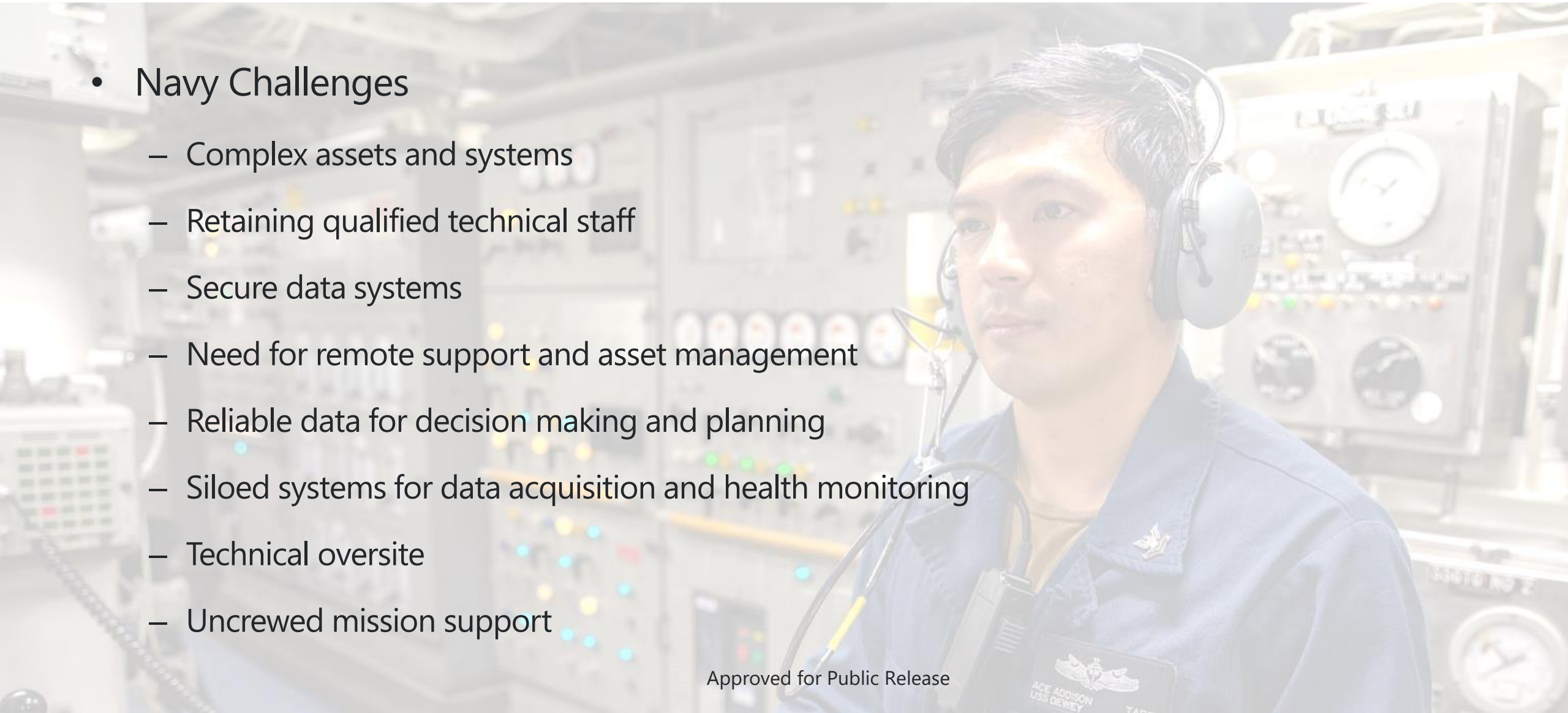
Credentials

- 20 years experience building software experiences
- 15 years experience in Maritime and Power Generation
- Leads FMD's digital solutions product development group
- Technology advisor, innovator, strategist and SME

Field Expertise

- Software development
- Data analytics & AI
- Business intelligence
- Technology introduction
- Digital media
- Extended Reality
- Robotics

Problem Statement



- Navy Challenges
  - Complex assets and systems
  - Retaining qualified technical staff
  - Secure data systems
  - Need for remote support and asset management
  - Reliable data for decision making and planning
  - Siloed systems for data acquisition and health monitoring
  - Technical oversite
  - Uncrewed mission support

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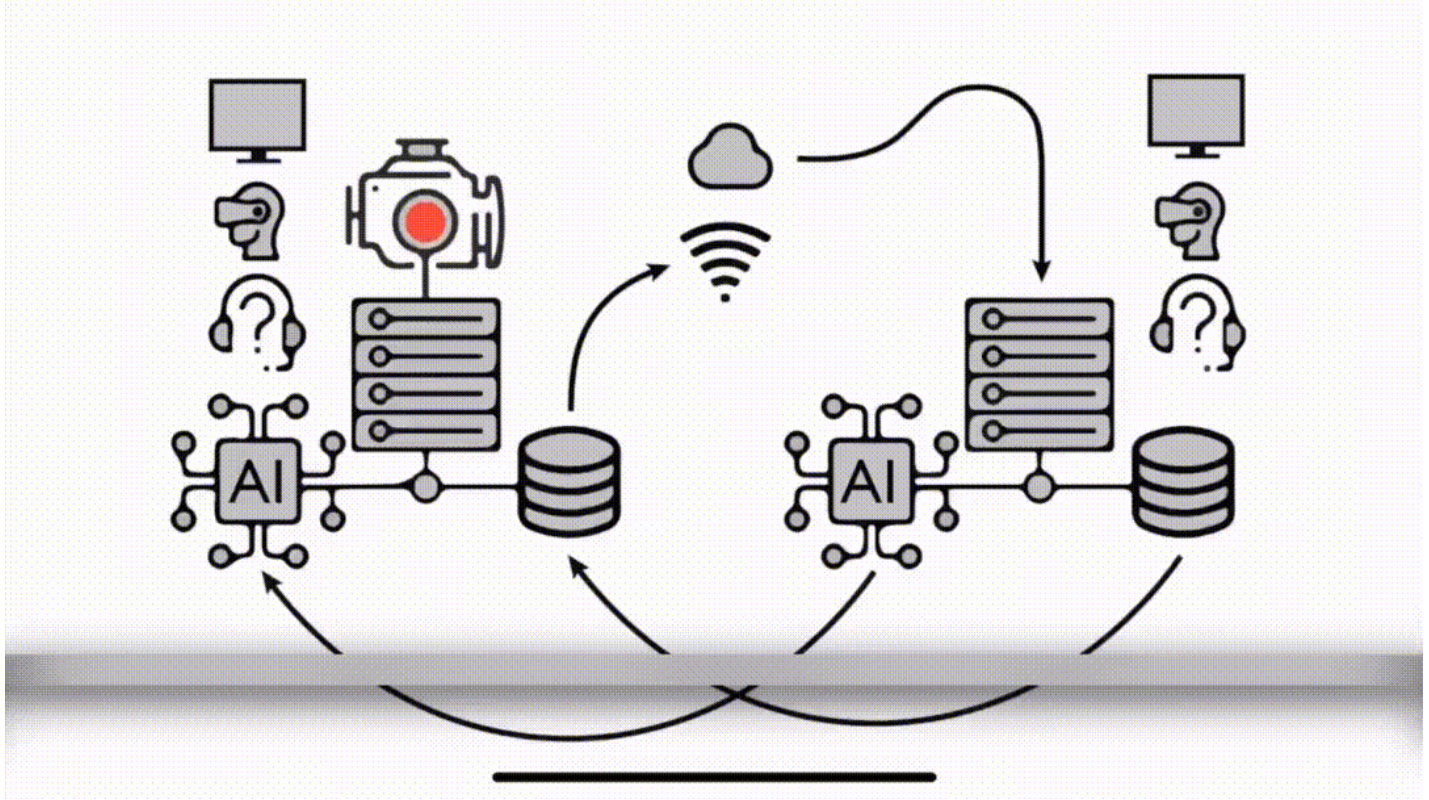
Introduction to
Connected Maintainer Environment (CME)

A digitally augmented machinery space comprised of capital equipment, control systems, automation equipment, data acquisition systems, predictive maintenance software, and extended reality (XR) interfaces to support operators and maintainers.



The Functional Areas of a
Connected Maintainer Environment

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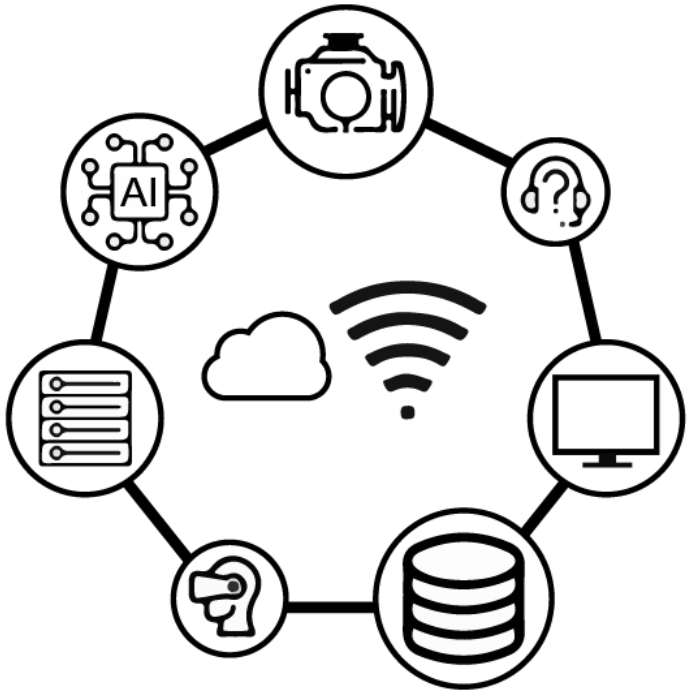
- On-premise ingest and historian
- AI/ML algorithms, prognostic calculations, and predictive health monitoring
- Updatable database of standard work packages
- “Media” Work packages
- MR – Augment Reality, Virtual Reality instructions
- On-demand insights across a class and/or fleet of vessels
- Secure communication capability
- External aggregation services
- Automated systems
- Central repository publishing tools
- Microservices



Primary Benefits

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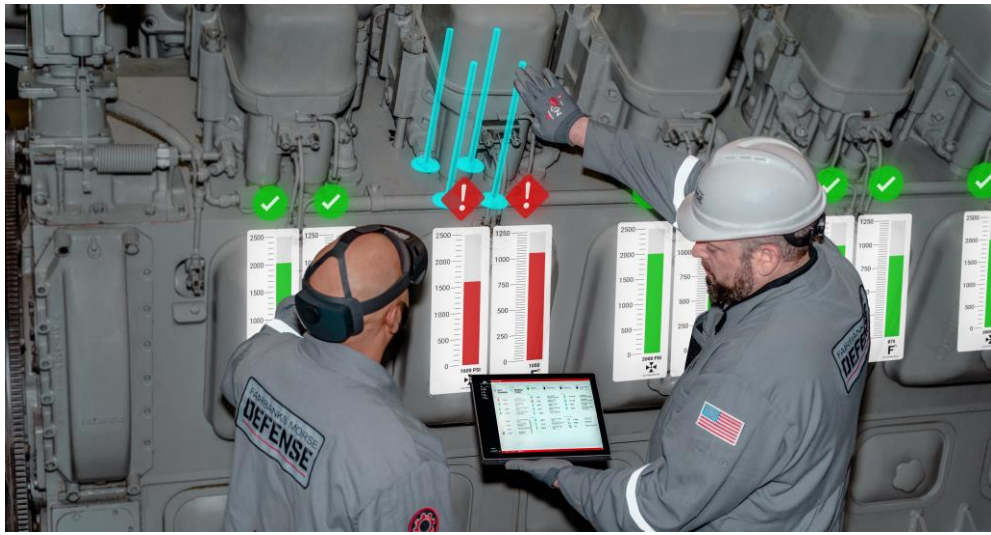
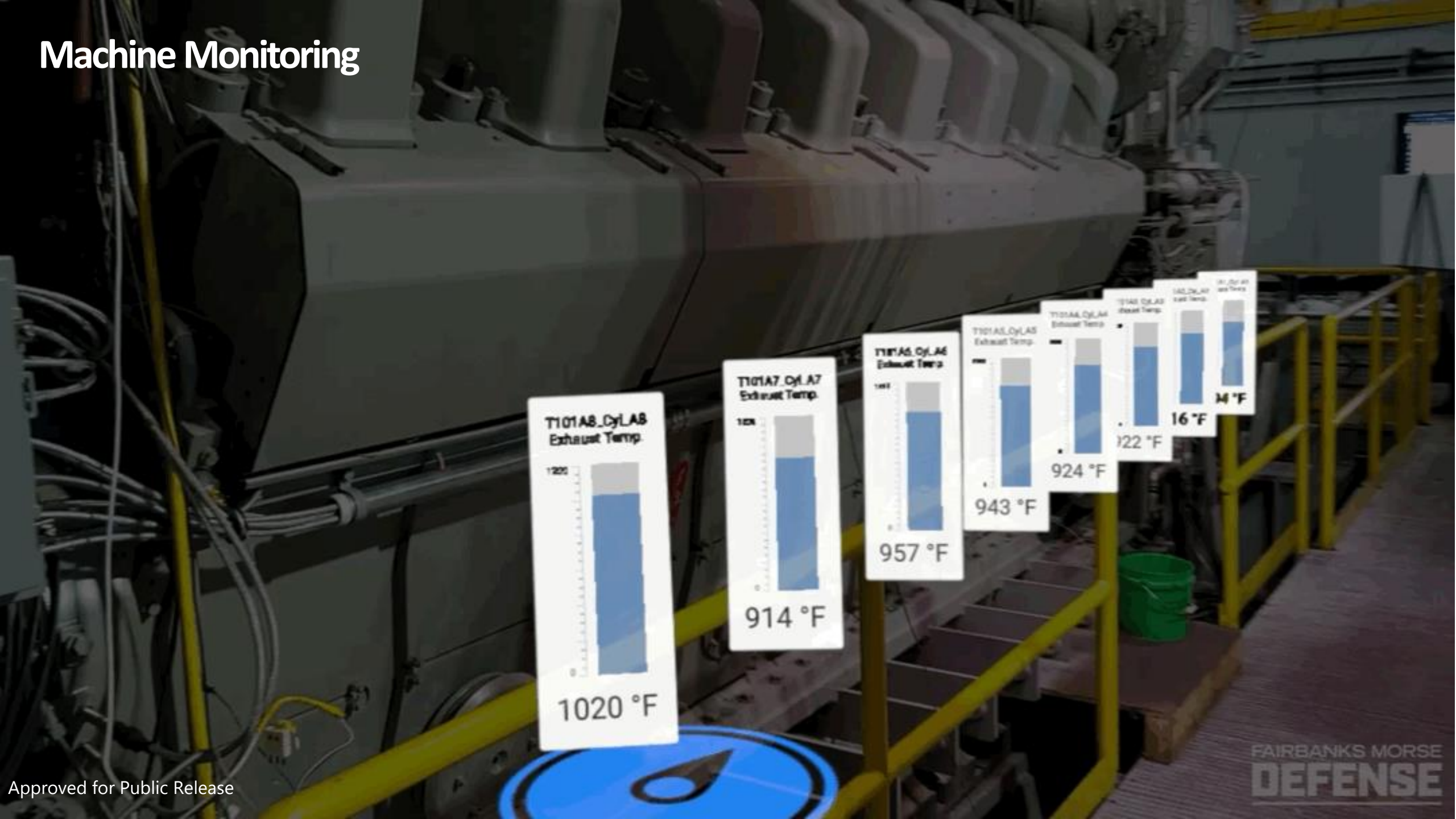
- Instantly leverage remote expertise
- Reduce mobilizations and travel costs
- Optional private and secure connectivity with LiFi
- Increase operational availability (Ao)
- Improve first time fix rate
- Train personnel remotely in an intuitive augmented reality environment
- Workforce multiplication by leveraging senior personnel's expertise

Secondary Benefits

- Equipment life statistics
- Training and staffing resource evaluation
- Data mining provides insight for the SIOP process and future platform development
- Consumption data for depots, Defense Logistics Agency (DLA), and fleet management
  - Material acquisition
  - Demand planning for the industrial base
  - Yard planning resources



Machine Monitoring



Work Instructions

ISSUES
(Machine Monitoring)

FM ONBOARD

Approved for Public Release

RESULTS
(Training & Fixing)

Training Content

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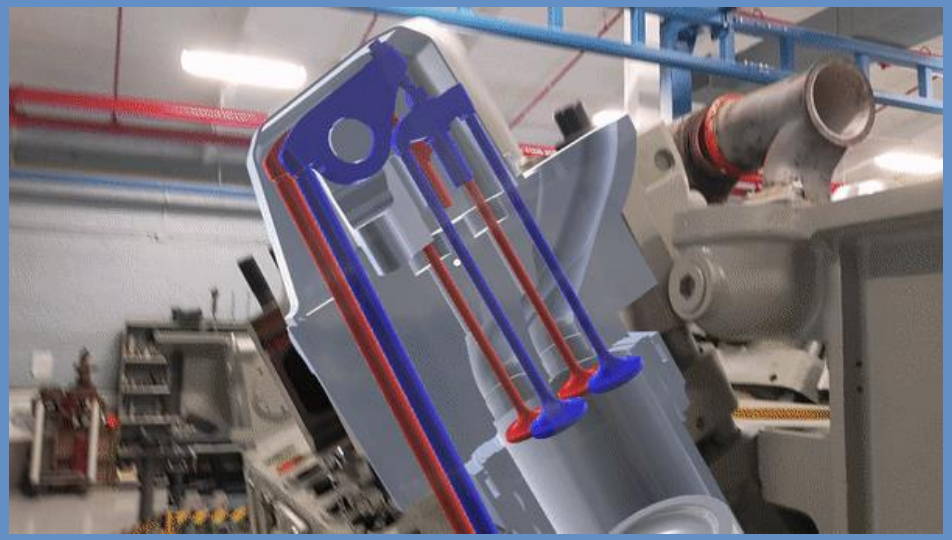
- Full systems and sub assembly
  - A-School lessons/familiarity
  - CG Academy lessons/Student Engineer training
- Simulated casualties
  - Run simulations in Augmented Reality with no risk to personnel or equipment
- Mixed reality training mixes physical and digital assets
  - Mount internal components on real assets
  - Pre-arrival training/familiarization with assets



Connected Maintainer Environment in Practice

- ✓ AI identifies possible valve lash issue
- ✓ XR and PC based software alerted
- ✓ Historic data provided
- ✓ Work instruction offered for repair
- ✓ Worksteps followed
- ✓ Technician requests remote support
- ✓ Additional information provided
- ✓ OQE's captured in repair process
- ✓ AI Validates repair on restart

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Risk Mitigation

Security Device Software Comms	• UIDs at the hardware level • Signed software • Li/Fi and private 5G networks
XR Devices Computing Power Field of View Secure Comms	• 3Gen devices improving • Alternatives to wave guide • Multiple network drivers
Data Proprietary Data Systems Legacy systems	• Standard historians • Standalone sensors

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ONBOARD

WI-FI OUTPUT FROM 5G CASE

HOLOLENS-2 WITH WI-FI

PUBLIC CELLULAR NETWORK

PUBLIC CELLULAR CARRIER

ENCRYPTED

5G TRANSIT CASE W/ BATTERY

SECURE ETHERNET CONNECTION

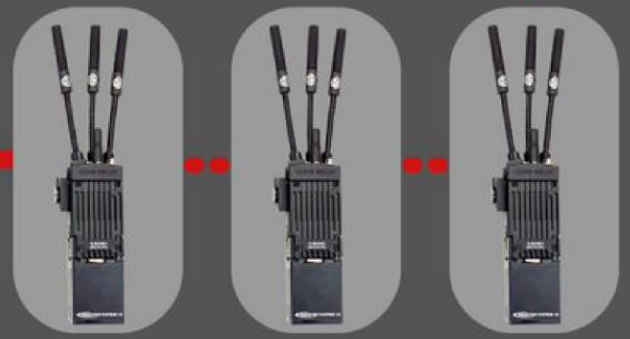
OPEN AIR

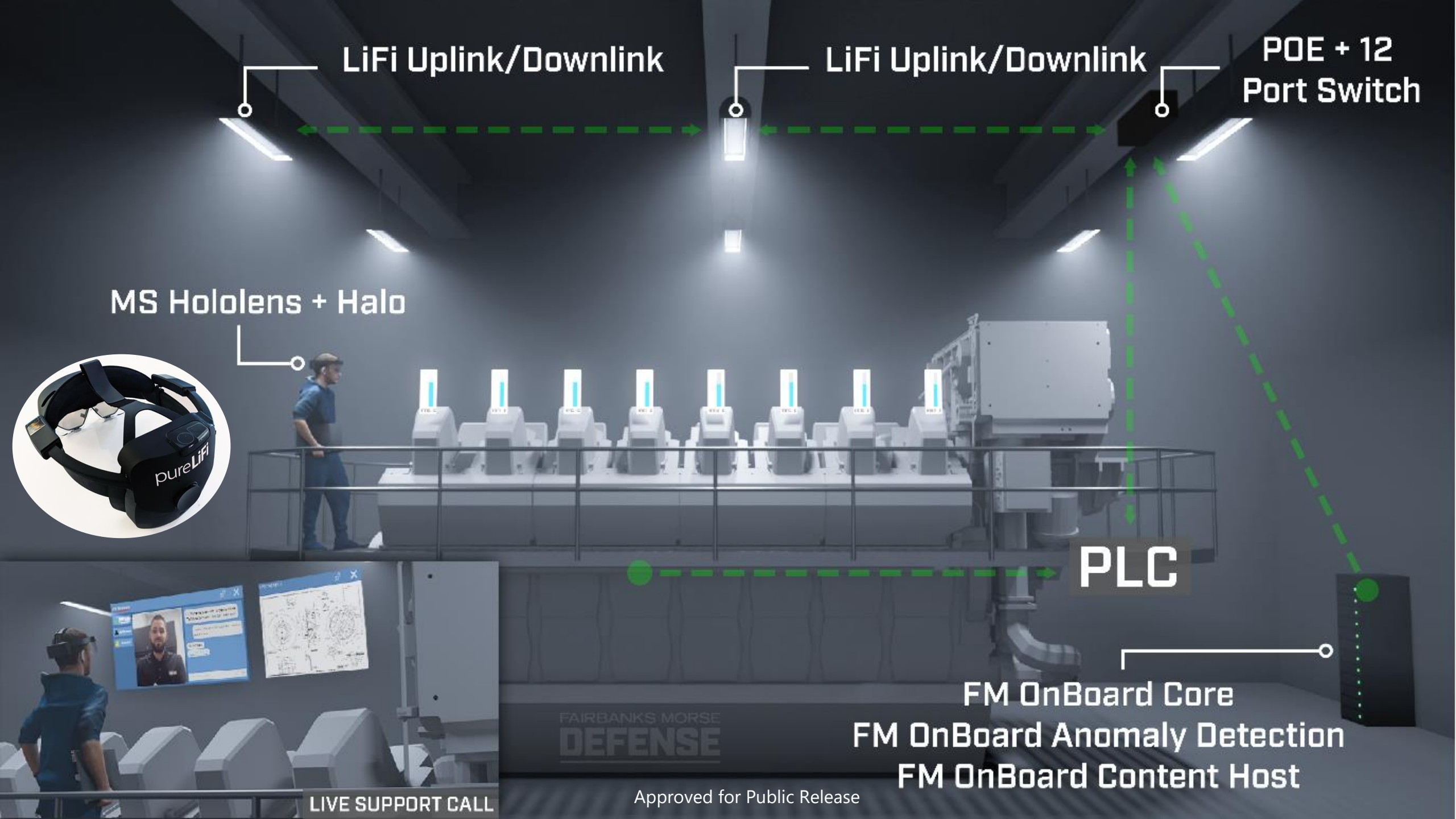
EXTENDED INTERIOR

SECURE LI-FI NETWORK

HOLOLENS-2 WITH WI-FI

SECURE ETHERNET CONNECTION





Conclusion

- FMD is leaning forward to revolutionize how the maintainer operates and performs their activities with equipment agnostic solutions.
- The connected maintainer environment is real and can be accomplished now.

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