



The Hess PHM Group

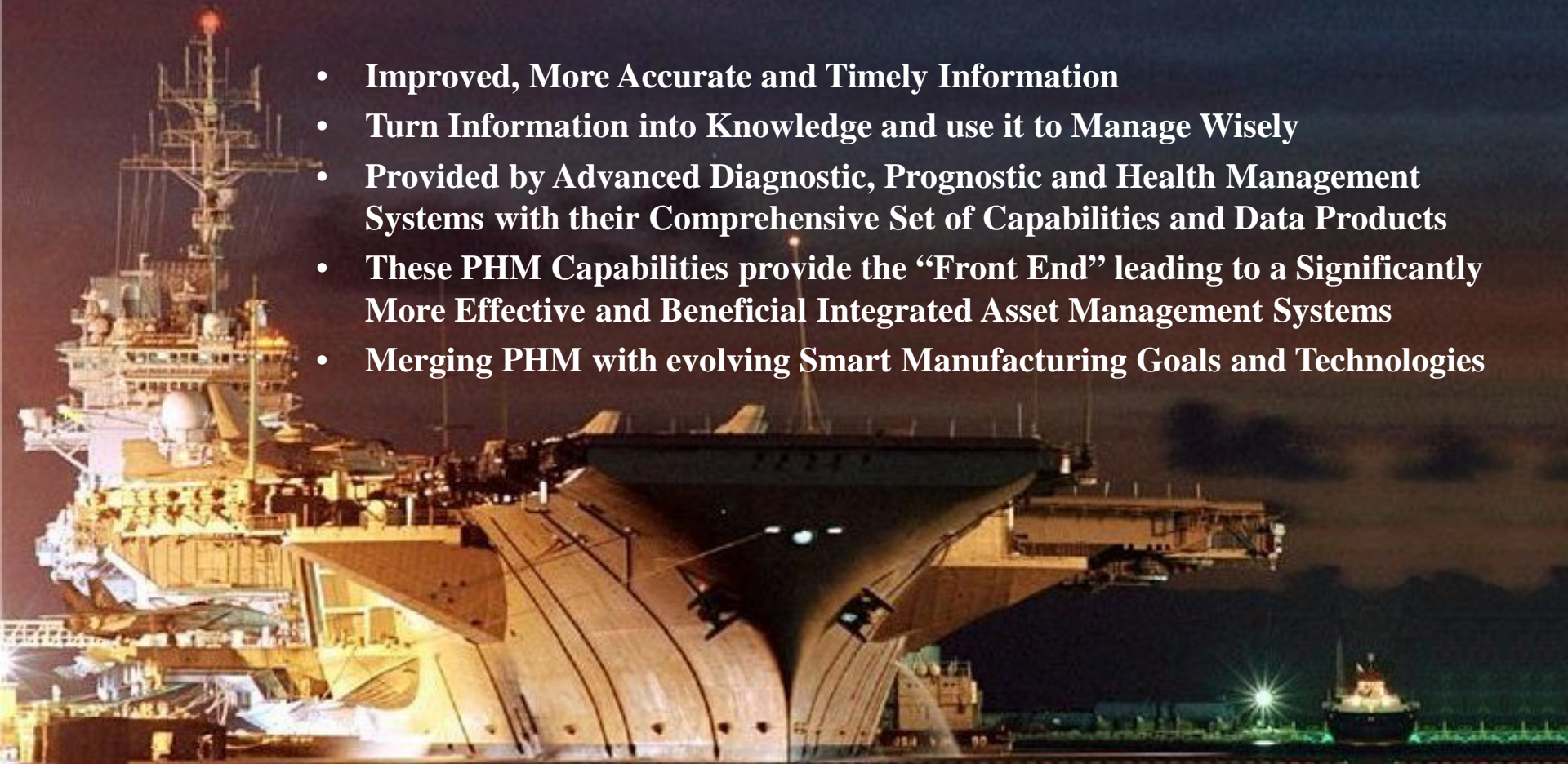
NIST Road mapping Workshop on Measurement Science for Prognostics and Health Management of Smart Manufacturing Systems

NIST Gaithersburg, MD
19-20 Nov 2014

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The Hess PHM Group
President of the PHM Society

Better Asset Management thru Improved Information on Actual Equipment Condition

- **Improved, More Accurate and Timely Information**
- **Turn Information into Knowledge and use it to Manage Wisely**
- **Provided by Advanced Diagnostic, Prognostic and Health Management Systems with their Comprehensive Set of Capabilities and Data Products**
- **These PHM Capabilities provide the “Front End” leading to a Significantly More Effective and Beneficial Integrated Asset Management Systems**
- **Merging PHM with evolving Smart Manufacturing Goals and Technologies**



What?

A set of capabilities and information products – mixed technologies applied for the field of PHM

Why?

Turning Data and Health State into Information then Knowledge and then having the Wisdom to do something constructive with it

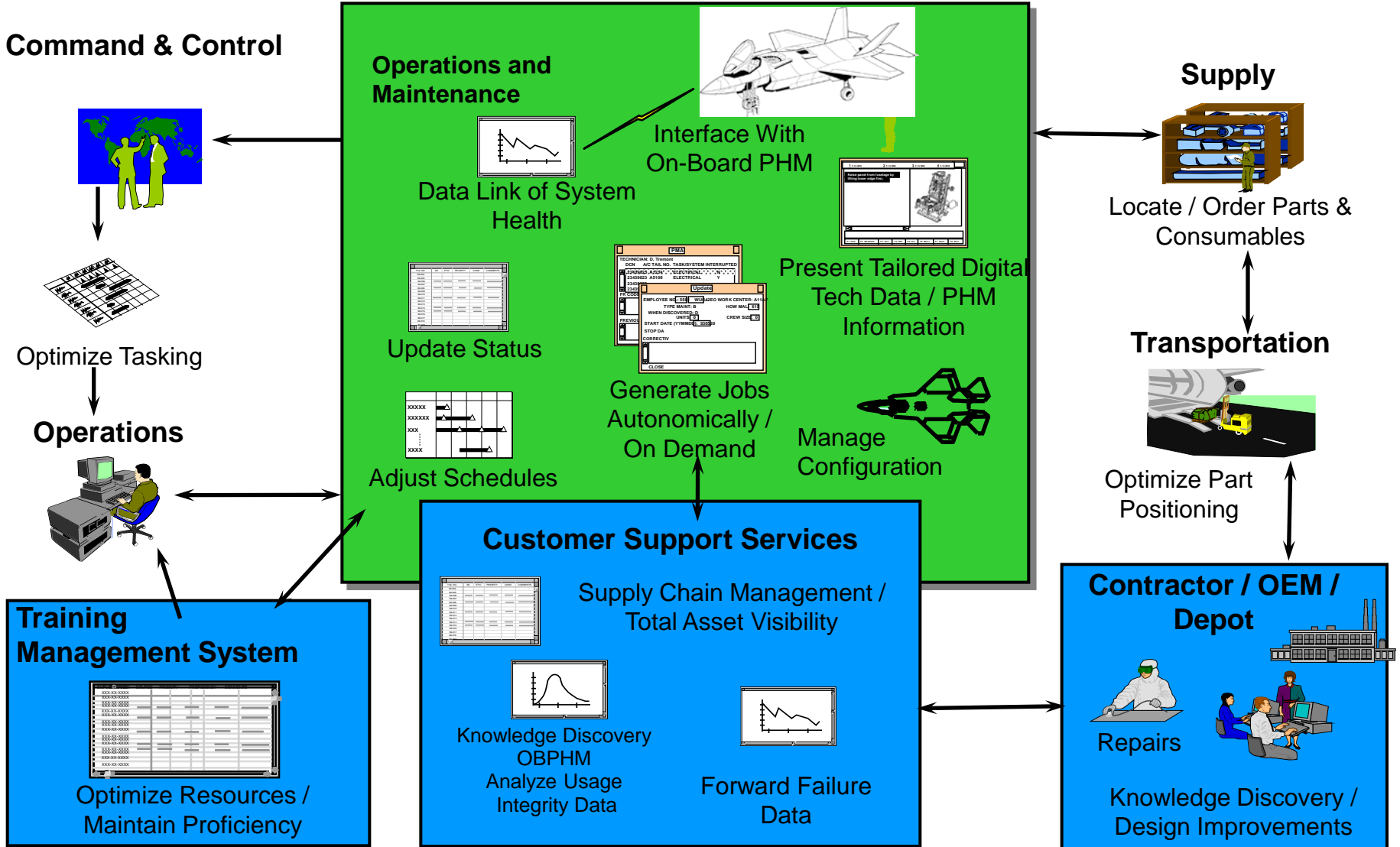
Need to Positively Impact Availability and Overall Enterprise Costs
“ Do something that the “boardroom cares about”

“Need to Understand the Why before Defining the What”

Question of the Day

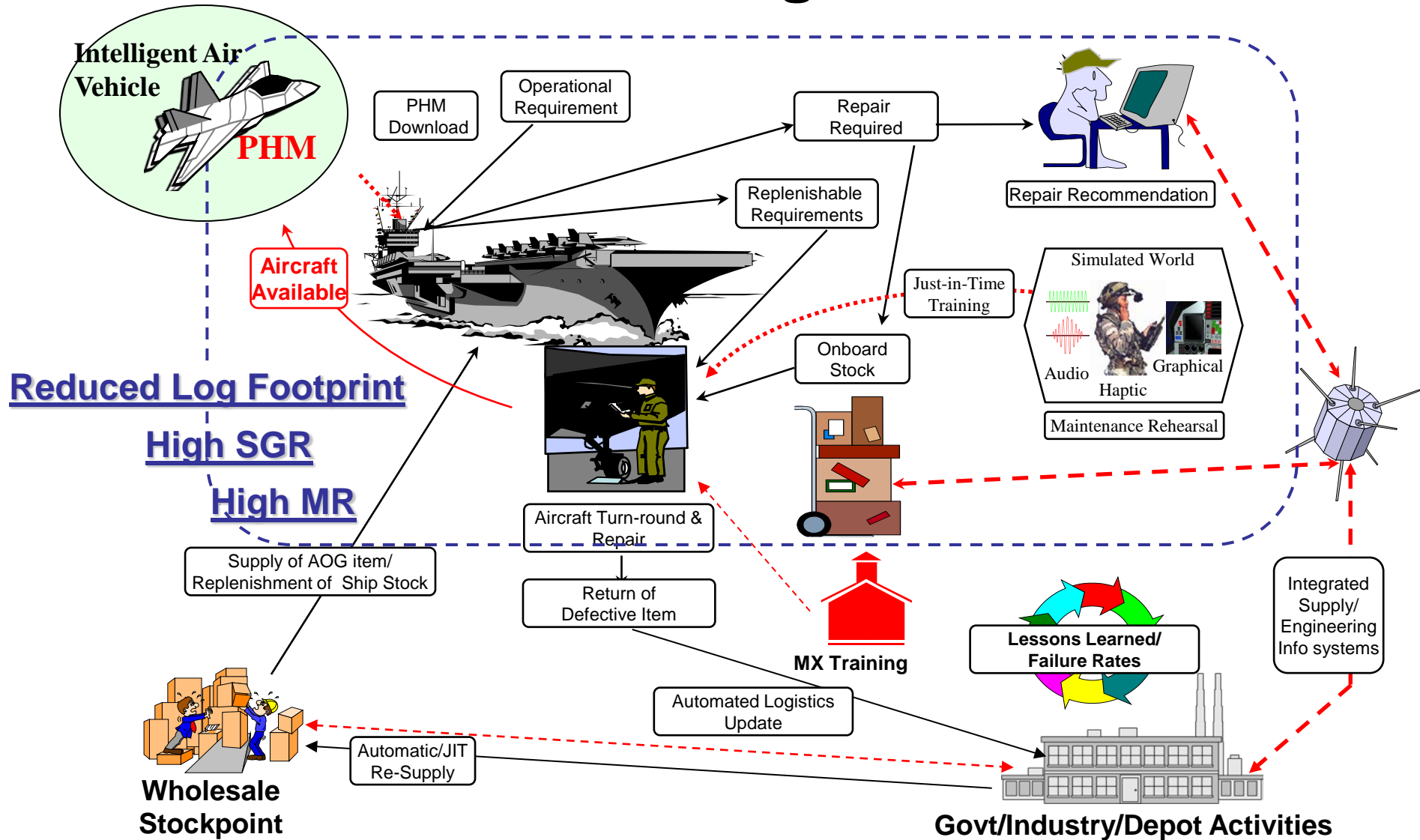
How can PHM be used to best support the goals of “Smart Manufacturing” from an Enterprise-wide perspective?

Distributed Logistics Information System Facilitates Today's Advanced Logistic Concepts



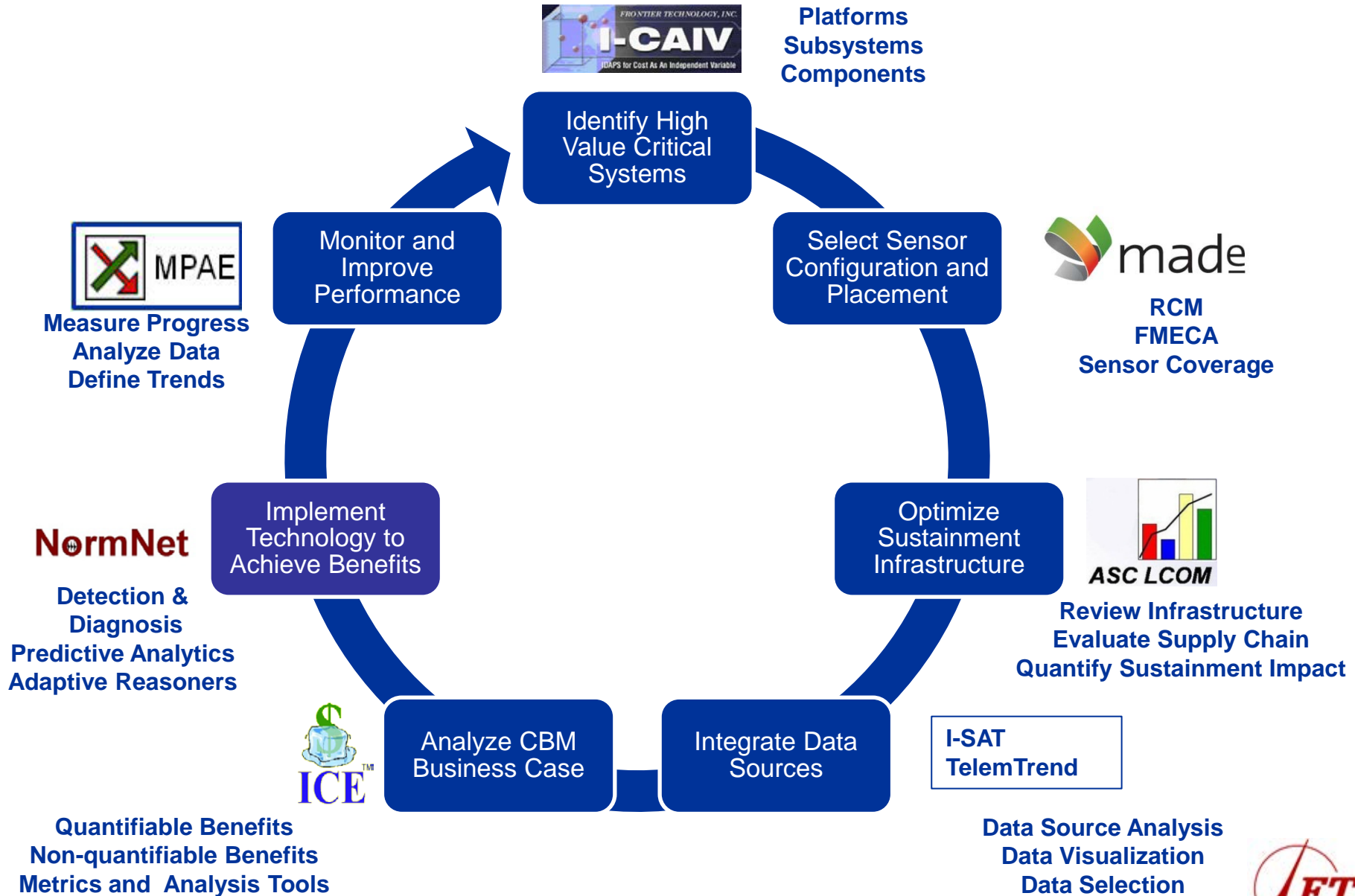


PHM Is the Air Vehicle Enabler of the Autonomic Logistics Structure



Managing CBM+

Empowering Clients Through Data Driven Decisions





Some Thoughts for this NIST Workshop

- PHM as a Design Attribute
 - PHM capabilities must be part of the Overall System Design Process and its many Trade Studies, same as weight, cost, performance, etc.
 - Paradigm shift to use PHM capabilities and life long usage data to reduce weight, costs, redundancy out of the platform design, e.g., F404 Fan Disk extra weight
- Using Manufacturing, “Green Run”, Qualification, Depot, Maintenance Data
 - Keep and use later with PHM for enhanced troubleshoot, fleet problems, design improvements, e.g., F402 Fan Blade Stall – hand finishing example
- Enterprise-wide Big Data Perspective – Analytic Tools Available
 - Ability to see across various data bases and info sources
 - Enabling better business decisions, e.g., SAS truck driver safety example
- Many System and Enterprise Integration Challenges
 - Including Human “buy-in” at all levels
- All Industry Sectors (having large and expensive assets) warrant some PHM and the associated benefits



Some Thoughts for this NIST Workshop (2)

- Embedded Sensors and wire runs during the Manufacturing Process
 - 3-D Printing or other New Technologies Enabled
- Manufacture in Energy Harvesting Devices to Power Embedded Sensor or other Systems
 - Smart Self-powered components
 - Particular useful for Structure Health Monitoring
- Improved Corrosion Health Management is a Huge Benefit Area
 - Embedded corrosion sensors and health assessment analytics
 - Integrated corrosion barrier Coating and degradation assessment
- Used of Nano-technologies for sensing
 - Surface mounted or embedded during manufacturing
- Aggressive used of PHM on critical machinery that can stop the manufacturing process
 - PHM for Robotics
- PHM for the manufacturing machines, the processes, the operators, their training and their “habits”