“RISK MANAGEMENT AND MATERIAL PROTECTION OF EEE COMPONENTS: NON-COMPLIANCE, COPY CATS AND FRAUDS™”

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*COPYRIGHT 2018. DEDICATED TO CHIEF THOMAS MICHAEL REILLY, USN (RETIRED) AND CREW, U.S.S. HELENA BOMBED AT PEARL HARBOR 7 DECEMBER 1941 AND RETROFITTED BUT SUNK AGAIN AT BATTLE OF KULA GULF 6 JULY 1943.
SUSPECT COUNTERFEIT ITEMS AWARENESS TRAINING

SUSPECT COUNTERFEITS INCLUDE

Materials

Equipment

Components
DEFINITIONS

Suspect Counterfeit Item
+ A suspect item (SC/I) that is
  A copy or substitute *without legal right or authority* to do so, or
  One whose material, performance, or characteristics are *knowingly*
  *misrepresented* by the vendor, supplier, distributor, or manufacturer

+ If a product can be manufactured, it can also be counterfeited.

EEE Part
Electrical, Electronic and Electromechanical (EEE) Parts can constitute ESD Sensitive Devices (ESDS) or Components.
CAN SUSPECT COUNTERFEIT FIRE EXTINGUISHERS POSE A REAL RISK?

Candice T. Bruce, MSgt
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440 SCOS/GWAB
192 SCMS
23 Sweeney Blvd.
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DSN: 575-5320
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Suspect Counterfeit Fire Extinguishers

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Captain Perry Vermillion and Crew of the LA County Fire Department
REAL
There is a Different serial # for each extinguisher

FAKE
Screen Printed Label

ULTRAFIRE?

Suspect

900 mAh 3.6 V
1200mAh 3.7 V

Real Deal

Marking
SUMMARY OF THE ULTRAFIRE

The blue one is suspect counterfeit of brand name UltraFire Li-Ion battery. The genuine one is rated at 3.7 Volts, 900 mA-hr and tests out at about **900 mA-hr**. The blue one is rated at 3.7 Volts, 1200 mA-hr but tests out at about **350 mA-hr**. The real one also has a protection circuit built-in to prevent fire/explosion, the blue one does not have any protection. Blue battery from on-line source and grey real battery from Battery Junction.

Moore’s Law: Microprocessor Densification from 1971 to 2018

![Moore's Law Graph](image)

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Overview of Spacecraft that falls into SmallSat Category

Satellite Densification

LADEE
- 844 lbs.

CYGNSS-1
- 64 lbs.

PhoneSat 1.0
- 3 lbs.

KickSat
- 0.011 lbs.

100 kg to 500 kg

10 kg to 100 kg

1 kg to 10 kg

<1 kg

Minisatellite

Microsatellite

Nanosatellite (CubeSat)

Picosatellite

NASA/TP-2015-216648/REV1

Power Plant Rooms by Kevin Brophy
NASA ADVISORY PUBLICATION
MAY 2018

“The Wireless Wriststrap” aka
Suspect Counterfeit Wearable

by
Bob Vermillion, CPP/Fellow
RMV Technology Group LLC

IN COLLABORATION WITH
NASA Langley Research Center
NASA Armstrong Flight Research Center
and
NASA Johnson Space Center

THE CORDLESS WRISTSTRAP

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Walking on Tile Floor wearing a Cordless Wrist Strap

Body Voltage Generation Analysis Test Summary

Peak Voltage: -704 volts & 960 volts

Walking on Tile Floor wearing a Wrist Strap with Ground Cord

Volts

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ESD PACKAGING THAT IS BEING SUSPECT COUNTERFEITED!

Long Term Storage = Issues?
Long-Term Storage/Antistatic Transfer

ANTISTAT CROSS CONTAMINATION RISKS

- Recycled Dip Tubes:
  - Loss of ESD Properties
- Knock off Dip Tubes:
  - Not ESD Safe
Antistatic Migration
- Failures: Handling/Inspection
- Failures: Manufacturing
G-19A DEVELOPS EEE PARTS PACKAGING RECEIVING PROTOCOLS FOR ESD SENSITIVE DEVICES

SAE Develops Protocols for ESD Incoming Inspection that includes the following:

1. MBB (Type I, ESD Aluminum Shielding Bag)
2. Static Shielding Bag (Type, III Metallized Layer)
3. Humidity Indicator Cards (HICs) - Desiccant
4. IC Antistatic & Conductive Carriers (Dip Tubes)
5. JEDEC Trays
6. Vacuum Formed ESD Polymers
7. ESD Paperboard
8. Tape & Reel
9. Antistatic Polyurethane and Polyethylene Foams
10. Vacuum formed Trays or Clam Shells
11. Antistatic Bubble & Pink Poly Issues
12. Labels

Google Map your Supplier!

Is your Distributor Located in a Business Center or is it only a mailbox?

A so-called “Suite” can really be just a Mailbox
SUSPECT COUNTERFEITERS DO NOT PRACTICE ANSI/ESD S20.20 PROCEDURES

ANSI/ESD STM4.1 Work Surface

- WRIST STRAP
- ESD GROUNDED MATS
- ESD GROUND MAT
- STAND ON SURFACE
- EQUIPMENT GROUND
- GROUND TERMINAL
- Ionizer
Suspect Counterfeit Products

Dip Tube

Tape & Reel

Dip Tubes From China
Field Test 2-Point Resistance of Dip Tube

Failed

Blue Antistat Bubble Wrapped Around Dip Tube

Readings

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THE RISK IS NOT TESTING JEDEC TRAYS THAT MAY BE SUSPECT COUNTERFEIT

Being ANSI ESD S20.20 Compliant does not insure knowledge and performance on how to package, how to handle, how to store, how to ship, how to repackage sensitive parts and components!
Insulative JEDEC Tray Promotes a Discharge!

Tape & Reel Package

Separate Cover Tape from Carrier while Grounded
SUSPECT COUNTERFEIT REEL

Risk Production Failures

1.5 x $10^{12}$ ohms

-15,080 volts

Good Parts on a Suspect Reel = Issues!

Catalog & Internet Hazards

Packaging Engineering Static Control Protocols
Grid Bag “Lack of Performance”

ANSI/ESD STM11.31 (Shielding)

1358 nJ

<20nJ Limit

Sensor Lab
EEE Parts
(ESD Sensitive Devices)

Suspect Counterfeit Awareness Training
Emphasis is traditionally focused on the part or Component.

Courtesy of PCX Inc
The “After” is a training simulation at RMV illustrating how a sophisticated counterfeiter using a “walnut blaster” can remove original lettering!

TAKE AWAYS

1. Qualify and Specify products for Purchase!
2. Don’t rely on Vendor Specification Sheets.
3. Conduct Packaging and ESD Material Reviews.
4. Know the Products your Purchase.
5. Trust (Test) but continue to Verify beyond a visual inspection process!
6. Training! Training! Training!
7. Place Suppliers on a CoC Program.
Headquartered at NASA Ames Research Center since 2008, Bob Vermillion, a foremost Industry Leader in specialty materials science and SME in Electrostatics, was named the ESD Technical Authority for NASA in 2018. From the development of an advanced ESD material for a Mars mission in 1999, the Ameristar winner of the USA Top Electronics Packaging Engineering Design in 2002, Bob’s anti-counterfeit embedded watermark was a precursor to some methods in use today for identification of counterfeit materials. Inducted into the IOPP College of Fellows in 2007, Bob Vermillion was the First to Present and the First to Publish on “Non-Compliant & Suspect Counterfeit ESD Materials Used in the DoD Supply Chain” for the NASA Quality Leadership Forum, Cape Canaveral, Florida in 2010. RMV was named 2014 Corporation of the Year by NIPHLE, whose members include the DoD and the support contractor community. In 2018, Bob was awarded the prestigious James A. Russell Lifetime Achievement Award for Packaging Engineering innovations and technology excellence to protect the Warfighter.

Founder and Co-Chair of the SAE G-19 Subcommittee on EEE Packaging, Bob is an active member of the NASA Interagency Working Group (IAWG – ESD) and Advisory Board member of the NASA Academy of Aerospace Quality (AAQ) in partnership with Auburn University.

In 2018, RMV developed the first ESD training program specially designed for NASA, the US Military and the contractor community that supports the manufacture of electronic components called the iNARTE® Certified ESD Aerospace & Defense Engineer™ Training with international certification through Exemplar Global (ASQ).
As an independent provider of technology engineering services, RMV is the largest ESD materials test laboratory of all NASA sites. Core capabilities include R&D support for advanced and specialty materials, flexible electronics test and evaluation, technical and specification writing plus Suspect Counterfeit “hands on” training for Industry and Government.

For Training Information on ESD & Suspect Counterfeit:

Please visit our websites that can be found at www.esdrmv.com (for Industry) and www.esdaerospacetraining.org (for government) to view the list of recent technical articles in peer-reviewed publications and the blog for the most updated news and events. For direct inquiries, please contact Bob Vermillion at bob@esdrmv.com or call 650-964-4792.

THIS AWARD FOLLOWS THE 2015 NIPHLE CORPORATE AWARD TO RMV, ONE OF THE FEW SMALL BUSINESS FIRMS TO RECEIVE THIS COVETED AWARD IN SUPPORT OF THE WARFIGHTER FOR PACKAGING ENGINEERING INNOVATIONS AND CONTRIBUTIONS. IN 2016, THE CORPORATE AWARD WAS PRESENTED TO NORTHROP GRUMMAN MISSION SYSTEMS.

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