

# **SAE IVHM Initiative**

**PHM Standards Panel**

**PHM Society Conference**

**Minneapolis September 26th 2012**

**David Alexander**

**SAE Aerospace Standards Europe**

# SAE IVHM History – and Future...

1905



2012



SAE formed in 1905 to promote safety and common practices for the emerging automobile market.

SAE charter expanded in 1916 to incorporate aeronautics

1<sup>st</sup> SAE Aerospace Standard, 1917

SAE E-32 – EHM committee established in 1975

G-11 SHM is formed – work begins on the SHM guidebook in 2008

IVHM Steering Group Established in June 2010

HM-1 IVHM Committee formed in October 2010

SAE AeroTech, IVHM Book in October 2011

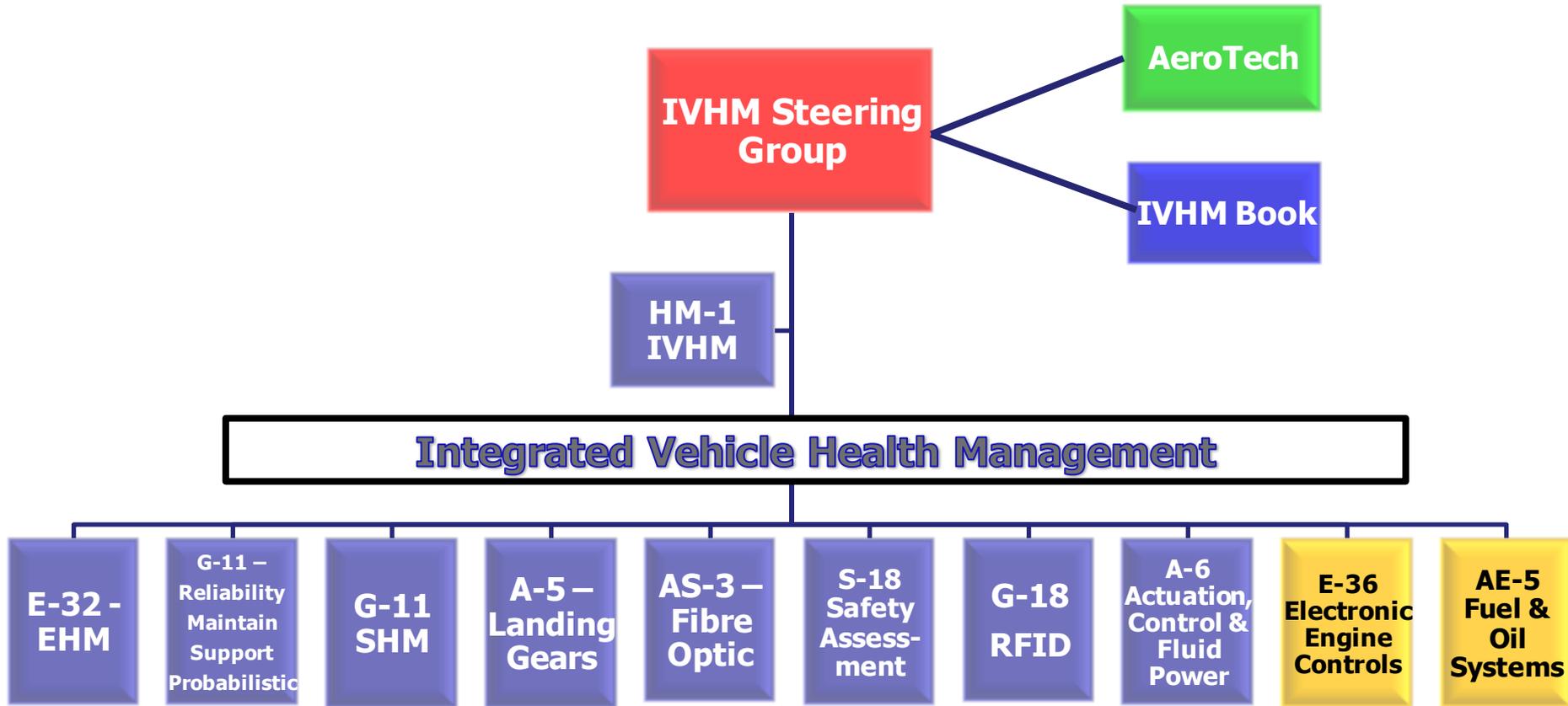
5 SAE IVHM standards in progress in 2012

# SAE IVHM Steering Group



- Established June 2010
- Chair: Dr. Richard Greaves, Executive VP, Technology & Engineering, Meggitt PLC
  - Dr. Greaves elected to SAE Board of Directors
- Stated Objectives:
  - Coordinate/Integrate Health Management Standardization in the SAE Technical Standards Programs
  - Map and monitor IVHM relevant standards, practices and activities
  - Identify future needs
  - Promote PHM and IVHM systems to key stakeholders
  - Advance IVHM technologies through standards and other fora

# SAE IVHM Initiative



# Examples of SAE Health Management Standards

- **ARP6137** Tire Pressure Monitoring Systems (TPMS) for Aircraft
- **AIR6168** Landing Gear Structural Health Monitoring
- **AIR5273** Actuation System Failure Detection Methods
- **AIR6034** Airborne Hydraulic Monitoring Systems
- **AIR6552** Measure, Store, and Access Fibre Optic Transceiver Test Data
- **ARP6461** Guidance on structural health monitoring for aerospace applications
- **AIR5080** Integration of Probabilistic Methods Into the Design Process
- **JA1010** Maintainability Program Standard
- **AIR4061B** Guidelines for the Integration of Engine Monitoring Functions with On Board Aircraft Systems
- **AS4831A** Software Interface for Ground-Based Monitoring
- **AIR4175A** A Guide to the Development of a Ground Station for Engine Condition Monitoring
- **AS5393** Health and Usage Monitoring System, Blade Tracker Interface Specification
- **ARP1587B** Aircraft Gas Turbine Engine Health Management System Guide

# SAE Technical Reports

- AS – Aerospace Standard
  - Contains design or parts standards, performance or quality standards, and or other areas such as material, product, process, procedures or test methods.
- AMS – Aerospace Material Specification
  - Materials and Process Specifications
- ARP – Aerospace Recommended Practice
  - Documentations of practice, procedures, and technology that acts as guides to standard engineering practices.
- AIR – Aerospace Information Report
  - Contains reference data, historical information or educational material useful to community
- ARD – Aerospace Resource Document
  - Usually support reports and issued for limited amount of time (field data, field testing, compilation of results, etc.)

# Key SAE SHM Standards

## **Work in Progress**

**Document Number:** ARP6461

**Title:** Guidance on Structural Health Monitoring for Aerospace Applications

### **Issuing Committee:**

G-11shm, Structural Health Monitoring And Mgmt (Aisc)

### **Scope:**

This document is applicable to civil and military aerospace airframe applications where stakeholders are seeking guidance on the development and certification of Structural Health Monitoring (SHM) technologies for Structural Health Management (SHMang) applications. 1.1 Purpose The document has these major purposes:• provide guidance for structural maintenance practices using SHM methods to facilitate the inclusion of these practices within maintenance and airworthiness documents• standardize and harmonize worldwide understanding about SHM (incl. terminology)• provide basic requirements to guide SHM technology development• provide guidance on certification issues related to SHM 1.2 Field of Application The application of the document is to provide guidance for, but not limited to:• development, maturation, design and certification of structural monitoring for application in civil air transport• modification of maintenance and management infrastructure to use and exploit SHM systems.• improvement of maintenance practices by an alternative tools to conventional NDI that can satisfying scheduled and/or unscheduled maintenance tasks in a cost effective manner Note: Although guidance such as this may be crucial to success, use of this guidance alone cannot be assumed to constitute regulatory agency acceptance. Any accepted use would be project specific following dialogue with the appropriate regulatory agency.

Landing Gear Structural Health Monitoring  
AIR6168

Date Published: 2012-04-12

### **Issuing Committee:**

A-5B Gears, Struts And Couplings Committee

### **Scope**

This SAE Aerospace Information Report (AIR) discusses past and present approaches for monitoring the landing gear structure and shock absorber, methods for transient overload detection, techniques for measuring the forces seen by the landing gear structure, and methods for determining the fatigue state of the landing gear structure. This AIR covers the landing gear structure and shock absorber. It does not include the landing gear systems or landing gear wheels, tires and brakes. Landing gear tire condition and pressure monitoring are detailed in AIR4830 and ARP6137, respectively.

# SAE PHM Sessions, Seminars and Books

SAE 2011 **AeroTech** Congress & Exhibition  
October 18-21, 2011  
Centre de Congrès Pierre Baudis  
Toulouse, France  
[www.sae.org/aerotech](http://www.sae.org/aerotech)



**SAE International**

SAE 2012 AEROSPACE  
ELECTRONICS AND AVIONICS  
SYSTEMS CONFERENCE  
October 30 - November 1, 2012 • Phoenix, Arizona, USA  
[www.sae.org/events/aeas/](http://www.sae.org/events/aeas/)

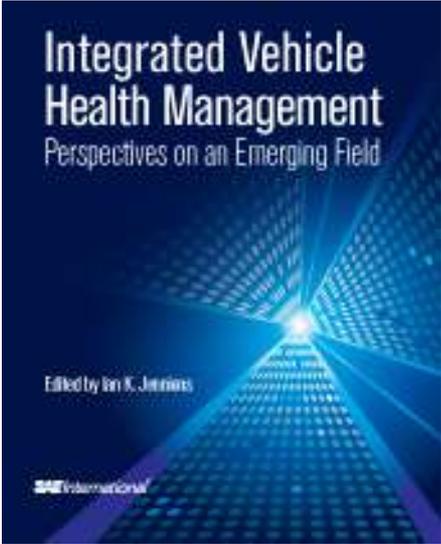


**SAE International**

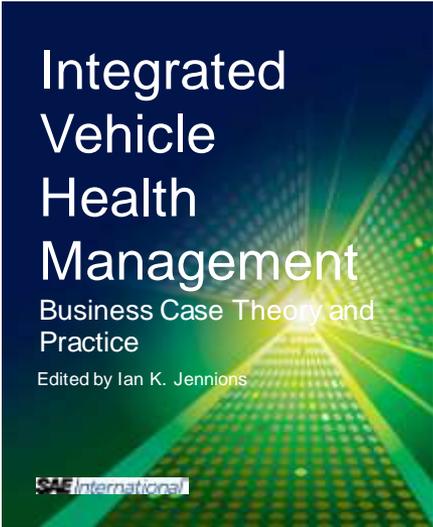


## *Integrated Vehicle Health Management: Technical Perspectives and Business Case*

Out Now!



Published October 2012



Published October 2013



# SAE PHM Portfolio



# Thank you

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