MAINTAINING UNMAINTAINABLE SYSTEMS

SAE 2018 Aerospace Standards Summit, October 2-3, 2018
Luis Hernandez
Global Strategic Solutions LLC
8614 Westwood Center Dr., Suite 430
Vienna, VA 22182
luis@gssllc.net
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”

- 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.

“Inherent Self-protection mechanisms”

“Engineered System”

“Engineered System”

Global Strategic Solutions

10/03/2018
“Autonomous Systems” are here to stay!
Autonomous Systems Require “Health-Ready Components”

- “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).

Published by SAE on April 2nd 2018

https://www.sae-itc.com/case-study/unlocking-potential-ivhm-technology
SAE IVHM Capability Levels

The path to self-adaptive health management

IVHM System Sophistication

0 1 2 3 4 5

SAE IVHM Capability Level

Limited On-Vehicle Warning Indicators
Enhanced Diagnostics Using Scan Tools
Telematics Providing Real-Time Data
Component Level Proactive Alerts
Integrated Vehicle Health Mgmt.
Self-Adaptive Health Mgmt.

MANUAL DIAGNOSIS & REPAIR PROCESS PERFORMED BY TECHNICIAN

DIAGNOSIS & REPAIR AUGMENTED BY PROGNOSIS & PREDICTIVE ANALYTICS
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.