

**SAE INTERNATIONAL**

## **THE DOD/SAE STANDARDS RELATIONSHIP**

Defense Standardization Program Workshop 2018

Judith Ritchie  
Director, Government & Industry Affairs - Aerospace  
SAE International  
Washington DC.



# AGENDA

- Premise
- Global Industry Standards
- Civil Maintenance of Military Standards
- Civil Standards Developed for Military Use
- Case Studies, Counterfeit Avoidance, Systems Engineering

Standards developed by and for military agencies have underpinned the aviation system.

Partnership between industry and military agencies is paramount.

Through the Perry “MilSpec” Reform thousands of military standards are now maintained by civil SDOs: replicated around the world.

DoD use the civil/industry standards process in a number of ways:

- Strategic leadership – directing military needs for civil standards solutions;
- Involvement – technical leadership and oversight in standards development;
- Deployment – adoption, procurement through civil standards

# SAE GLOBAL INDUSTRY STANDARDS

# The Global Standards Development Paradigm

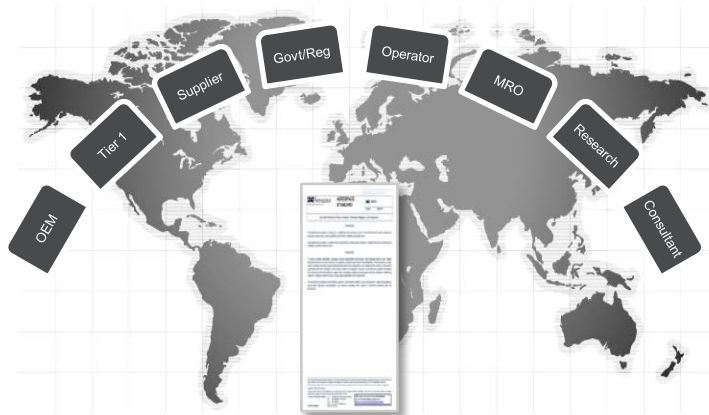
● Before –



● Then –



● Now –



Defence



DEF/Mil Standards

Civil Standards



Civil



# Long-Standing DoD/SAE Partnership



- **U.S. Standard B Liberty trucks built to SAE standards in World War I**
- **1997 – Transfer of over 1500 MilSpecs to SAE during Mil-Spec Reform**
- **DoD has adopted over 3400 SAE standards**
  - Largest number adopted of one standards developing organization
- **SAE is key player in DoD efforts to revitalize standardization in systems engineering**
  - Developed SAE EIA 649, Configuration Management (DoD adopted Mar 2015)
  - Developed SAE AS6500, Manufacturing Management Program (DoD adopted Jan 2015)
- **SAE is key player in DoD efforts to prevent and detect counterfeit parts**
  - AS5553B Counterfeit Electrical, Electronic, and Electromechanical Parts Avoidance, Detection, Mitigation, and Disposition
  - ARP6328 Guideline for Development of Counterfeit Electronic Parts Avoidance, Detection, Mitigation, and Disposition Systems
  - DoD adopted

# Global Defense Agency and Industry Participation In Standards Development

- U.S. Department of Defense
- U.S. Air Force
- US Army
- US Army RDECOM
- US Army TARDEC
- U.S. Navy (NAVAIR, NAVSEA)
- Defense Contracts Management Agency (USA)
- Defense Logistics Agency (USA)
- Canadian Department of National Defense
- Canadian Air Force
- UK Ministry of Defence
- Royal Air Force
- Military Aviation Authority
- French Ministry of Defence
- DGA (France)
- NATO – NSA



- Department of Defense
- HBM-nCode
- iRobot
- TU Darmstadt
- Andromeda Systems Incorporated
- Nevada Automotive Test Center
- General Dynamics Land Systems
- GP Technologies Inc
- Aberdeen Test Center
- DRS Sustainment Systems



- Leonardo
- Airbus Defence & Space
- Airbus Helicopters
- BAE Systems
- Boeing
- Dassault Aviation
- General Dynamics
- GE Aviation
- Lockheed Martin
- MBDA
- Meggitt
- Northrup Grumman
- Pratt & Whitney
- QinetiQ
- Rockwell Collins
- Rolls Royce
- Saab Aircraft
- Safran
- Sikorsky
- Thales



# TRANSFERRING MILITARY STANDARDS TO CIVIL SDOs

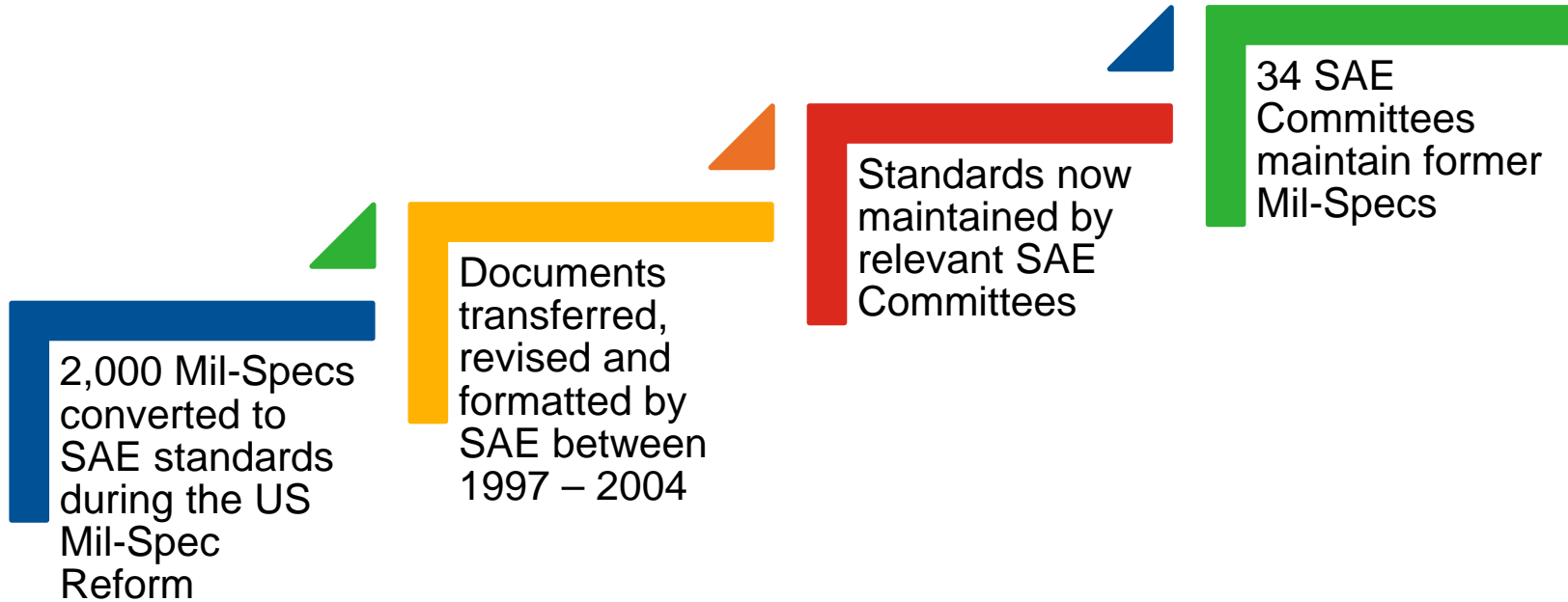
- It's simple\*, cost effective and has been proved many times!

\*with an established process

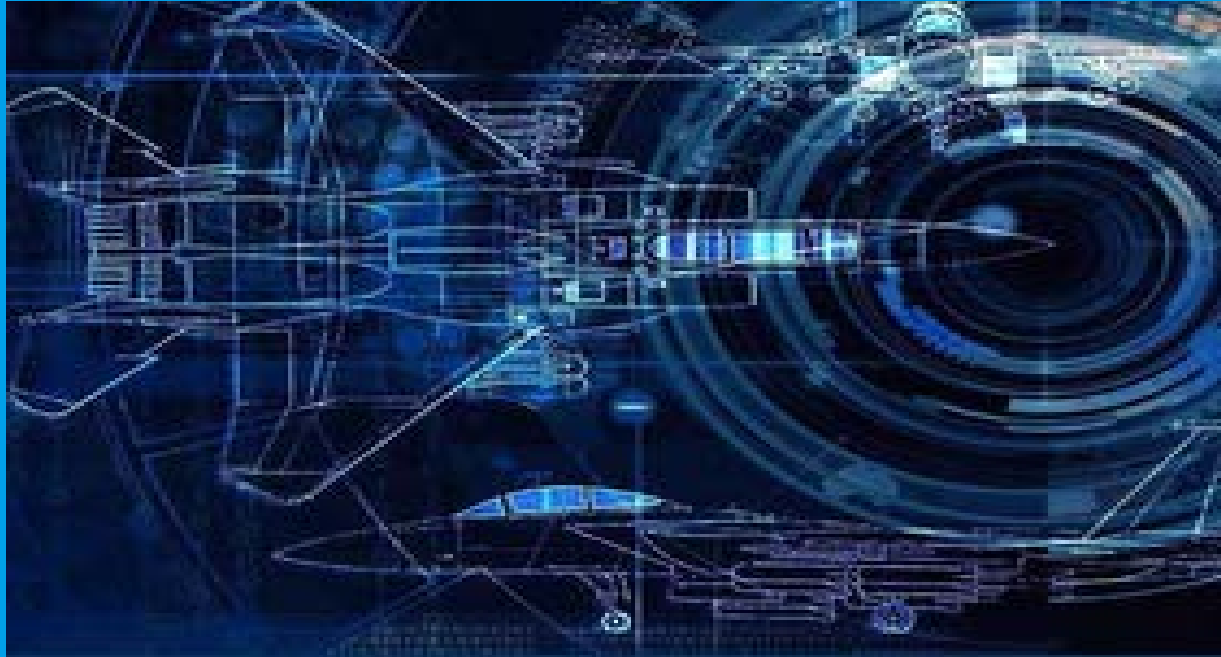


- **Development & Maintenance of standards by industry standards committee:**
  - Spreads the cost burden of standardisation across the stakeholder base
  - Engages all stakeholders – quality of standard:
    - Users (Military and/or Civil)
    - OEMs
    - Tier 1 companies
    - Manufacturers and Supply Chain
    - Regulatory and certification agencies
  - Facilitates use of COTS products (and so interoperability)
    - Drives down costs of products and maintenance/servicing/parts

# SAE International And DoD MIL-SPECS



# CASE STUDIES AND EXAMPLES



# Examples Of SAE Standards Referenced In Military Aircraft Designs And Support Packages

## ELECTRO OPTICAL INTERFACE SPECIFICATIONS

**AS6129** Interface Standard, Airborne EO/IR Systems, Electrical

**AS6135** Interface Standard, Airborne EO/IR Systems, Data

## ENGINES

**AIR4250** Electronic Engine Control Specifications and Standards

## COUNTERFEIT AVOIDANCE STANDARDS

**AS5553** Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition

**AS6081** Fraudulent/Counterfeit Electronic Parts: Avoidance, Detection, Mitigation, and Disposition - Counterfeit Electronic Parts; Avoidance Protocol, Distributors

## CORROSION PREVENTION

**AS12500** - Prevention and Control of Corrosion in Electronic Components and Assemblies

NOTICE OF  
CANCELLATION

FED-STD-595C  
NOTICE 2  
February 14, 2017

## **FEDERAL STANDARD**

### **COLORS USED IN GOVERNMENT PROCUREMENT**

FED-STD-595C, dated 16 January 2008, and all associated slash sheets, are hereby canceled. SAE-AMS-STD-595, “Colors Used in Government Procurement,” supersedes FED-STD-595C. This document, and all new SAE-AMS-STD-595 color standard products such as fan decks and color chipsets, may be obtained from [www.sae.org](http://www.sae.org), or SAE International Customer Service, 400 Commonwealth Drive, Warrendale PA 15096.

# AMS-STD-595 Engineering Aid

In September 2014, the U.S. General Services Administration (GSA), Federal Acquisition Service (FAS) transferred FED-STD-595 to SAE International. The standard defines colors for government procurement

SAE has printed the associated print media, fan decks, reference binders, color chips and sets for sale to the users of AMSSTD595™ - the first SAE Aerospace Standards Engineering Aid.

US DoD formally adopted AMS-STD-595A on 14<sup>th</sup> February 2017



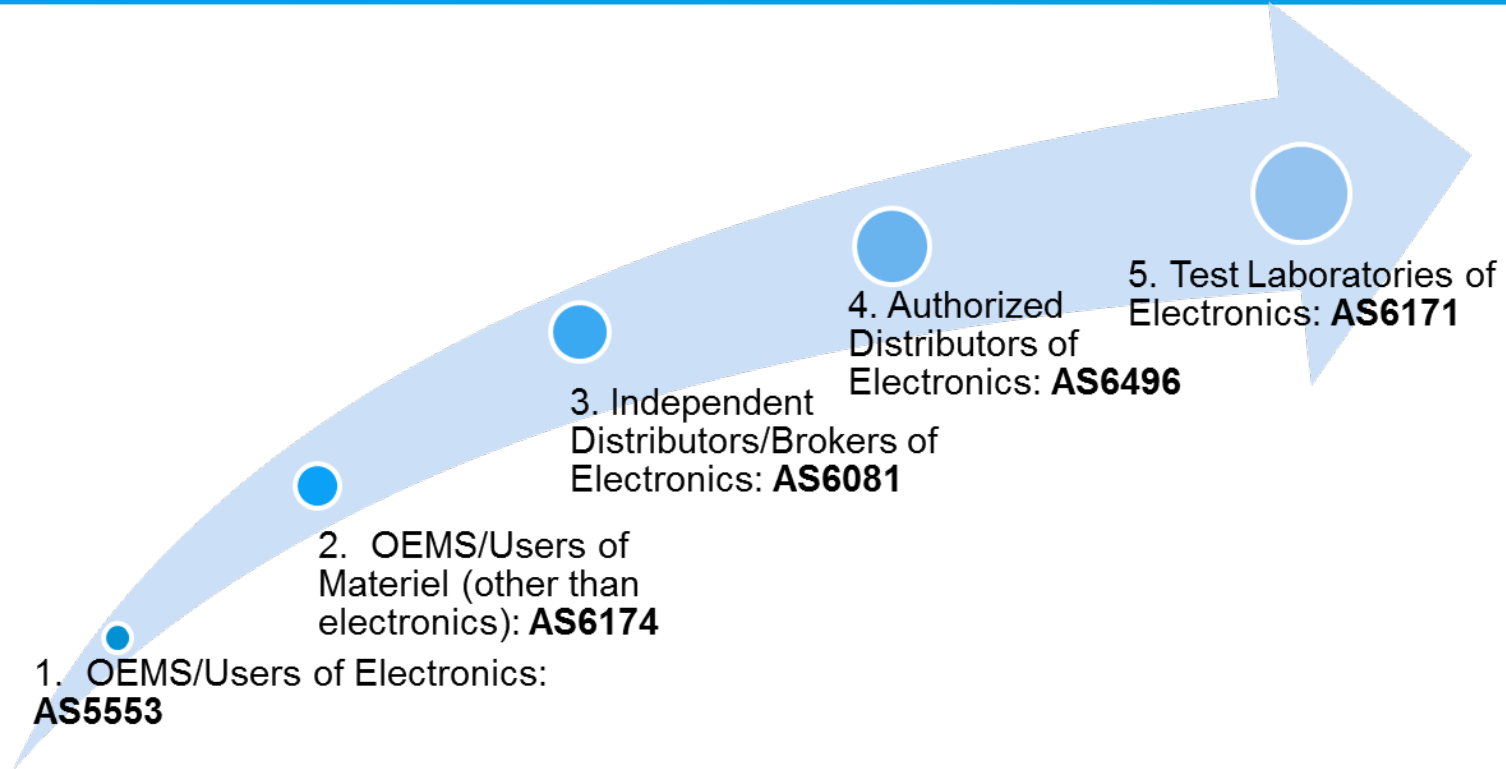
Chartered in 2007 to address aspects of preventing, detecting, responding to and counteracting the threat of counterfeit electronic components. Participants included:

- Government
- Defense/Aerospace manufacturers
- Industry Groups
- Testing Laboratories
- April 2009 - SAE International released aerospace standard AS5553, Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition
- August 2009 – United States DoD adopted AS5553

- April 20, 2010 – DoD PSMC (Part Standardization and Management Committee) requested SAE to address counterfeit NON-electronic parts
- October 4, 2010 – AS6174 based on major rewrite of AS5553 to address all materiel
- Jan-May 2011 – revised to consider Office of the Secretary of Defense (OSD) and WH Intellectual Property Enforcement Coordinator(IPEC) PEC input
- Published AS6174 May 2012



# G-19 AND G-21 COUNTERFEIT PREVENTION AND DETECTION STANDARDS



# Industry Standards to Mitigate Supply Chain Risk in Supply Chain

## G-19 and G-21 Management Committee

JEDEC JC-13	G-19 Counterfeit Electronic Components Committee Oversight					G-21 Counterfeit Materiel Committee Oversight
Auditor Competency (IESDsxxxx)	Test Laboratory Accreditation Standard (AS6810)	Auditor Competency (ASxxxx)			Auditor Competency (ASxxxx)	
Certification Body	Accreditation Body	Certification Body				
Original Component Manufacturer	Test Provider	Distributor		Original Equipment Manufacturer/User/MRO		Commodity Specific
	Proficiency Test Provider Operator(s) Certified to PT Scheme for Identified AS6171 Test Methods	Authorized/ Franchised	Broker/ Independent			
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>JESD243, Fraudulent/Counterfeit Electronic Parts: Avoidance, Detection, Mitigation and Disposition for Manufacturers</b>                      JEDEC JC-13                 </div> <div style="border: 1px solid black; padding: 5px;"> <b>JESDxxx, Compliance Standard or Guide (Includes Audit Checklist)</b>                      JEDEC JC-13                 </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>AS6171, Test Methods Standard; Counterfeit Electronic Parts, SAE G-19A</b> </div> <ul style="list-style-type: none"> <li>• <b>AS6171/1:</b> Suspect/Counterfeit Test Evaluation Method</li> <li>• <b>AS6171/2A:</b> External Visual Inspection (EVI) (incl. remarking, resurfacing, weight, dimensions, SEM)</li> <li>• <b>AS6171/3:</b> X-Ray Fluorescence (XRF) (incl. lead finish, thickness)</li> <li>• <b>AS6171/4:</b> Delid/Decapsulation Physical Analysis (DDPA)</li> <li>• <b>AS6171/5:</b> Radiological Inspection (RI): X-ray imaging</li> <li>• <b>AS6171/6:</b> Acoustic Microscopy (AM): external and internal</li> <li>• <b>AS6171/7:</b> Electrical Test: Curve Trace, Full DC, Key Electrical Parameters for AC, Switching, and Functional Tests; ambient or over temperature (incl. environmental, burn-in, seal)</li> <li>• <b>AS6171/8:</b> Raman Spectroscopy</li> <li>• <b>AS6171/9:</b> Fourier Transform Infrared Spectroscopy (FTIR): materials identification</li> <li>• <b>AS6171/10:</b> Thermogravimetric Analysis (TGA)</li> <li>• <b>AS6171/11:</b> Design Recovery (DR) SAE G-19A</li> </ul> <ul style="list-style-type: none"> <li>• <b>AS6171/12:</b> Acoustic Microscopy</li> <li>• <b>AS6171/13:</b> Secondary on Mass Spectroscopy</li> <li>• <b>AS6171/14:</b> Radiated Electromagnetic Emission</li> <li>• <b>AS6171/15:</b> Packaging</li> <li>• <b>AS6171/16:</b> Netlist Assurance</li> <li>• <b>AS6171/17:</b> Laser Scanning Microscopy</li> <li>• <b>AS6171/18:</b> TMA Test Methods</li> <li>• <b>AS6171/19:</b> AES Test Method</li> <li>• <b>AS6171/20:</b> XPS Test Method</li> <li>• <b>AS6171/21:</b> GC/MS Test Methods</li> <li>• <b>AS6171/22:</b> SEM Test Methods SAE G-19A</li> </ul>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; background-color: #e0ffe0;"> <b>AS6496, Authorized Distributor Counterfeit Mitigation Sub-com.</b>                      SAE G-19AD                 </div> <div style="border: 1px solid black; padding: 5px; background-color: #ffe0e0;"> <b>ASxxxx, Compliance Standard or Guide (Includes Audit Checklist)</b>                      SAE G-19C                 </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; background-color: #e0ffe0;"> <b>AS6081, Counterfeit Electronic Parts Avoidance, ID's.</b>                      SAE G-19D                 </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <b>AS6301, Compliance Standard or Guide (includes Audit Checklist)</b>                      SAE G-19C                 </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; background-color: #e0ffe0;"> <b>ARP6178, Counterfeit Electronic Parts; Tool for Risk Assessment of Distributors. Worksheet and User Guide. SAE G-19DR</b> </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <b>AS5538, Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition. SAE G-19CI</b> </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <b>AS6462, AS5553, Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition Verification Criteria Includes Audit Checklist. SAE G-19C</b> </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <b>ARP6328, Guideline for Development of Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition Systems. SAE G-19CI</b> </div> <div style="border: 1px solid black; padding: 5px; background-color: #ffe0e0;"> <b>AIR6860, Use of SAE AS5553 for Implementation of U.S. DFARS 252.246-7007 &amp; 252.246-7008. SAE G-19CI</b> </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; background-color: #e0ffe0;"> <b>AS6174A, Counterfeit Materiel; Assuring Acquisition of Authentic and Conforming Materiel</b>                      SAE G-21                 </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <b>AS6174/1, Compliance Standard or Guide (Includes Audit Checklist)</b>                      SAE G-21                 </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; background-color: #ffe0e0;"> <b>AS6174/2, Fastener Counterfeit Avoidance and Detection</b>                      SAE G-21                 </div> <div style="border: 1px solid black; padding: 5px; background-color: #ffe0e0;"> <b>AS6174/3, Bearing Counterfeit Avoidance and Detection</b>                      SAE G-21                 </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <b>AS6886, Refrigerant Counterfeit Avoidance and Detection</b>                      SAE G-21                 </div>
<b>AIR6273, Terms, Definitions, and Acronyms - Counterfeit Materiel or Electrical, Electronic and Electromechanical Parts</b> SAE G-19T						
		Published	In Development	Gap		

Specifications in Red are DoD Adopted

# Case Study – Electronics Corrosion Prevention

US DoD identified a need for improvements in corrosion prevention and control as well as standardization of materials and processes in the area of avionics and electronics.

Instead of developing a military standard, the civil standards process could be used.

In April 2014, the Defense Standardization Council approved an effort to develop an industry standard for corrosion prevention and control of defense avionics and electronics.



DEPARTMENT OF DEFENSE  
DEFENSE STANDARDIZATION PROGRAM OFFICE  
8725 JOHN J. KINGMAN ROAD, STOP 5193  
FORT BELVOIR, VA 22060-6225



MEMPHYS  
REF ID: DSPO

AUG 12 2014

Edward M. Manns  
Manager, Aerospace Standards  
SAE International  
400 Commonwealth Drive  
Warrendale, PA 15096

Dear Mr. Manns:

Based on the information you provided in response to our 30 May 2014 request for information, we are pleased to notify you that the Department of Defense (DoD) Corrosion Forum Specifications, Standards, and Qualification Processes Working Integrated Product Team (SSQP WIPT) selected SAE to develop a standard for corrosion prevention and deterioration control in electronic components and assemblies.

The SSQP WIPT noted that SAE has significant experience in developing and maintaining standards used by the DoD, and a knowledge of aerospace and defense issues from both government and commercial perspectives. In addition, the team appreciated SAE's proposal to develop a new corrosion standard leveraging the work already completed by the government as an initial starting point.

As you noted in your response, the first step either will be to establish a new technical committee to develop the standard or expand the scope and membership of an existing committee that addresses electrical/electronic distribution systems. You will be contacted soon by Mr. Richard Hays, who is the Deputy Director of the DoD Corrosion Policy and Oversight Office and a member of the SSQP WIPT to begin these discussions. Mr. Hays can be reached at 703-697-3952 or by email at [richard.a.hays@DSCC.mil](mailto:richard.a.hays@DSCC.mil).

We appreciate your interest in working with the DoD to develop this important standard and look forward to working with SAE.

Sincerely,

GREGORY E. SAUNDERS  
DIRECTOR

cc: Mr. Richard Hays

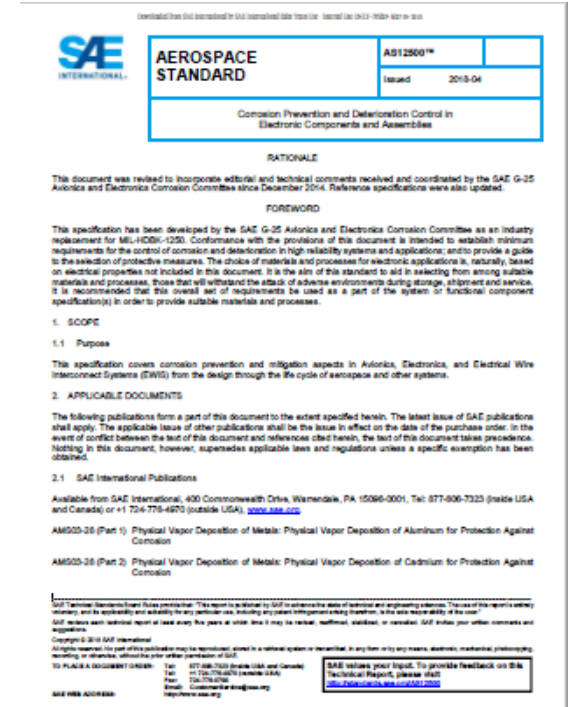
# Case Study – Electronics Corrosion Prevention

A tender was sent out and the SAE G-25 committee established to develop standard.

Committee contained industry experts & military representatives

## ***AS12500 Corrosion Prevention and Deterioration Control in Electronic Components and Assemblies***

Published 24<sup>th</sup> April 2018



Formed in 2017, the Systems Management Council is a sector agnostic council comprised of several standards committees. The committee's activities include the development and maintenance of system and enterprise level standards used by the US DoD and suppliers, and a growing number of commercial companies such as Boeing commercial.

## SMC

- Enterprise Information Data Management
- Configuration Management
- Reliability
- Lifecycle Logistics Supportability
- EMI/EMC
- Human Systems Integration
- Systems Engineering
- Systems Safety
- Position, Navigation, and Timing

# SAE IS ENABELING THE DIGITIZATION OF AEROSPACE

## Systems Management Council (SMC)

- Life Cycle Logistics and Supportability Data
- Configuration Management Data
- System Engineering Data

## Integrated Vehicle Health Management (IVHM)

- Prognostics and Health Management
- Preventative Maintenance and Maintenance Credits

## Digital and Data Steering Group

- Digital Twin and Digital Thread
- Data Governance and Security
- Blockchain Applications
- Big Data and Artificial Intelligence

•SAE1001, “Integrated Project Processes for Engineering a System,” is an integrated set of technical processes to help a project in the engineering or reengineering of a system, over the full life cycle

- Covers systems that can be any combination of people (*humans*); product (*hardware* or *software*); or process (*service*).
- Applicable to any type of system: commercial or non-commercial; small or large, simple or complex, preceded or unprecedented; new or legacy or any combination of these characteristics.
- Examples: a vehicle (air, ground, sea); corporate governance or intelligence system; IT system; air traffic control; manufacturing

# TARGETS FOR SAE-1001

- Primary targets are organizations inexperienced with systems engineering, with immature processes, dependent on other organizations, or developing systems engineering staffs
- The goal of SAE1001 is to help organizations improve:
  - Their processes, in particular the connections among them;
  - Their interactions with supporting organizations; and
  - Their development of experienced Systems Engineers
- It is especially intended to help organizations developing or starting to develop systems, that are inexperienced in systems engineering
- It can also help organizations that are seeing challenges with their defined processes



### Global, civil standards provide military with:

- Partnership in standards for military procurement and use
- Networks with allies and contractors
- Direct input into technology
- Common supply chains shared with commercial sectors

**We encourage involvement of DoD at all levels of the standards process**

# QUESTIONS?

**JUDITH RITCHIE**

**DIRECTOR, GOVERNMENT & INDUSTRY AFFAIRS - AEROSPACE**

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