

Known Knowns

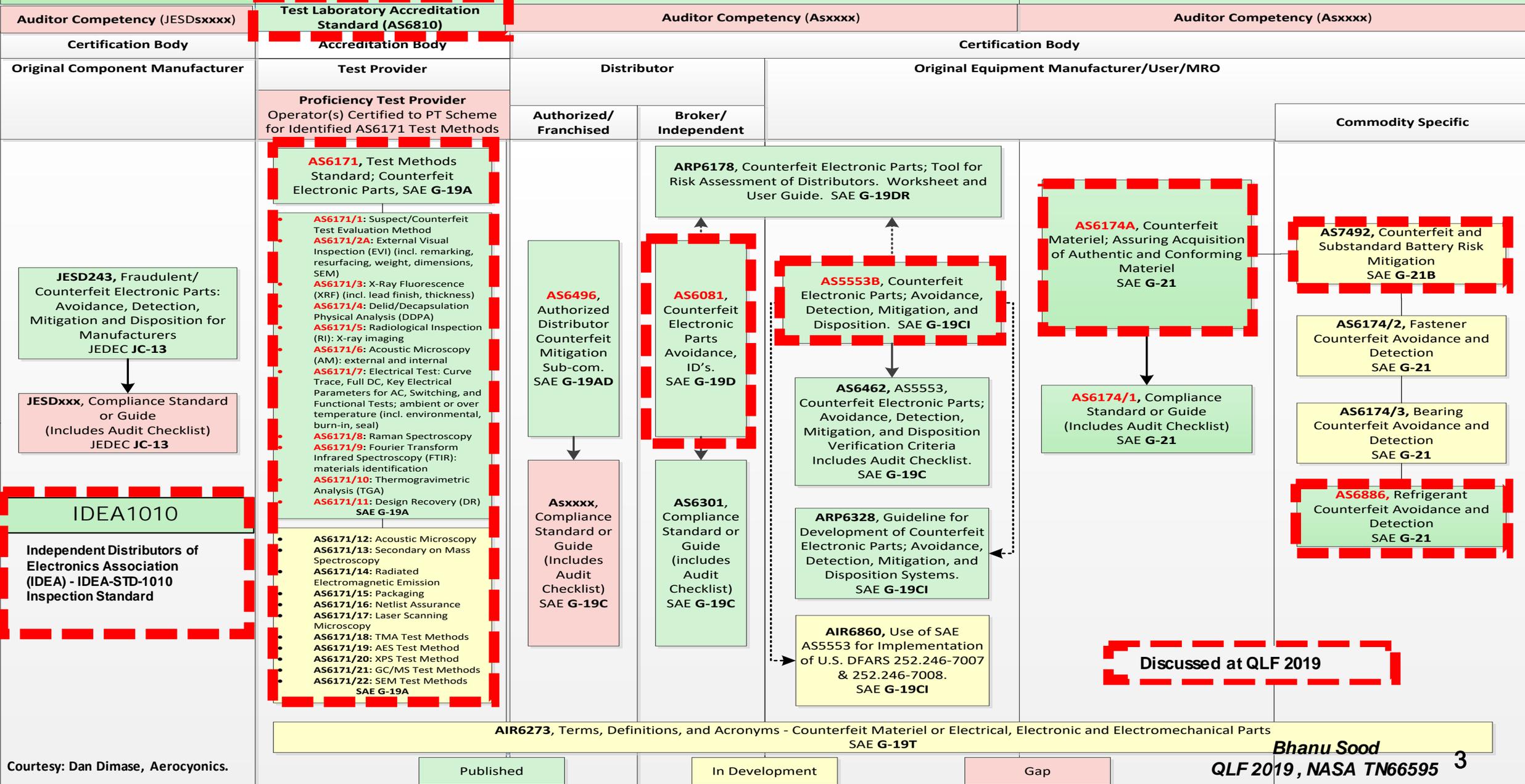
- Counterfeiting is not new and by no means the biggest threat to the supply chain.
- Many of the problems regarding counterfeits are due to lack of due diligence by the buyers.
- Purchasing and then inspecting to detect counterfeit parts is a fool's errand.
 - The time and cost for inspection mostly outweighs any benefit.
- There are NO alternatives to good supply chain management and obsolescence management.

Industry Standards to Mitigate Counterfeit Risk in Supply Chain

G-19 and G-21 Management Committee

G-19 Counterfeit Electronic Components Committee Oversight

G-21 Counterfeit Materiel Committee Oversight



Discussed at QLF 2019

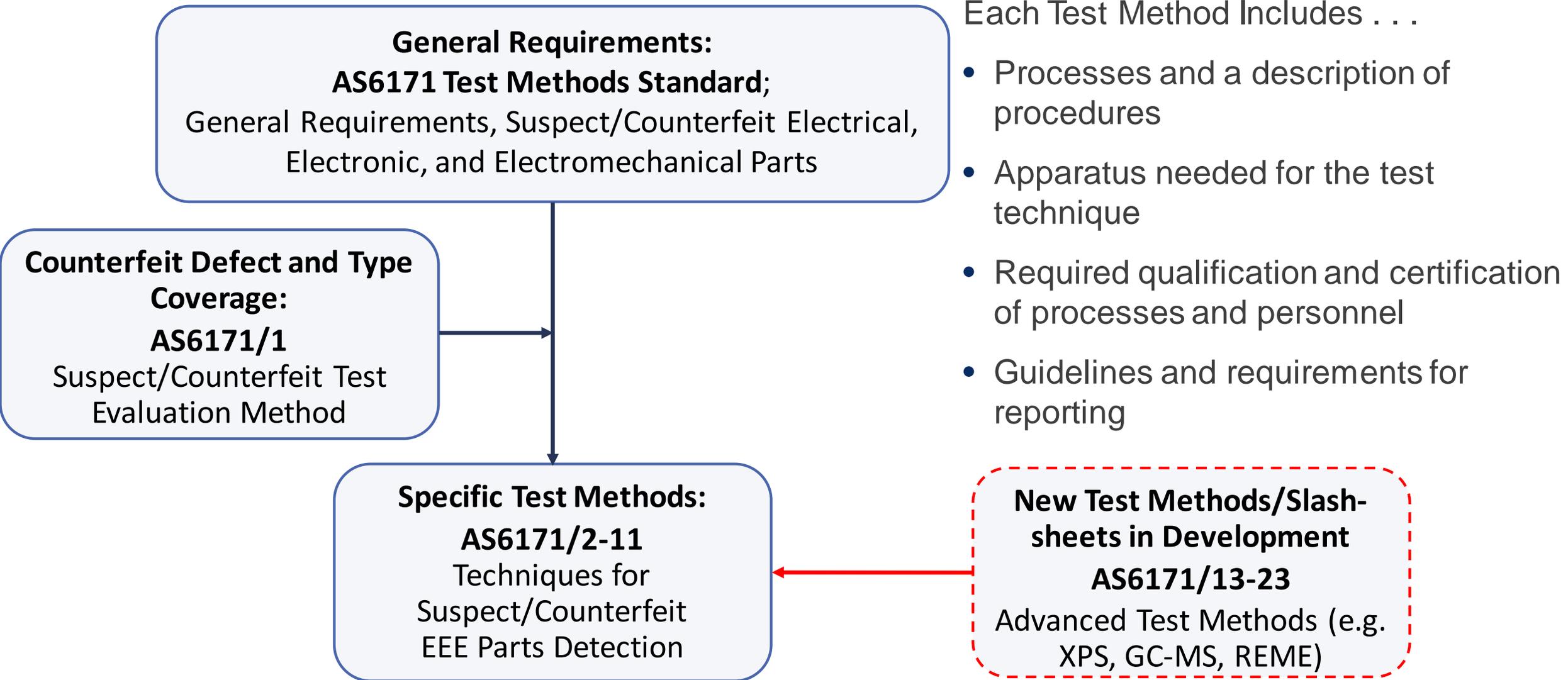
AS6171 – Lab Test Methods Standard

Test Methods Standard; General Requirements, Suspect/Counterfeit Electrical, Electronic, and Electromechanical Parts

Purpose	<ul style="list-style-type: none">Standardize practices and provide a risk informed test decision to detect Suspect/Counterfeit (SC) Electrical, Electronic, and Electromechanical (EEE) parts and to ensure consistency of test techniques and requirements across the supply chain.
Target Audience	<ul style="list-style-type: none">Independent Test LaboratoriesDistributors & OEMs (with in-house testing capability)OEMs, Integrators, and End-Users flowing down test requirements
Uses	<ul style="list-style-type: none">When other risk mitigation methods for avoiding the use of SC EEE parts (e.g., acquiring all parts from Authorized Sources, redesigning the system, having obsolete parts emulated, etc.) are either unavailable or inadequate.When a decision is made to use parts with unknown chain of custody that do not have pedigree back to the original component manufacturer.Have been acquired from a broker or independent distributor.
Status	<ul style="list-style-type: none">Published by SAE October 2016 (together with 11 slash sheets) and updated in April 2018.

Testing does not eliminate the preference for parts with traceability to the OCM/OEM/authorized manufacturer!

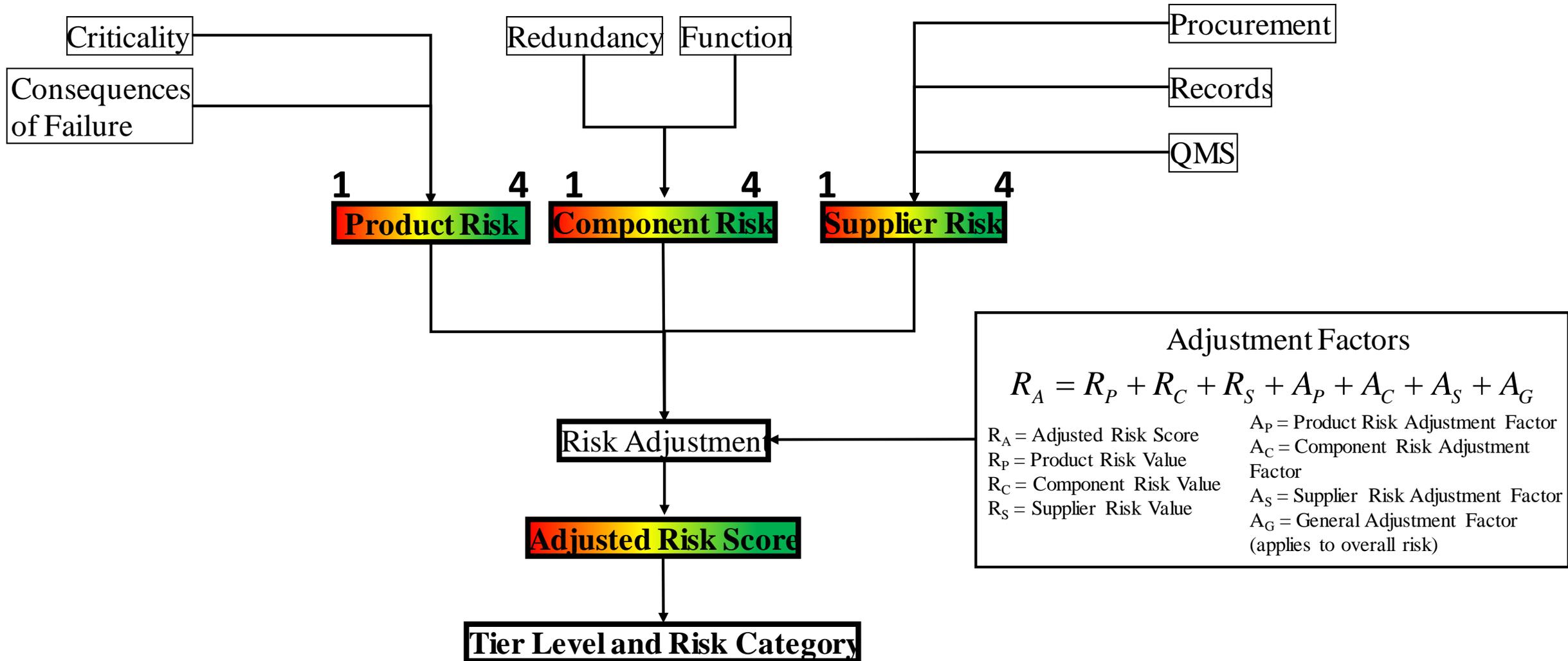
Organization of AS6171



Each Test Method Includes . . .

- Processes and a description of procedures
- Apparatus needed for the test technique
- Required qualification and certification of processes and personnel
- Guidelines and requirements for reporting

AS6171 – Risk Based Testing Criteria



Establish a risk level to determine level of testing

Test Methods in AS6171

- **AS6171/2: External Visual Inspection (EVI)** (incl. remarking, resurfacing, weight, dimensions, SEM)
- **AS6171/3: X-Ray Fluorescence (XRF)** (incl. lead finish, thickness)
- **AS6171/4: Delid/Decapsulation Physical Analysis (DDPA)**
- **AS6171/5: Radiological Inspection (RI):** X-ray imaging
- **AS6171/6: Acoustic Microscopy (AM):** external and internal
- **AS6171/7: Electrical Test:** Curve Trace, Full DC, Key Electrical Parameters for AC, Switching, and Functional Tests; ambient or over temperature (incl. environmental, burn-in, seal)
- **AS6171/8: Raman Spectroscopy:** materials identification
- **AS6171/9: Fourier Transform Infrared Spectroscopy (FTIR):** materials identification
- **AS6171/10: Thermogravimetric Analysis (TGA):** material analysis
- **AS6171/11: Design Recovery (DR):** device layout and function

AS6171 – Proposed SME Detection Test Flow

Steps	Physical/Environmental/Electrical Inspections/Tests	4 Critical Risk	3 High Risk	2 Moderate Risk	1 Low Risk	0 Very Low Risk
1	External Visual Inspection, EVI _G (General, Full Lot)	M	M	M	M	M
2	External Visual Inspection, EVI _D (Detailed, Sample)	M	M	M	M	M
3	Remarking, part of EVI Inspection	M	M	M	M	M
4	SEM	AN	AN	AN	AN	AN
5	XRF	R	R	R	R	R
6	Radiological Test	R	R	R	R	N/A
7	Delid/Decapsulation Physical Analysis (DDPA)	R	R	R	R	N/A
8	Acoustic Microscopy (AM)	R	R	R	R	N/A
9	Miscellaneous (FTIR, Raman, TGA, Design Recovery)	AN	AN	AN	AN	N/A
10	Thermal Shock, Pre and Post Electricals	AN	N/A	N/A	N/A	N/A
11	Value Measurement At Ambient Temp	R	R	R	R	R
12	Key Electrical Parameters At Ambient Temp	R	R	R	N/A	N/A
13	Key Electrical Parameters Over Temp	R	R	N/A	N/A	N/A
14	Burn-In and Final Electricals with Limits and Delta Limits	R	N/A	N/A	N/A	N/A
15	Seal (hermetic devices)	AN	AN	AN	AN	N/A
16	User/Requester (examples: PIND etc.)	AN	AN	AN	AN	AN

Key: M – Mandatory, R – Recommended, test performed; AN – As necessary, when specified by the User/Requester

AS6171 – Current Status

- AS6171 General Requirements and Slash Sheets AS6171/1 - AS6171/11 were published by SAE in October 2016.
- Update published to AS6171/2 (EVI) in May 2017.
- Update published to AS6171 in April 2018.
- AS6810 on Accreditation of Test Labs published in May 2018.
- AS6171 was adopted by Defense Logistics Agency (DLA) Land and Maritime in March 2017.
- Ongoing activities concerning new test methods and counterfeit types, as well as revisions to existing documents. . .

AS6171 – Slash-sheets in Development (1)

Document	Description	Current Status
AS6171/4A	Delid/Decapsulation/Physical Analysis (DDPA)	Undergoing revision
AS6171/6A	Acoustic Microscopy (AM) Test Method being updated to include capacitors	Balloted January 2019
AS6171/13	Secondary Ion Mass Spectroscopy (SIMS) Test Method	Two ballots completed; undergoing revision
AS6171/14	Radiated Electromagnetic Emission (REME) Test Methods	First ballot completed; undergoing revision
AS6171/15	Part Packaging Test Methods	Under development
AS6171/16	Netlist Assurance Test Methods	Under development
AS6171/17	Laser Scanning Microscopy (LSM) Test Methods	First ballot completed; undergoing revision
AS6171/18	Thermomechanical Analysis (TMA) Test Methods	Under development

AS6171 – Slash-sheets in Development (2)

Document	Description	Current Status
AS6171/19	Auger Electron Spectroscopy (AES) Test Method	Under development
AS6171/20	X-Ray Photoelectron Spectroscopy (XPS) Test Method	Under development
AS6171/21	Gas Chromatography/Mass Spectrometry (GC/MS) Test Methods	Under development
AS6171/22	Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray Spectroscopy (EDS) Test Methods	Under development
AS6171/23	EEE Assemblies	Under development
AS6171/A	General Requirements	Revision published April 2018
AS6171/2A	External Visual Inspection	Revision published May 2017

The requirements in AS6171 apply to accredited test laboratories, and are intended to ensure consistent and competent workmanship in the performance of the test methods.

AS6810 – Requirements for Accreditation Bodies

- Published in May 2018.
- AS6810 is an industry specific scheme that governs the accreditation process to AS6171.
- The SAE G-19A committee developed AS6810 to ensure that accreditation is performed according to a consistent and accepted set of standard requirements, by Accreditation Bodies operating under the requirements of ISO/IEC 17025.
- Defines criteria utilized by an Accreditation Body that is a signatory to the ILAC Mutual Recognition Arrangement (MRA), to establish conformance with AS6171 Test Methods Standard.

AS5553B Counterfeit EEE Part Avoidance

Counterfeit Electrical, Electronic, and Electromechanical (EEE) Parts; Avoidance, Detection, Mitigation, and Disposition – SAE G-19CI Committee

Purpose	<ul style="list-style-type: none">• This Standard was created to provide uniform requirements, practices and methods to improve the likelihood of only acquiring authentic and conforming EEE parts and is for use by organizations that procure and/or integrate and/or repair EEE parts and/or assemblies containing such items, including maintenance, repair and overhaul (MRO) organizations.
Target Audience	<ul style="list-style-type: none">• Original Equipment Manufacturers and Users/Integrators that purchase and/or manufacture products with electrical components.• The requirements are intended to be flowed down through the supply chain, to organizations that procure EEE parts and/or assemblies.
Uses	<ul style="list-style-type: none">• Counterfeit EEE Parts Control Plan• Purchasing Process• Verification of Purchased EEE parts• Material Traceability and Control, Reporting
Status	<ul style="list-style-type: none">• AS5553B published September 2016. AS5553C currently at Aerospace Council for ballot, expected to be published shortly.• ARP6328A in development. This document contains guidance for implementing a counterfeit mitigation program in accordance with AS5553.

AS6174A – Counterfeit Materiel Standard

Counterfeit Materiel; Assuring Acquisition of Authentic and Conforming Materiel – SAE G-21 Committee

Purpose	<ul style="list-style-type: none">• This standard was created to provide uniform requirements, practices and methods for: (a) Materiel/parts and supply chain management, procurement, inspection, test/evaluation (b) Response strategies when suspect or confirmed counterfeit materiel is discovered.
Target Audience	<ul style="list-style-type: none">• Suppliers, processors, and end product organizations.
Uses	<p>This standard was created in response to a significant and increasing volume of counterfeit materiel (in violation of intellectual property laws) entering the supply chain, posing significant performance, reliability, and safety risks.</p>
Status	<ul style="list-style-type: none">• AS6174A published July 2014. All materials and parts except EEE parts.• G-21R committee produced standard on refrigerants – AS6886 released 21 June 2015. (DoD Adopted on 15 Sep 2015 and is under review for Adoption by the United Nations.)• AS6174/1 Verification Matrix published April 2017.• AS6174/2 Fasteners slash sheet in development. Resolving ballot comments.• AS6174B Bearings slash sheet in development.• G-21B Counterfeit and Substandard Battery Risk Mitigation Committee established January 2019. AS7492 in early development.

AS6081 – Independent Distribution Standard

Fraudulent/Counterfeit Electronic Parts: Avoidance, Detection, Mitigation, and Disposition – Independent Distribution - SAE G-19D Committee

Purpose	<p>Standardizes practices to:</p> <ul style="list-style-type: none">• Procure parts from reliable sources;• Assess and mitigate risk of distributing counterfeit parts• Control suspect or confirmed counterfeit parts.• report suspect and confirmed counterfeit parts.• assess, mitigate, control, and report parts which have been used, refurbished, or reclaimed, but represented as new.
Target Audience	<ul style="list-style-type: none">• Independent Distributors/Brokers of Electronic Components
Uses	<ul style="list-style-type: none">• Requirements for a Counterfeit Mitigation Program• Intended to be used for Certification of Distributors
Status	<ul style="list-style-type: none">• Published – November 2012. Rev. A in development

IDEA-STD-1010-B– Inspection Standard

Independent Distributors of Electronics Association (IDEA) - IDEA-STD-1010 Inspection Standard for Acceptability of Electronic Components Distributed in the Open Market

Purpose	<ul style="list-style-type: none">• To set forth practices and requirements for visual examination and acceptability criteria of electronic components purchased in the Open Market.• This is done by presenting a combination of concepts, theory, materials, methods and verification criteria.• Technical resource for the visual inspection of electronic components, focused on the detection of substandard and counterfeit components.• Product handling, packaging and storing, Inspection equipment, Test house relationship management, Visual inspection, Advanced inspection techniques, Comparison of acceptable v non-conforming characteristics via photo references, Post-inspection actions
Target Audience	Independent Distributors/Brokers of Electronic Components
Uses	<ul style="list-style-type: none">• Includes tiers of inspection – packaging inspection and visual examination• Advanced tier includes x-ray, XRF, C-SAM and decapsulation• Emphasis on training
Status	Published by IDEA in April 2011. Revision C is currently under development.

Summary

- The SAE G-19 Standards, combined with the new FARs, focus on authorized distribution channels for counterfeit parts avoidance.
 - Risks of authorized distribution channels being contaminated still remain
 - Inspections need a golden sample for comparison
 - Cost, time, risk of part damage due to inspection
 - Incomplete information from device manufacturers
- With the integration of complex hardware, software, and firmware, new risks are coming from threats that can exploit vulnerabilities.
 - Newer slash-sheets in AS6171 address some, but not all these threats.

Acknowledgements

- GSFC Risk and Reliability Assessment Branch (Nancy Lindsey - Branch Chief)
- GSFC Safety and Mission Assurance Directorate (Richard Barney - SMA Director)
- NEPP NASA Electronics Parts Program (Michael Sampson - Program Manager)

Questions?



Bhanu Sood, Ph.D.

Phone: +1 (301) 286-5584

bhanu.sood@nasa.gov