



Electronics Inspection and Test

Examples of Counterfeit and Non-Conforming Electronics Hardware Industry Tools, Best Practices

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Outline

- Background & History
- Industry Issues- Items that continue to challenge the supply chain
- Standards & Best Practice- Updates, where are we today?
- Sues- Detection, Analysis & Interpretation
- Case Studies- NC Supply Chain Examples
- Case Studies- NC Raytheon Examples
- **OEM Counterfeit-** Past Incidents & Evolving threats
- Conclusions & Recommendations- Training, Standards, Resources

Background & History



Crude re-marks, reject scavenging, mechanical samples- Incidence rate in-frequent



Current Global counterfeits: [2000's - Today]

Above PLUS re-claimed E-Waste & clones, improved refurbish & remarking techniques

- Drastic increase in incident / detection rates
- Impacts entire electronics supply chain> OCMs OEM's AD's ID's Brokers

✓ DOJ U.S. Counterfeit Ring Investigation: MVP Micro & VisionTech

- High profile cases prosecuted since, highlight how serious & pervasive this issue is
- DOJ / GAO estimate hundreds of thousands to *Millions* of counterfeit IC's & components have infiltrated the supply chain

 SASC Hearings Nov. 2011: Government & Industry testimony Representation: MDA, GAO, SIA, Independent Distributors & OEMs

NDAA 2012 - 2015: Anti-counterfeit laws passed, FAR & DFARS implementation continue to evolve & refine requirements!

Counterfeit IC's impact the entire electronics supply chain

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Space and Airborne Systems Industry- Challenges, Conferences, Standards

OCM adoption of EU RoHS & WEEE: Implemented mid-2006
 Non-uniform Industry adoption added complexity & confusion to the supply chain
 Inconsistent implementation (04-07)- Part Numbers, Datasheets, PCN's, Product Packaging
 Reclamation requirements- Without domestic recycling policies provides an endless stream of E-Waste. Utilized by counterfeiters once chain of custody is lost

Conferences & Workshops: Increased industry awareness
 Components for Military & Space Electronics; Counterfeit Training- CMSE & CCAT (CTI)
 CALCE U. Maryland Joint with SMTA- Counterfeit Symposium
 U. Conn ARO / CHASE Workshop- Annual event, University of Connecticut
 ERAI Executive Conference- Electronics Distribution (Presentations, training, panel sessions)
 Diminishing Manufacturing Sources & Material Shortages- DMSMS Conference (DoD WG)
 Media- LinkedIn (Interest Groups); Counterfeit Parts (H. Livingston, wordpress.com); RJO, PC- (R. Metzger, www.rjo.com)
 MDA Workshops- Counterfeit Materiel Training, Govt. Contractor- OEM (Supports PMAP)

Industry Standards & Best Practices: SAE, iNEMI, TechAmerica, ECA, IEC, GIFAS, IDEA & ERAI

Standards <u>under review / revision</u>- Impact of DFARS 2012-D055 *"Final Rule"* (May 2014) and updated sourcing requirements, released in NDAA 2015 [S.2410/HR3979] Sect. 817

Industry, DoD & Government Awareness: Dramatic Improvements

Analysis, interpretation disparities & knowledge gaps within the electronics industry- PERSIST

Requirements & standards evolving, as laws are refined w/ Industry SME Inputs

Policy, Process & Best Practice-

Targeting Counterfeit Components, Materials

Counterfeit Products Risk Mitigation and Prevention: **Raytheon**

243-RP: Corp. policy includes procurement, controls, supplier requirements, based on AS 5553A (7.24.12)
EI-03-38: SAS BU Plan, References RTN policy, calls out test verification procedures, sample size (8.29.14)
Supply Chain: Approved supplier requirements, includes CF risk mitigation, traceability, testing
167-RP: Corp. policy supplier audit process, articulates PSL requirements (12.12.14)
233-RP: Corp. policy defines minimum requirements for preferred suppliers, imposes "Q notes" (12.20.13)
TC 001: Imposes PSL test and inspection "Quality notes" requirements in supplier contracts (External)

- IDEA: "Acceptability of Electronic Components Distributed in the Open Market" IDEA-STD-1010B Released 4/2011- Independent Distributors of Electronics Association
 - Visual & surface inspection of electronic components, with examples

Chapter 16 [IDEA-STD-1010B] IDEA Inspection process guideline checklist

- Framework to define Quality Inspection workflow, generate process instructions & procedures

ERAI: "Screening for Nonconforming & Suspect/Counterfeit Parts" Updated July 2014

- Best practice document, Progressive Inspection & test, Identifies nonconformance attributes
- SAE: "Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition" AS 5553A Released Jan 2013- SAE International (Society of Automotive & Aerospace Engineering)
 - Requirements flow down, to sub-tier suppliers procuring electronic parts, *Rev. B in process*

OEMs & Supply Chain: Authorized, Franchised, Independent Distribution

Standards & Training-Counterfeit Components & Materials

SAE: "Counterfeit Electronic Parts: Avoidance, Detection, Mitigation & Disposition"

AS 6081: Nov. 2012- Mandatory practices for Independent Distributors, certifications in process

- AS 6496: Aug. 2014- Mandatory practices for Authorized Distributors, CB criteria & audits pending
- AS 6174: May 2012- Practices for parts and materials suppliers, released
- AS 6171: Initial draft pending- Testing & Analysis Methods, applies to Failure Analysis / Test Labs

Component Technology Institute: "Counterfeit Component Avoidance Program" CTI-CCAP-101 Established in 2008, Revision E-1

- Mandatory practices for Independent Distributors
- Detection / avoidance of acquisition & delivery of counterfeit electronic components

Inspection Certifications & Training:

IDEA-ICE-3000- Inspector Certification Pre-requisites, IDEA training & inspection experience
 Counterfeit Component Avoidance Workshop (CTI)- 2 day hands on event hosted in a FA lab
 NASA JPL- Beginner to advanced workshops, offered at Industry conferences
 IDEA-STD-1010B- Offered through IDEA / IPC certified training centers (IE: EpTac)
 MDA Workshops- Counterfeit materiel training, provided to DoD suppliers

ALL Policies Procedures & Standards effected by DFARS & NDAA Updates!

Recommendations: Updated, July 2014

Screening for Nonconforming & Suspect / Fraudulent / Counterfeit parts Used w/ Permission www.erai.com

Perform inspection- Utilize non-conformance criteria & accepted Industry practices (IPC / SAE / MIL-STD) http://www.erai.com/CustomUploads/ca/sc/Screening_for_Nonconforming_Suspect_Counterfeit_Parts.pdf



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IDEA Inspection Guidelines-

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IDEA-STD-1010B {Ch. 16} Used by permission from IDEA <u>www.idofea.org</u>

Perform inspection- Utilizing industry accepted conformance inspection criteria (IPC / SAE / MIL-STD)



USE: 1010B Std + IDEA Guideline & ERAI Recommendations {complimentary processes}

ISSUES- Detection, Analysis, Interpretation

- Standards provide procedures, guidance and examples of compliant & suspect counterfeit / non-conforming components
- Techniques in visual, surface, data and inspection analysis & investigation techniques are not defined in the standards (AS 6171 & Training required)
- > No Industry requirements for training & certifications (Inspection / Detection Varies)
- > Counterfeit inspection methods are new in the industry, *CF techniques evolving*
- OCM quality non-conformances, can be misinterpreted as "suspect" counterfeit
 Component history, construction knowledge & OCM engagement, REQUIRED to interpret results
- Analysis & data requirements in Industry consortia databases, IS improving! Minimum entry criteria established, early data entries lacked documentation / evidence to indict parts
- Parts categorized as SUSPECT require analytical tests to make determination. Cost prohibitive to most organizations

Updated examples illustrate some of these issues



Case Studies Supply Chain & Raytheon

Counterfeit Detection / Interpretation Challenges



Supply Chain Case Example 1-

High volume flash memory ; Training Issue

- Parts contained in OCM packaging. Labeling, Component finish / quality consistent with OCM
- Visual Inspection & surface tests executed per 1010B: for Authenticity (06 week 42)

Barcode readout, verify component info.
 Inspect mold cavities
 Dimensions per datasheet
 Verify OCM markings, P1 location
 Top / Bottom surface Match
 Marking Permanency
 Surface Test (Blacktopping)
 No reported ERAI Instances
 Date code verified with supplemental EOL information

- Customer noted mold mark opposite Pin1 was textured, claimed part was re-surfaced, <u>Iot rejected</u>
- Surface test in-correctly executed, results misinterpreted
- P1 mark is always smooth, alternate mold marks can be textured!
- Enhanced optical / textured images Revealed acetone and excess Burnishing smoothed part surface
- Enhanced digital imaging highlights black top evidence. <u>NONE</u> present



wing item due to blacktoppin

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Training, test execution & Interpretation leads to false Indictments!

Supply Chain Case Example 2-

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High volume flash memory ; Database Issue, EU RoHS Interpretation

LH 28F160S5HT-L70

- OCM packaging & consistent component finish, pass 1010B QC inspection. No report history in ERAI database
- Customer questioned date code (06 week 32), ERAI database reports a LTB of <u>12/31/04</u>. Incorrect info. entered in IHS —
- OCM responds with PCN / EOL LTB date of <u>8/31/06</u>, last ship date <u>11/30/06</u> {builds continue 6-12 months after LTB}
- Customer part number search indicates product is Tin/Lead, box states "Lead Free"
- RoHS transition year- Some OCMs DID NOT change part numbers or add LF markings
- OCM did not respond to tech. support *LF* request. Customer accepted part on risk, verified parts were "Lead free" via XRF



Industry is looking at ICs with a lot of scrutiny & are risk adverse!

Supply Chain Example 3-

EU RoHS Compliance ; Inconsistent OCM Implementation

- RoHS & WEEE Legislation implemented in the EU in the 2006 timeframe
- Continues to cause confusion in the legacy supply chain. Various OCM's implemented RoHS at different times using non-uniform marking methods
- In transition years- (04-07) Some OCMs DID NOT change part numbers or add LF markings
- Others marked outer packaging label, added symbols, prefix, suffix or changed part numbers
- Example OCM compliance notice provided, delineates between RoHS 5/6 & 6/6 RoHS with a suffix letter designation
- Language and designation in compliance document is confusing
- **RoHS 5/6 = Tin/Lead plating, 80% Compliant RoHS** 6/6 = Lead Free or 100% Compliant
- Implementation lends itself to CF remarking

RoHS EU Directive Compliance

Section 21.0

The European Union (EU) has adopted a new directive 2002/95/EC, the Restriction of Hazardous Substances ("RoHS Directive"), which will restrict the use of certain substances, including lead (Pb), in electrical and electronic products. The directive applies to all such electrical and electronic products and their component parts that will be placed on the market after July 1, 2006. In addition to lead, the directive restricts the use of mercury, cadmium, hexavalent chromium, and certain halide-containing flame retardants.

Lead free parts are compliant to EU Restriction of Hazardous Substance (RoHS) Directive 2002/95/EC. The Lead-free package option is available today. Lead-free parts will have a letter 'G' added to the top line of the part marking. See example below

standard (non "G") parts are compliant to 5/6 RoHS substances, exception being

Hg - Mercury Cd - Cadmium Cr+6 - Hexavalent Chromium PBB - Polybrominated Biphenyl PBDE - Polybrominated Diphenylether.

RoHS Compliant Part Marking

RoHS Compliance = Lead Free? Depends, easy to remark & easily indicted!

Pb.







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Supply Chain Example 4-

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PCI Bus Controller ; Mask protection symbol removal not documented

- Several data sheet inconsistencies noted during inventory inspection, part verification
- Row #1- Logo, takes up 2 lines XYZ Co.
 PCI COMM CHIP
- Row #3- Contains letter instead of the Mask protection symbol, as indicated. Datasheet does not define this (Symbol NOT required for protection)
- Mask protection symbol- Efforts by OCM's to protect discrete component forms & die surface layout. Intent to protect physical die artwork
- Row # 4- Does contain a mask set revision code (defined in data sheet)
- Row #5- Missing, sub-contractor code. Datasheet does not clarify. Implies made at the OCM foundry
- Disclaimers- OCM reserves the right to make changes to product & datasheet without notice



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Additional work & data analysis required for inspection

Supply Chain Example 5-

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Precision Op-Amps; OCM Parameter Binning, Unconventional marking

- OCM packaging & consistent component finish, pass 1010B QC inspection Date code: 2006 week 36
- Component packaging & leads pristine, copper present on the lead ends, known device traceability
- EOL check indicates this product is still in production, low cost / reduced counterfeit risk
- OCM changes P/N by "Parameter Binning" these devices through test
- V offset: OP277U A = +/- 50uV; Drift +/- 1uV
 V offset: OP277U = +/- 20uV; Drift +/- 0.15uV
- Unconventional marking method used to bin the lot, raises concerns in today's QC risk adverse inspection. Seen as "suspect"
- Not able to verify marking convention for date code
- ERAI reports found on this device for other issues. High volume / low cost devices can be a target for counterfeiters



New parts <u>scrapped</u>, cost / availability of device not worth selling

Supply Chain Example 6-

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RS-485 Quad Line Rcvr.; Inspector Training, OCM Silkscreen Alignment

- OCM packaging & consistent component finish, pass 1010B QC inspection Passed ALL quality tests Date Code: 2003 Week 26
- Components appear brand new / un-used.
 Silkscreen alignment anomaly. Issue encountered, newer devices / certain OCM's
- Components loaded in OCM tubes, taped & sealed, known origin device traceability
- EOL check indicates equivalent product in production, in alternate component form factor. Reduced counterfeit risk
- NO ERAI reports found for this supplier or device type, legacy technology
- Blemish in lead plating during inspection noted as contaminant (Mark is from tube contact). Inspector retrained
- Identified in 1010B, as SUSPECT
- Another form factor DMSMS Issue product verified in support of legacy programs



New parts <u>scrapped</u>, cost / availability of device not worth selling

Supply Chain Example 7-

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CMOS, Quad Op-Amp; Training, OCM Product Line Marking Convention

- OCM packaging & consistent component finish, pass 1010B QC inspection Passed ALL quality tests Date Code: 2005 Week 27
- Components appear brand new / un-used. In OCM packaging & Reel. Bag / Reel & packaging info. Match to point of OCM origin
- EOL check confirmed product is in production, common part made by OCM & multiple suppliers, Reduced counterfeit risk
- NO ERAI reports found on this supplier device type, common circuit technology
- QC Inspectors concerned by Font / Alignment change on Row #1 "7"
- OCM uses unconventional methods to Identify product lines, QC informed of Unique OCM marking
- Cursory knowledge Required! detailed datasheet w/ die size & circuit layout but part number marking convention, not listed!



Parts passed inspection, provided to customer

Supply Chain Example 8-

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1-2 way opto-coupler / Isolator; Training, Customer Construction Knowledge

- Packaging, component finish, Dimensions, markings, surface Inspected to 1010B, *Passed*
- OCM uses alternate packaging methods, body & lead cut looks rough as a result. Leads, body, markings in new / unused condition
- EOL / database check verified parts still in production & has not been reported
- Discrete component provider offers "packaged" footprints for CCA attachment. Lot from a reputable Authorized Distributor
- High volume, special case components DO NOT always follow IC OCM Quality Standards!
- Components sold to customer with details communicated about appearance
- Customer QC rejected parts for suspect resurfacing, NO evidence provided
- Withheld return of parts despite sharing data / Information related to these part types









Training and research on OCM construction & Q levels required

Raytheon Example 1-

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Fixed Delay Line, Data I/O; Training, Construction Knowledge

Components provided to FA lab as "suspect counterfeit"

Failure during CCA assembly Lead solderability Issue, de-wetting from solder pads **Components indicted as "suspect**" Based on appearance due to counterfeit awareness

>> Surface sanding marks evident & poor quality ink marking

>> Component package appearance seems rough / damaged

- SEM-EDS Analysis Revealed
 - Intermetallic formation Beneath the Tin/Lead, caused the de-wetting, *Supplier plating issue*
 - Supplier provides custom timing devices based on customer's circuit design application
 - Part markings, surface finish consistent with manually assembled specialty components
 - > Fixed Digital Delay Lines (DDLs) > Time Delay Units (TDUs)
 - > Bite Line Filters

> Low Noise Amplifiers (LNAs) > RF Filters (LP, HP, BP)



Components from Stores provided along with failures

Raytheon **Raytheon Example 1-**Space and Airborne Systems Fixed Delay Line, Data I/O; Sanding Marks, Poor Construction & Print Quality Consistent Sanding Marks, **From Manual** Assembly Lens Z00:X20 0.1000inch **Manually Component wall** stamped epoxied in place, Ink Marks **Cavity filled with** All dimensions & lead potting & sanded formation MEET PRINT 0.1000inch

Supplier Issue indicted as counterfeit based on cursory knowledge

Raytheon Example 2-

High Freq. Amplifier- IF AMP; OCM Revision / DS updates / Design tolerances

- Components acquired to support a 20 board build for legacy program upgrades. 17 components per board
- Components obtained from approved ID, purchased from their approved supplier. Previously owned by Raytheon, sold as excess inventory!
- Updated CF requirements instituted Q notes requiring authenticity & electrical testing
- Passed Supplier tests & incoming inspection
- Amps. failed during CCA electrical test (low gain) & indicted as suspect counterfeit due to physical differences. Components had 2004 DC
- Components with an older date code remaining in stores worked! OCM discontinued part in 2009
- OCM revised component 4x during production, lead frame, wire bond & mold changes. Lead width failed tolerance & paddle width marginal
- OCM confirmed effects of longer ground loop on gain
- CCA design did not optimize circuit to provide gain in nominal range (db roll-off shifted to the right)
- PCN not released, the effect of ground loop gain changes at frequency *not documented* In the datasheets!

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Amps. replaced with legacy components date code 2000 Added requirements do not always yield positive results!



OEM Counterfeit Incidences

Examples- Raytheon Past History, Evolving Threats

Remarked Parts- FY 2010-11

- Coating used to cover original "ghost" markings date code 9917 (1999 Week 17) then remarked with date code 0418 (2004 Week 18)
- > Xilinx discontinued this part in 2002







Visual & Surface Tests

Lead Frame & Die- FY 2010-11

Lead Frames Different **Die Layouts Different** A2009-02026 RAYTHEON IDS HQ 07/15/09 XILINX G744532-13 A2009-02026 RAYTHEON IDS 07/15/09 XILINX G744532-13 A2037808A DC0418 SN3 V1 A2037808A DC0418 SN3 V2 A2009-02026 RAYTHEON IDS HQ A2009-02026 RAYTHEON IDS HQ 07/15/09 XILINX G744532-13 07/15/09 XILINX G744532-13 A2037808A DC0418 SN5 V1 A2037808A DC0418 SN5 V2

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X-Ray evaluation examines differences

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Logo & Wrong Die- FY 2010-11

Found inside - IDT 49C465 Should be Cypress VIC068A-GMB 64 BIT Error Detection & Correction VME Interface Controller VIC068A-GMB 5962-9201001MXC **USA 0037** C93707 △ 07330 1991

Crude package level remarking

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Detection Methods-*Non-destructive*



different signal gain levels for image enhancement

confirms hidden markings revealed non-destructively w/ CSAM

CSAM imaging reveals sub-surface markings

FA Commercial Counterfeit Incident

5962-8771501CX ; Dual Op-Amp, *May 2012*

Customer:

- Requested RCA of failed devices
- Known good & failed devices provided

Follow on Analysis

- Marking Differences noted
- X-ray & Optical Die differences noted
- Multiple Die Inside
- Linear Tech Confirmed these were counterfeit

ISSUES:

- Many long lead components (previous slide) acquired PRIOR to NDAA 2012
- Latest legislation applies to all materials in stores, regardless of acquisition date. Effects stock



T1002AMJ/883

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Solder plating obscures lead extensions

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Incident: Op-Amp Sept. 2011

L00024H/883 (MIS-19837/04) Hi-Rel Op-Amp out of production since 1998



Terminations breaking during lead-forming process, leads visually appeared undisturbed

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Lead Extensions- Weld zone comparisons



Two termination constructions revealed during cross-sectional analysis





Iron-Kovar & Kovar-Kovar extensions evident & structurally weaker

Recent Incident- MIS19837-88 Apr. 2012

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Reported by Incoming Inspection

- Suspect lead dimensional issues
- Failed electrical test, 60% yield

Materials Failure Analysis

- Leads breaking at a noted weld point
- Markings failed solvent permanency tests, even peeling with tape
- Peeling and flaking plating, failed external visual inspection

Part Information & History

- Out of production, \$91.00 each
- Purchased from ID Source in 2010
- ID source acquired from MVP?
- 3rd Confirmed T0 can incident in 4 years



Summary, Recommendations-Analysis, Training

- Legacy OCM component quality [some suppliers] varied in the 1995 2010: MIL-STD dis-continuation; market demand / cost competition; legacy quality programs did not scale with demand; automated packaging / integration / inspection processes required improvement for high volume manufacturing (AOI / AXI)
- Industry standards & best practices defines inspection criteria but do not provide guidance on interpretation
- Execution of visual and surface inspection analysis technique knowledge gaps exist within the supply chain- *Training, AS 6171, OCM engagement, Experience!*
- Interpretation is subjective, requires working knowledge of IC supplier assembly / packaging construction, OCM markings & finish quality levels- *Review of lessons* learned repository / consortia databases (of similar non-conformances) should be a required for analysis. There are always exceptions to the rule!
 - Not called out in requirements, procedures or work instructions
 - Improves interpretation, increases knowledgebase

Establish a DoD - Industry working group Improve Analysis, Training & Reporting

Summary, Recommendations-

Reporting & Keeping Informed

- Minimum reporting guidelines for analysis, supporting images & documentation, HAVE BEEN ESTABLISHED to improve data collection & reporting
- Continue participation in workshops, conferences, networking events, roundtable discussions: We collectively learn from sharing analysis and results, increases experience knowledgebase & reduces errors

Resources & Links:

Raytheon- Counterfeit Avoidance Team activity
 Component Technology Network (CTN) & Counterfeit Parts: Internal websites
 CAT resources: Participate in internal / External industry activities

Access to: Q notes, enterprise resources, procedures, standards, papers, presentations

Raytheon Counterfeit Part Tool (RCPT): Internal Incident Database

- Perform Searches Review supplier Info.
- Supplier Assessments Create RCPT Incident Report
- 2. Counterfeit Parts- Industry Blog, Wordpress: counterfeitparts.wordpress.com
 - Tracks Federal Register, industry & standards activity related to counterfeit components & Materials
- 3. Standards Gap Analysis: counterfeitparts.files.wordpress.com/2014/09/stds_gap_analysis_140915.pdf
 - Related to CF prevention, detection, avoidance, published / maintained by H. Livingston (Sept. 15, 2014)
 - Maps high level detection / avoidance elements. Select standards to optimize organizational CF mitigation
- 4. Utilize Networking Media- www.linkedin.com Several Relevant Interest Groups

Industry involvement is critical to success!

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Acronyms, Definitions

AT&L: Acquisition, Technology & Logistics; DoD undersecretary (OSD) *IP:* Intellectual Property, patented or trade secret body of work AD: Authorized Distributor **ITAR:** International Traffic in Arms Regulations AOI / AXI: Automated Optical / X-Ray Inspection, Process improvement KPA: Key Process Area Legacy: Previous generation system (Military / Aerospace) ASL / PSL: Approved or Preferred Supplier List LF: Lead Free **BU:** Business Unit LMS: Learning Management System, Raytheon Training tool CAT: Counterfeit Avoidance Team (Enterprise wide) LTB: Last Time Buy **COTS:** Commercial Off The Shelf (components, products) MDA: Missile Defense Agency **CB:** Certification Body **MIL Spec:** Military Specifications **CPB:** Customs Protection & Borders MIL-STD: Military Standard (specifications) CPI/CI: Critical Program Information / Counterintelligence NC: Non-Conformance, Electronic Components, Hardware, Material or Process CTN: Components Technology Network (Enterprise wide) NDAA: National Defense Authorization Act, Implemented Annually **DFARS:** Defense Federal Acquisition Regulation Supplement **NHA:** Next Higher Assembly **DHS:** Department of Homeland Security OCM: Original Component Manufacturer **DLA:** Defense Logistics Agency **OEM:** Original Equipment Manufacturer (Systems) **DLAD:** Defense Logistics Acquisition Directive OSD: Office of the Secretary of Defense (U.S.) DMS: Diminishing Manufacturing Supply (source) PCN: Product Change Notice DoD: Department of Defense (U.S.) PLCP: Product Life Cycle Process DoJ: Department of Justice (U.S.) **POC:** Point Of Contact ECA: Electronics Components Association Standards **PPP:** Program Protection Plan EHS: Environmental Health & Safety Prime: System Design Lead / Provider EOL: End Of Life (System Refurbishment / Upgrades) QC: Quality Control ERAI: Electronic Resellers Association Incorporated **RESA:** Raytheon Enterprise Supplier Assessment ETMA: Engineering Technology & Mission Assurance **RoHS:** Reduction of Hazardous Substances FD: Franchised Distributor RTN: Raytheon GAO: Government Accountability Office (U.S.) SAE: Society of Automotive & Aerospace Engineering **GIDEP:** Government-Industry Data Exchange Program SEM-edx: Scanning Electron Microscopy-energy dispersive x-ray spectroscopy **GIFAS:** French Aerospace Industries Association SASC: Senate Armed Services Committee ICE: Immigration & Customs Enforcement SIA: Semiconductor Industry Association **IEC:** International Electrotechnical commission SME: Subject Matter Expert IC: Integrated Circuit SMT: Surface Mount Technology **ID:** Independent Distributor Supplier: Sub-system component provider, Sub-Contractor **IDEA:** Independent Distributors of Electronics Association **WEEE:** Waste Electrical & Electronic Equipment Directive **iNEMI:** International Electronics Manufacturing Initiative WG: Working Group Infringement: Describes a violation of rights on intellectual property, copyright or patent XRF: X-ray fluorescence

Abstract

With the implementation of expanded regulations & rules, how we inspect, test & forensically analyze sub-system components should be evaluated, along with updated training material. Industry best practice SAE standards, IDEA & ERAI inspection / analysis criteria continue to evolve, as counterfeiting methods & other supply chain issues are un-covered. In this presentation, we will look at suspect counterfeits and non-conforming electronics analyzed in the laboratory. Several supply chain OCM examples will be provided.

How do we differentiate between counterfeits and non-conforming hardware when observed anomalies at times can be so similar? How do we categorize these, when there are issues related to chain of custody, access to a full suite of analytical tools is limited / cost prohibitive and the OCM is not obligated to provide assistance? When it comes to obsolescence & DMSMS legacy related issues, this becomes a serious problem and a area of risk & concern.

We will compare IDEA-STD-1010B Inspection guideline (Ch. 16) to a recently updated (July 2014) comprehensive non conformance inspection procedure, provided by ERAI. A listing of resources and Links related to the counterfeit Issue, a comparison of industry standards to assess which are a best fit for a particular technology sector, along with best practice recommendations will be provided in this presentation.