

MAINTAINING UNMAINTAINABLE SYSTEMS

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What is an “Unmaintainable System”?



System Health Management Perspective

- **The immune system** protects the body against disease or other potentially damaging foreign bodies. When functioning properly, the immune system identifies and attacks a variety of threats, including viruses, bacteria and parasites, while distinguishing them from the body's own healthy tissue.
- **The self-adaptive health management system** is integrated with vehicle control functions to provide autonomous, real-time, self-adaptive control and optimization to extend vehicle operation and enhance mission completion and/or safety, in the presence of component or system degradation.

“Created System”



Inherent Self-protection mechanisms

- Over time, system degrades with age or exposure to damaging environment.
- System's inherent sensing mechanisms monitor system health.
- System's self-healing is supplemented with changes in system operation & maintenance.

“Engineered System”



“Autonomous Systems” are here to stay!



Autonomous Systems Require “Health-Ready Components”

SURFACE VEHICLE AND AEROSPACE RECOMMENDED PRACTICE

JA6268: DESIGN & RUN-TIME
INFORMATION EXCHANGE FOR
HEALTH-READY COMPONENTS

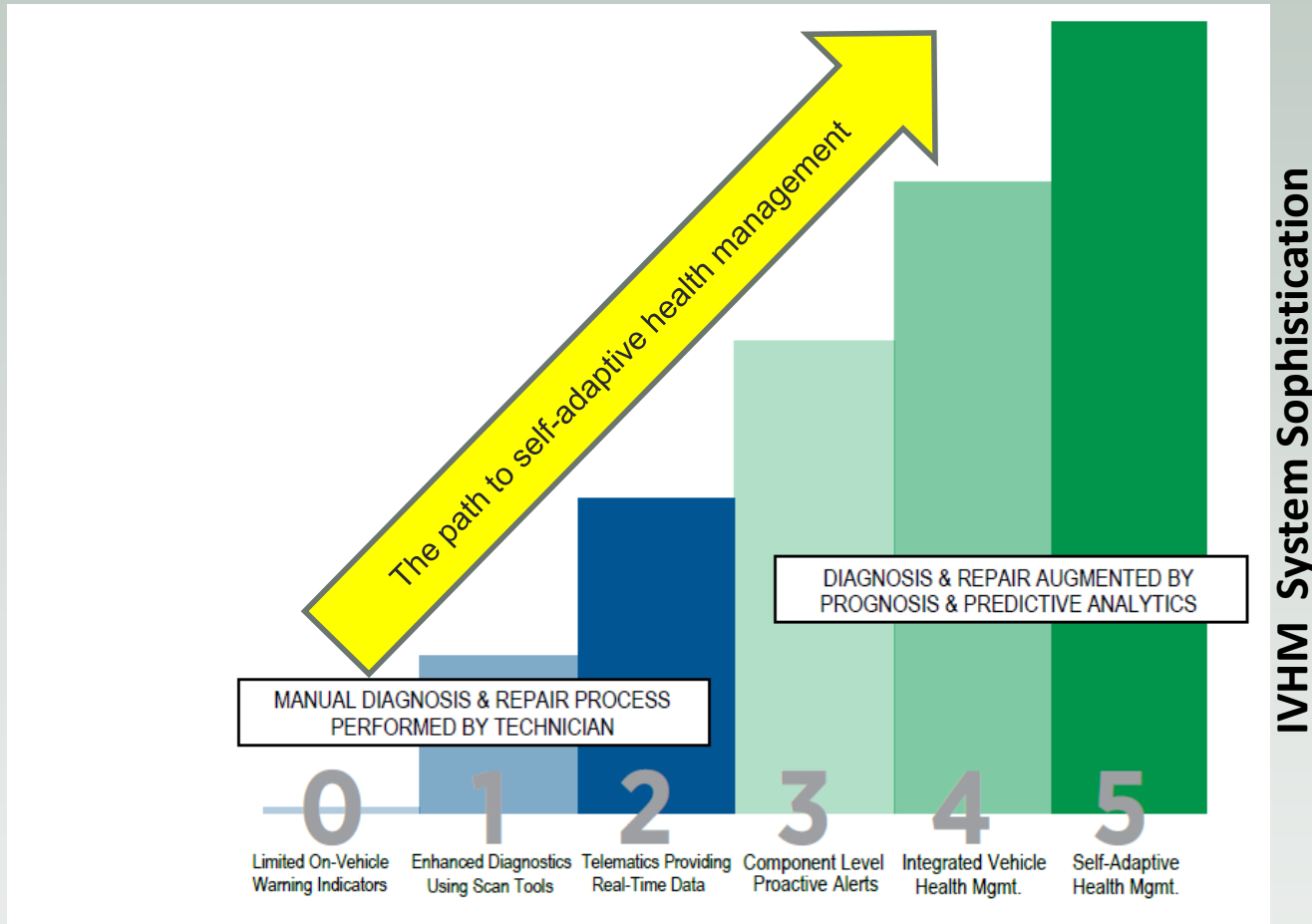
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- “**Health-ready components**” are supplier-provided components or subsystems which have been augmented to monitor and report their own health or those where the supplier provides sufficient information to accurately assess the component’s health via a higher-level system on the vehicle.
- JA6268 provides a methodology to **characterize or expose the inherent “health-ready” functions** of components, subsystems or systems.
- **JA6268 defines a six level IVHM classification system** ranging from Level 0 (indicator light alerts) to Level 5 (self-adaptive health management).



<https://www.sae-itc.com/case-study/unlocking-potential-ivhm-technology>

SAE IVHM Capability Levels



SAE IVHM Capability Level

Takeaways

1. As the human body defends itself against damaging foreign bodies through its immune system, engineered systems require an inherent health management system to monitor and prevent equipment failures.
2. Complex, autonomous, engineered systems require “health-ready” components to facilitate self-adaptive health management.
3. The SAE JA6268 methodology can be used to specify health-ready requirements for new systems, and establish health-ready capability levels and growth path toward self-adaptive health management.