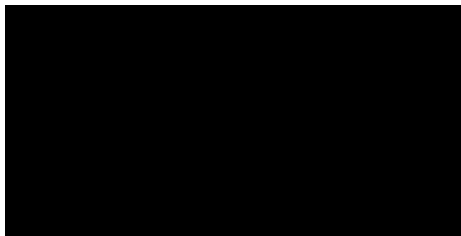




# Critical Global Market Challenges

Ivan Straznicky and Steve Edwards



# Critical Global Market Challenges

- Ivan Straznicky will discuss:
  - The challenges involved in ensuring and maintaining product integrity through RoHS compliance
- Steve Edwards will discuss:
  - The challenges of adhering to open architectures while ensuring that critical technology is secure and trusted when selling to foreign markets



# Critical Global Market Challenges: RoHS

Ivan Straznicky, Technical Fellow, Curtiss-Wright Defense Solutions

# Critical Global Market Challenges: RoHS

- Today's budget constraints and changing global mission strategy are increasing efforts for growth through international sales.

*Vice Adm. Joseph Rixey, Director, US Defense Security Cooperation Agency (Nov. 5, 2014):*

"...since 2001 and 2005, we were roughly averaging about \$12 billion to \$15 billion a year in sales. The last five years we've been over \$39 billion, almost \$40 billion per year."

# Critical Global Market Challenges: RoHS

- WEEE / RoHS

# Critical Global Market Challenges: RoHS

- WEEE / RoHS

- Rose?



# Critical Global Market Challenges: RoHS

- RoHS

- Row-house?



# Critical Global Market Challenges: RoHS

- RoHS

- Definitely not Ross!!!



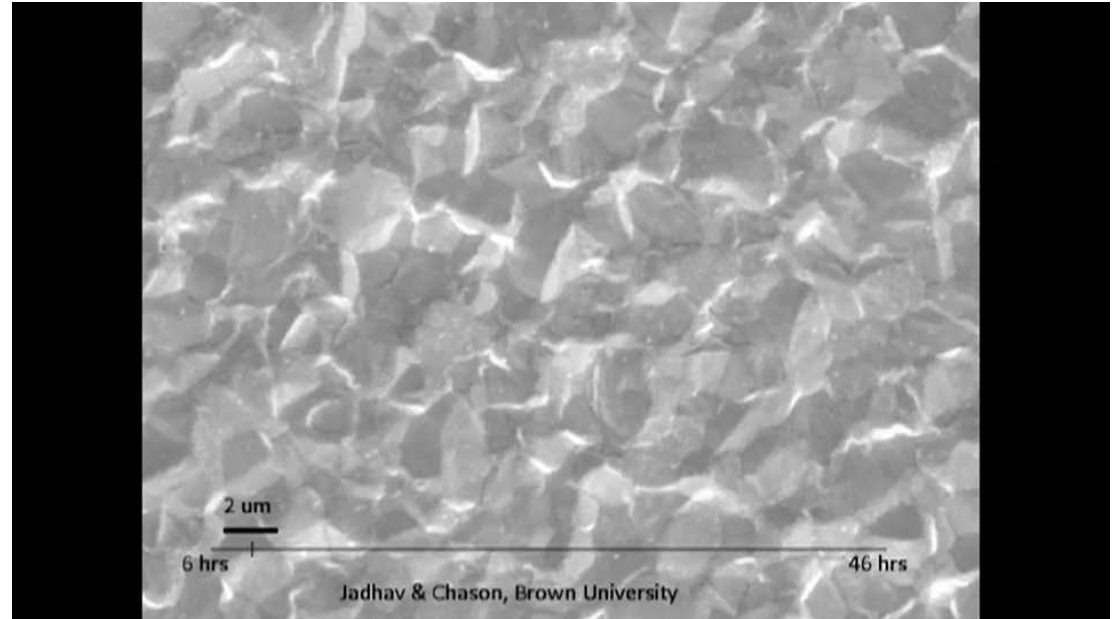


# Critical Global Market Challenges: RoHS

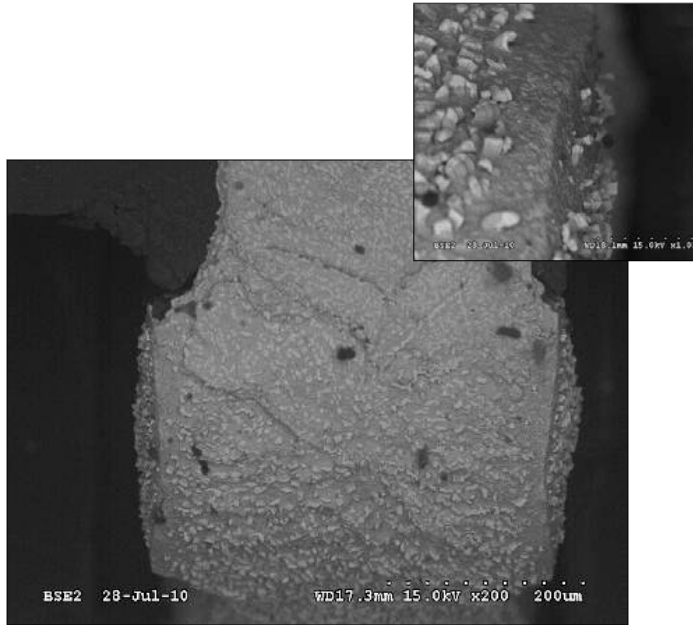
- RoHS = Restriction of Hazardous Substances Directive:  
*Restricts the use of certain hazardous substances in electrical and electronic equipment*
  - Introduced by the European Union in 2006
    - restricted the use of lead components on many electronic products
  - Recent changes instituted in July 2011
    - extended to include more electronic equipment categories, and removal of previous exemptions was initiated.

# Critical Global Market Challenges: RoHS

- The Tin Whisker phenomenon



# Critical Global Market Challenges: RoHS



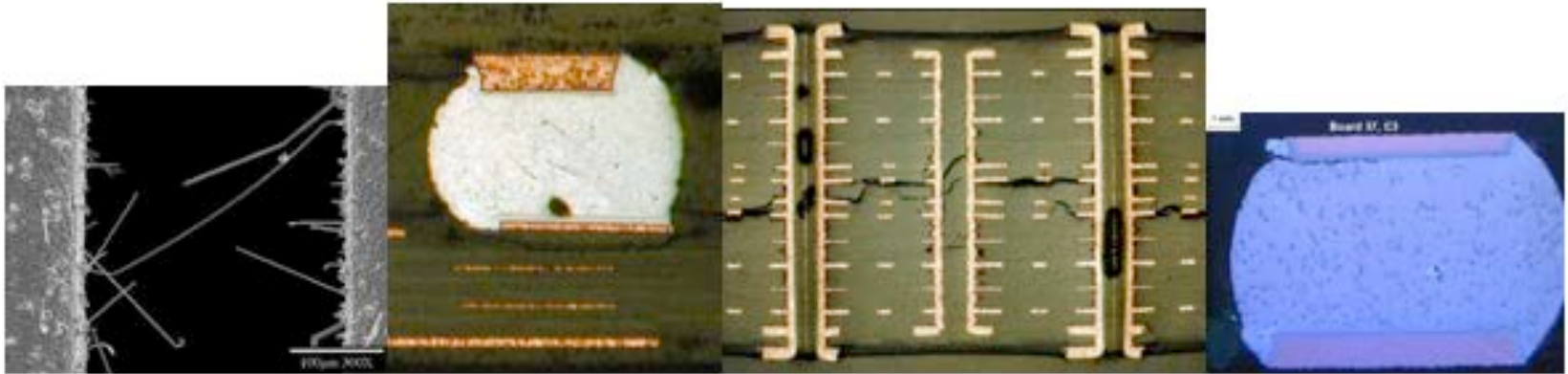
Hillocks on termination finish (SnPb card)



Whisker on termination finish (LF card)

# Critical Global Market Challenges: RoHS

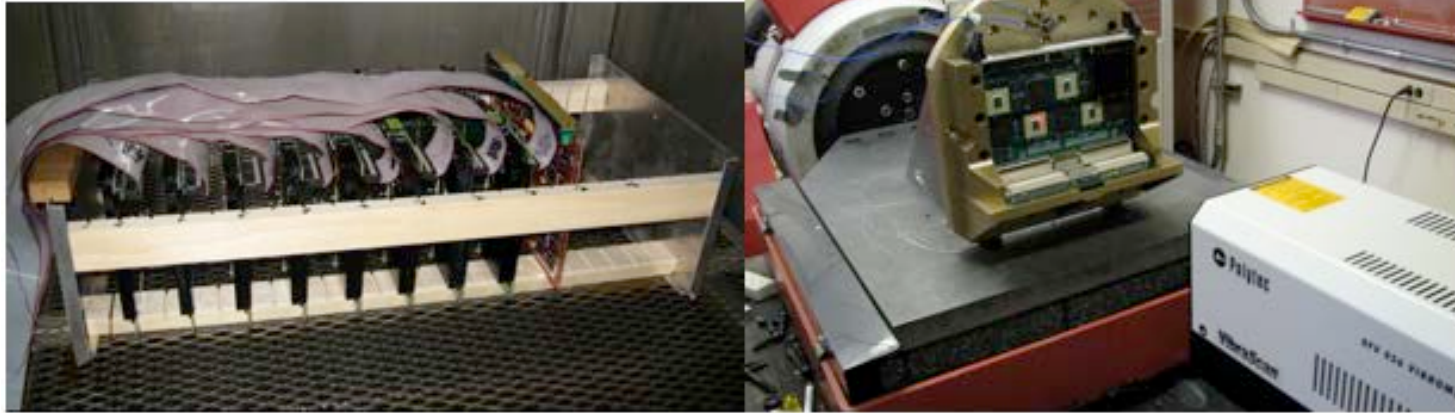
- Failure Modes



Failure modes (tin whiskering, pad cratering, delamination, solder cracking)

# Critical Global Market Challenges: RoHS

- Testing



Test assemblies  
(thermal cycling, vibration)

# Critical Global Market Challenges: RoHS

- Legal implications emerging:



# Critical Global Market Challenges: RoHS

- The good news is that intensive research is leading to effective mitigation of tin whiskers.



# Critical Global Market Challenges: RoHS

Risk (from PERM)	Level/Certainty	Testing example
Tin whiskers	High/High	Temperature/humidity
Pad cratering	High/High	Pad pull, Bend testing
Shock & vibration	High/High	Step stress vibration
Long-term storage	High/High	Thermal aging
Combined environments	High/Medium	Vibration / Thermal cycling
PCB Interconnects	Medium/High	Interconnect stress testing
Thermal cycling	Medium/High	-55/105C (ANSI/VITA 47)
New manufacturing defects	Medium/High	DOEs, prototyping, production



# Critical Global Market Challenges: RoHS

- The Takeaway:
  - The COTS industry must be committed to maintaining the high reliability of its products for the aerospace & defense (A&D) sector.
  - The embedded industry needs to educate itself on the risks associated with the use of lead-free parts, such as tin whiskers.
  - The Good News:
    - Effective means of reducing these risks have been developed.
    - These mitigating techniques need to join the existing suite of mitigations that vendors in our industry have already put in place to ensure the ruggedness and reliability that deployed military systems demand.
  - Later in 2015 we propose to launch a “Lead-Free VSO Working Group” in the VSO





# Critical Global Market Challenges: Trusted Computing

Steve Edwards, Technical Fellow, Dir. Product Management – ISR Solutions

# Critical Global Market Challenges: Trusted Computing



*Captured US Drone on display in Iran*

# Critical Global Market Challenges: Trusted Computing



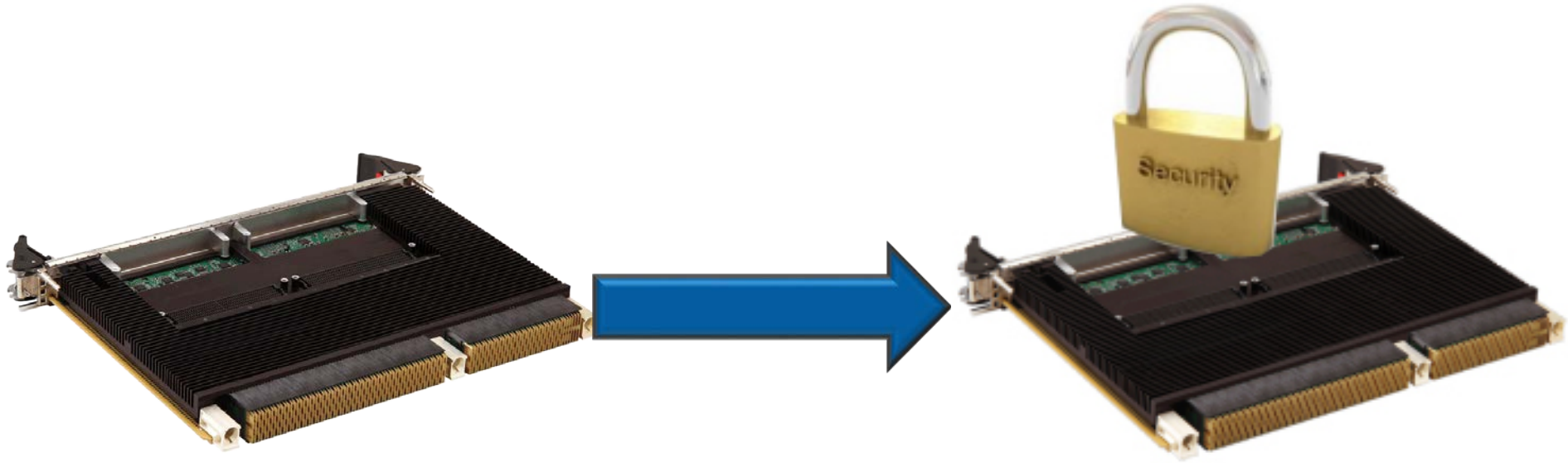
*Captured US Drone on display in Iran*

Increased Risk

# A Case Study

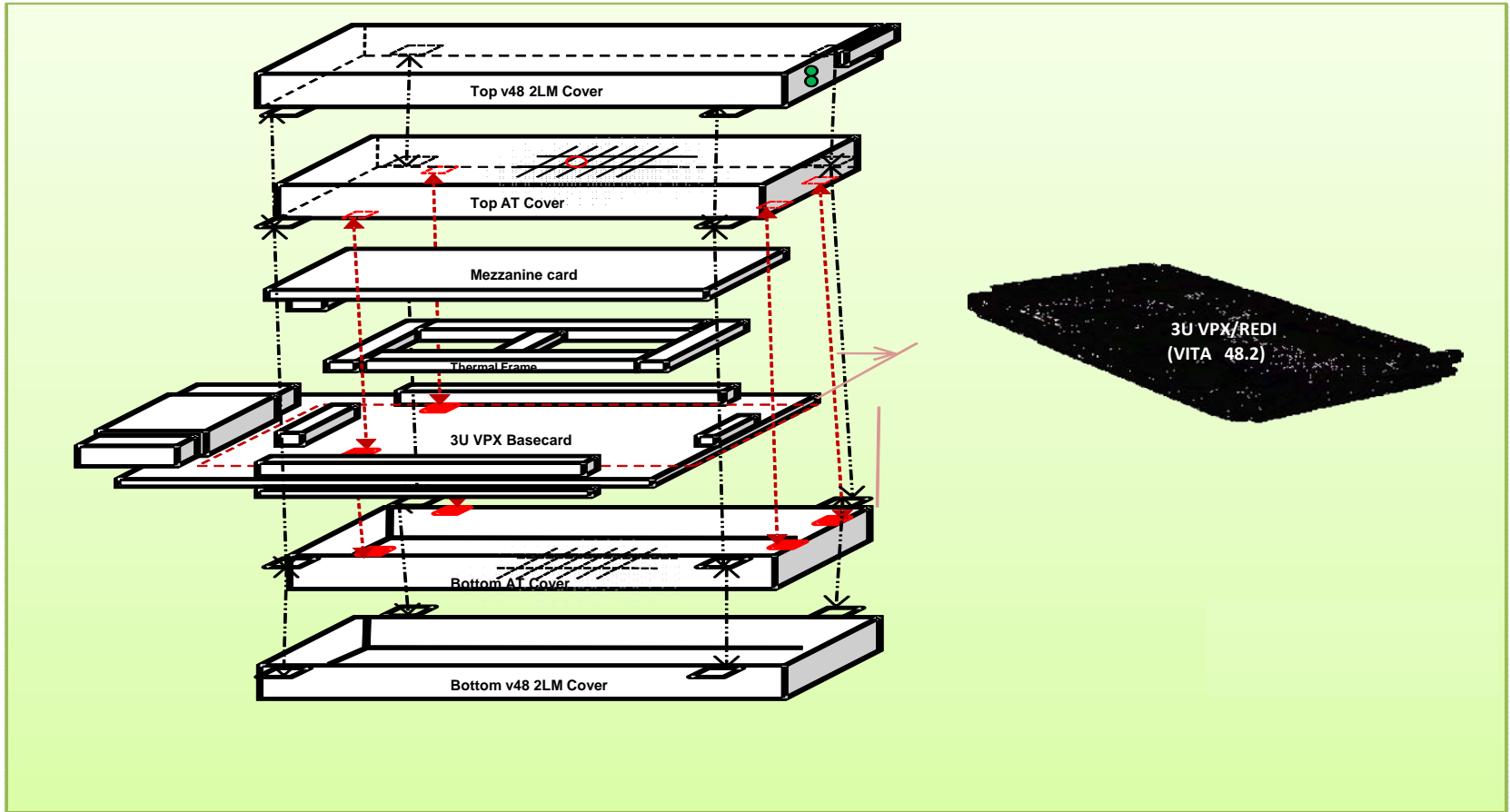


# From COTS to Trusted Computing





# Critical Global Market Challenges: Trusted Computing





# Critical Global Market Challenges: Trusted Computing



# Take Away



The End

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Q&A

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