

# MDA/QS CQSDI Brief



**Mike Wadzinski**  
**Director**  
**Quality, Safety and Mission Assurance**  
**February 24, 2015**

**DISTRIBUTION STATEMENT A.**  
Approved for public release;  
distribution is unlimited.

Approved for Public Release  
15-MDA-8130 (19 February15)

Version: 1



# Agenda

- **Bottom Line Up Front (BLUF)**
- **QS Organization Update**
- **MDA Assurance Provisions (MAP) Rev B**
- **Parts, Materials, and Processes (PMAP) Rev B**
- **MDA Assurance Reps (MAR) Regional Plan**
- **QS-Defense Contract Management Agency (DCMA) Partnering**
- **FY 14 Audit Summary**
- **Recent Quality Issues**
- **Recent Quality Initiatives**
- **Conclusions**

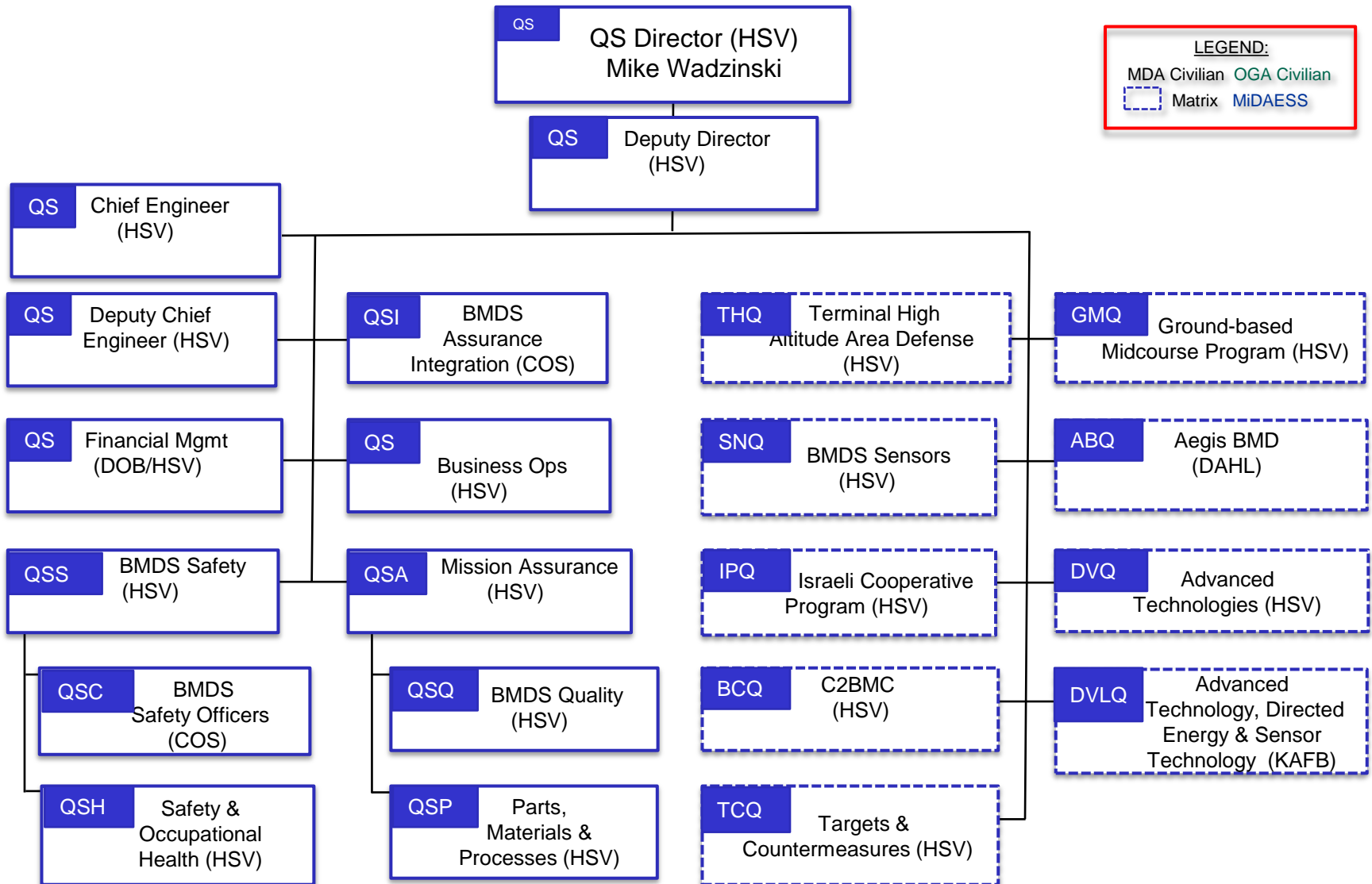


# BLUF

- **Why Quality is important**
  - Even the smallest parts matter, and for that reason everyone, up and down the supplier chain, has a critically important job – to ensure the Ballistic Missile Defense System (BMDS) is of the highest quality. This is an imperative for the nation.
  - The cost of a defect may be the cost of a city (when an interceptor or another part of the BMDS does not work, we cannot do our mission)



# QS ORGANIZATION





# MDA Assurance Provisions (MAP) Revision B

- Approved 13 June 2014
- Implementing on all new contracts; assessing existing contracts
- A standardized set of 14 Quality, Safety, and Mission Assurance provisions, requirements, and processes for mission and safety critical items:

## MDA Assurance Provisions (MAP)

- 3.1 Management
- 3.2 Design and Development
- 3.3 Software and Firmware
- 3.4 Technical and Mission Assurance Reviews
- 3.5 Reliability, Maintainability, and Availability
- 3.6 Parts and Materials Control Program
- 3.7 Integrated Test and Evaluation Program
- 3.8 Test, Meas., and Diagnostic Equip. & Stds.
- 3.9 Interface Management
- 3.10 Configuration Management
- 3.11 Control of Nonconforming Items & Materials
- 3.12 Fabrication and Quality
- 3.13 Supplier Management
- 3.14 Safety





# MAP Revision B Changes Summary

- **New Key Requirements**
  - **Integrated Digital Environment**
  - **Mandatory Government Inspections**
  - **Responsible Engineer**
  - **Verification, Validation, and Accreditation Processes of Models and Simulations**
  - **Software Development, Maintenance, and Operational Processes**
  - **Software Reliability Program**
  - **Firmware Development Plan**
  - **Reliability Surveillance of Deployed and Fielded Systems**
  - **Critical Lifts**
  - **Supplier Management System**
  - **Safety Critical Data and Software Isolation**
  - **Highly Accelerated Life Test and Highly Accelerated Stress Screen**
- **Replaced “developer” with “Government” and “contractor” throughout the document**
- **Added and consolidated metrics for all provisions into Appendix B**
- **Updated referenced specifications and standards**
- **Incorporated additional MDA policies and directives**
- **Streamlined and restructured configuration management provision**



# Parts, Materials, and Processes (PMAP) Rev B

- **Applicable Documents (References)**

  - **Government and Commercial**

- **PMP Management Structure, Roles, and Responsibilities**

  - **PMP Board, PMP Control Board, PMAG**

- **PMP Requirement examples**

  - **Electrical, Electronic, and Electromechanical (EEE) Parts**

  - **Materials**

  - **Corrosion Prevention**

  - **Prohibited Parts and Materials**

  - **PMP Quality Requirements**

  - **Counterfeit Parts**

  - **Radiation Hardness Assurance**

  - **PMP Qualification**

  - **Commercial Off the Shelf (COTS)**

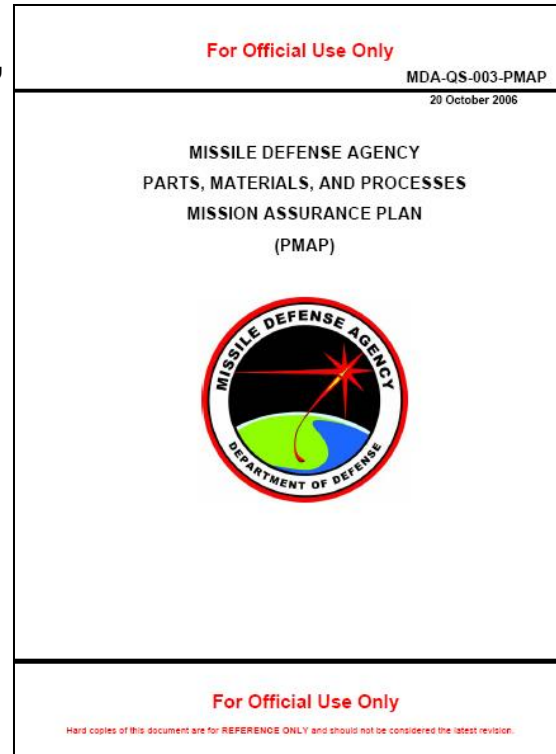
    - **Management**

  - **Failure Analysis**

  - **Environmental Controls**

  - **Handling**

  - **Preservation, Packaging and Storage**



- **Appendices**

  - Derating
  - Plastic Encapsulated Microcircuit (PEM)
  - COTS
  - Radiation Hardness
  - Assurance
  - Prohibited PMP
  - PMAP Data Items
  - Corrosion Prevention

**The MDA PMAP is widely recognized  
as the best high-reliability PMP plan in DoD**



# PMAP Revision B New Requirements

PMAP Para.	Change	Rationale
<b>3.1 Hardware Categories Definitions, Tables 1 &amp; 2</b>	Adds Target Category “T” similar to Cat “D” (Shipboard Environment) with additional requirements for Particle Impact Noise Detection (PIND) for cavity devices, non-destructive evaluation, parts traceability, special Destructive Physical Analysis requirements, supplier/vendor selection	Adds tailored Parts, Materials, Processes requirements for Targets (previously N/A)
<b>3.2.9 Electrical Connectors</b>	New paragraph invoking guidelines on connector selection, cleanliness, and maintenance	Provide guidance for connector selection
<b>3.3.11 – Friction Welding</b>	All friction welding processes shall be in accordance with American Welding Society (AWS) C6.2 or PMP Control Board approved alternative.	Covers Friction Welding for Titanium Spin Welding
<b>3.3.16 Composites</b>	New paragraphs 3.3.16 and three sub-paragraphs	Provides process requirements and design guidance due to complexity with composite in structural applications





# New PMAP Rev B Counterfeit Parts Requirements

**Includes specific receiving inspection requirements (PMAP 3.6.6) to assist in identifying counterfeit parts**

**Includes specific tests (Table 5) for preventing/identifying, requirements for containing, and notifying user community about counterfeit parts (PMAP 3.6.7)**

## **PMAP 3.6.8 Destructive Physical Analysis (DPA)**

- **For Space and Interceptor hardware, DPA shall be performed on 1 device per lot date code for ICs, Semiconductors, Stacked Caps, and custom Magnetics**
- **Once a possible counterfeit is identified, developer shall**
  - **Impound the part/material and *all others in the lot*, including any product already used in another assembly**
  - **Verify procurement source and certifying paperwork**
  - **Contact the manufacturer (also the distributor if needed)**
  - **Initiate a Government and Industry Data Exchange Program (GIDEP) Alert**

**PMP Team Must Work with Contractor Purchasing and Quality Organizations to Manage Counterfeit Parts**



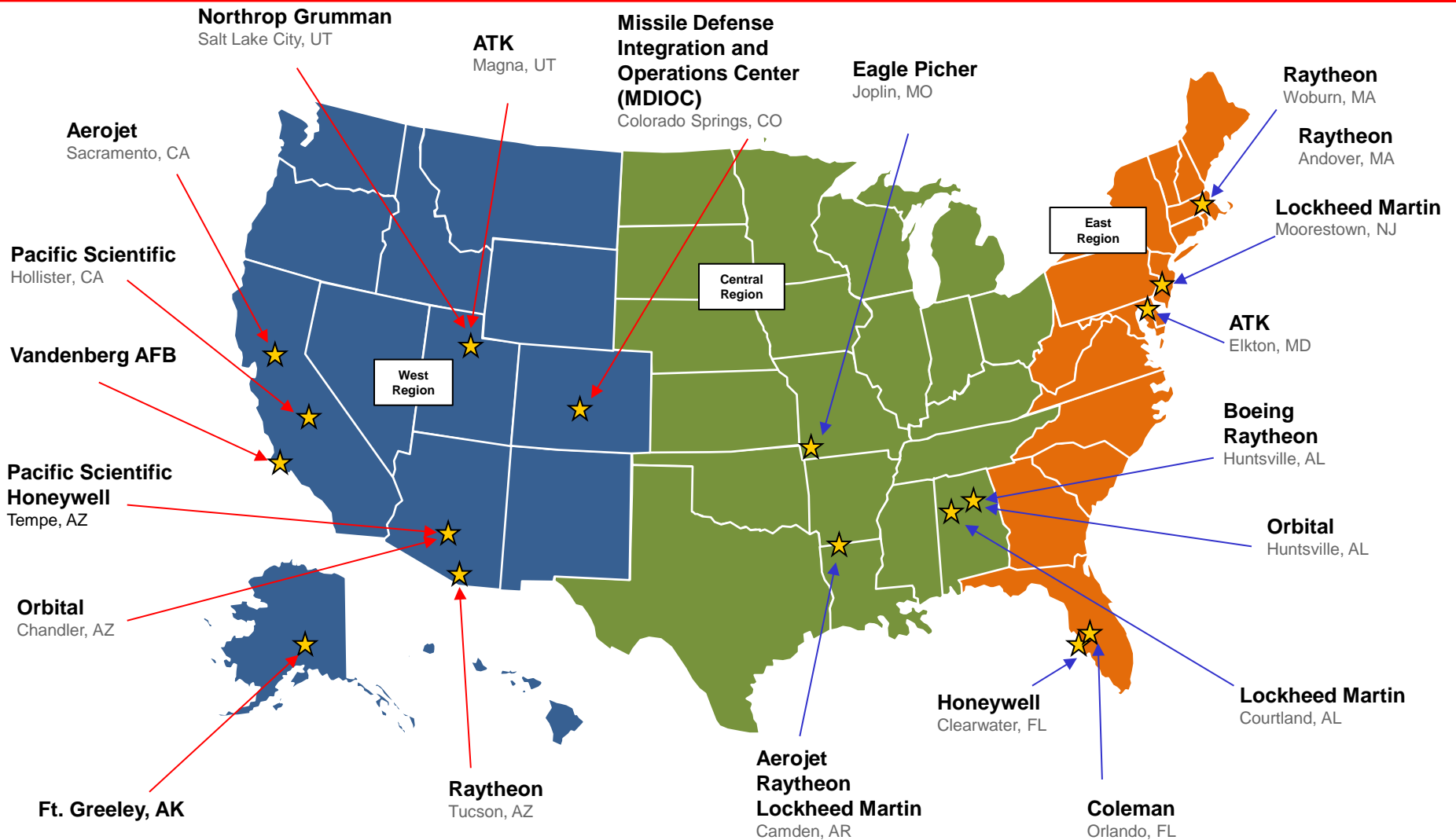
# PMAP Revision B

## Revised Requirements

PMAP Para.	Change	Rationale
<b>3.10 Commercial Off-The-Shelf Product Management</b>	Added a paragraph to address Information Assurance products evaluation and validation for compliance to NSA requirements	The acquisition of all Government OTS IA products to be used on systems entering, processing, storing, displaying, or transmitting national security information shall be limited to products which have been evaluated by the NSA, or in accordance with NSA-approved processes.



# MDA/QS MAR Locations





# MAR Regional Plan

**Purpose:** Expand the footprint of the current MARs to cover additional companies utilizing a regional approach to supplier management.

**Background:** Based on previous QS supplier assessments, many quality issues exist at lower tier suppliers. Approximately 1,300 issues were documented in 2012. This plan was developed to provide visibility into the sub-tier supply chain, to identify similar issues and mitigate the risks.

- 35 additional companies were selected to participate in the MAR Regional Plan based on complexity of hardware, critical function of hardware within the system, history of quality issues and production status of MDA programs.

## Results:

- The MAR Regional Plan has increased coverage from 19 sites to 54 sites.
- MARs have visited these companies to determine if suppliers are following industry best practices. The assessment activities are similar to the MAR's conduct of safety, quality and mission assurance activities at their parent contractor locations. Deeper assessments are performed as deemed needed.
- MARs work significant findings with MDA Program Offices.
- Additional suppliers being added as necessary.



# MDA-DCMA Partnering

- **Updating MDA and DCMA Overarching Memorandum of Agreement (OMOA) and Memorandum of Understanding (MOU)**
- **MDA & DCMA to conduct joint Technical Assessments on the MDA critical supply base**
  - **MDA training DCMA to MAP, PMAP Requirements**
- **MDA and DCMA to review and update program quality assurance surveillance**
- **MDA and DCMA developed common Supplier Questionnaire and share resultant data**



# FY 14 Audit Summary

## FY14 Audit Summary

- 5 Locations
- 237 Total Findings.
  - 202 Deficiencies (85%), 35 Observations (15%)

Tier	Duration	Date	# of Teams	Notes
2	4 Days	Completed 13 Dec 2013	7	38 Findings – 31 Deficiencies; 7 Observations.
2	4 Days	Completed 21 Mar 2014	5	12 Findings; all 12 Deficiencies.
1	8 Days	Completed 8 May 2014	7	87 Findings. 74 Deficiencies, 13 Observations.
2	5 Days	Completed 18 Jul 2014	4	22 Findings; 19 Deficiencies, 3 Observations.
1 & 2	5 Days	Completed 8 Aug 2014	9	78 Findings. 66 Deficiencies, 12 Observations.



# Recent Quality Issues

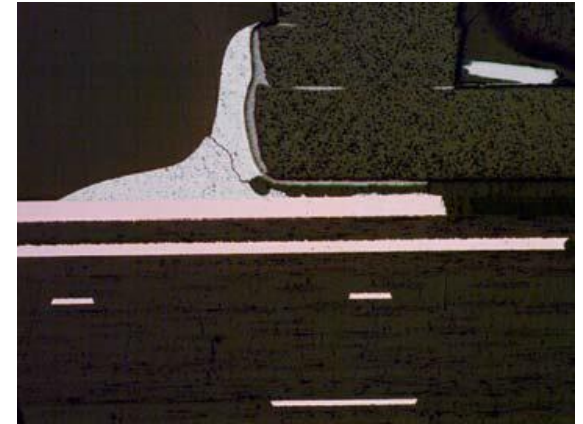
## Easily avoided quality escapes

1. **Gold embrittlement**
2. **Wrong Solder flux**
3. **Use of Pure tin**
4. **Improper application of Loctite**



# Gold Embrittlement

- **Gold embrittlement- improper removal of gold on leads prior to solder can lead to solder cracks/failure**
- **Gold Plating's are intended to preserve the solderability of surfaces even after an extended shelf-life**
- **Common sources of gold contamination include:**
  - **Plating on printed circuit boards**
  - **Plating on electron component terminations**
  - **Older Mil-Spec Integrated Circuits**
- **Industry continues to procure parts with gold leads without applying the proper mitigation to reduce the risk of gold embrittlement**
- **5 incidents in which circuit cards were installed in mission critical hardware at two separate prime contractor facilities without properly pre-tinning or solder bath.**
- **Results were solder joints containing 2 to 9% of gold by weight, which has significant solder joint embrittlement and reduction of endurance strength.**



Failure Due to Gold Embrittlement





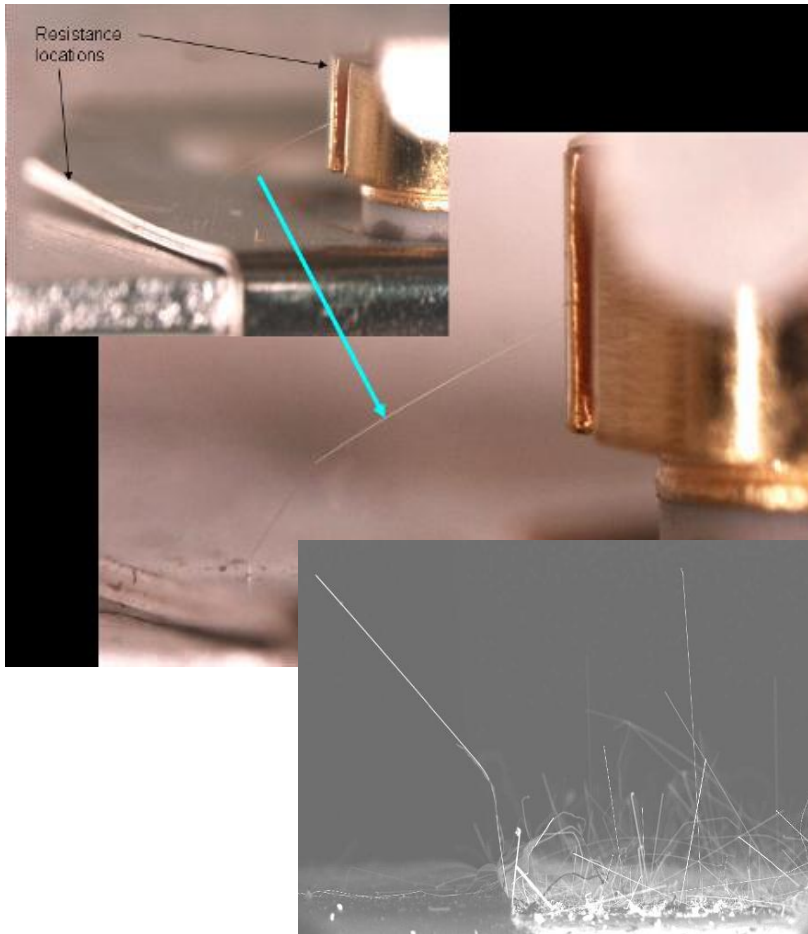
# Wrong Solder Flux

- **Wrong solder flux used on multiple cable assemblies increasing potential for corrosion**
- **Solder wire with Medium Activity flux core was used in the assembly of several harnesses**
- **Flux is required to be Low Activity to prevent long-term corrosive effects**
- **Manufacturer work instructions were ambiguous and the operator used a prevalent flux-cored solder for assembly (drawing requirement was correct)**
- **The non-conformance escaped initial First Article Inspection and was caught at a later re-inspection**
- **Highly Accelerated Stress Test conducted (temperature-humidity life test) using Arrhenius-Peck model to simulate service life and determine risk**



# Use of Pure Tin

- Use of pure tin parts increase potential for tin whiskers growth and foreign object debris (FOD) causing electrical short/failure



Tin Whiskers

- Pure tin in an electrical system can grow tin whiskers which can impact system operation by causing electrical shorts
- Tin-lead (Sn-Pb) is preferred to prevent the growth of whiskers (at least 3% Pb)
- Conformal coating mitigation may be compromised due to uncoated areas and degradation
- Risk analysis ongoing with inspection of residual hardware, growth prediction, failure modes and effects analysis



# Improper Loctite Application

- **During factory assembly and disassembly operations, loose connector jackpost nuts were observed**
  - **All units had seen CCA level vibration environments. Jackpost nuts had fallen off and become FOD**
- **Root cause determined to be insufficient Loctite applied to the jackpost threads due to ambiguous planning and operator variability at the sub-tier supplier**



# Recent Quality Initiatives

## **MAR As-Designed vs As-Built Product Assessments:**

- MARs are now performing independent assessments on complex assemblies with the goal of reducing escapes.

## **Supply chain requirement flowdown assessment -**

- Contractors sometimes flow down “all” requirements, even those that are not applicable to particular supplier. This can lead to confusion and nonperformance of requirements that truly are applicable.
- Contractors do not verify all requirements are being implemented by suppliers other than simple and insufficient receiving inspections



# Recent Quality Initiatives

- **Recent quality escapes at suppliers raised concern that other escapes exist that we do not know about.** As a result we are re-reviewing the following at high priority suppliers
  - **First Article Inspections** – In depth review of first production article to ensure it meets requirements.
  - **Hardware Acceptance Reviews** – Less in depth review of every article to ensure it meets requirements.
  - **Engineering Changes** – Changes made to design or manufacturing process that may cause product not to meet requirements.
  - **Requirements Flowdown** – Prime contractor requirements must be flowed down to supplier or supplier may make product that does not meet requirements.
  - **Manufacturing Instructions** – Detailed instructions on how to make a product. Need to be unambiguous and complete or product may not meet requirements.



# Conclusion

## MDA Quality Initiatives:

- **Updating requirements based on lessons learned, new technology and industry input.**
- **Partnering with DCMA to leverage capabilities**
- **Increasing lower tier supplier assessments**
- **MDA Audits still finding issues**
- **Simple escapes can cause big problems**
- **MDA initiating new quality initiatives to address concerns**

