Discussion

Driver in 2003:

Started to see confusion in testing protocols of PCB motherboards vs package substrates

Motherboards>Package > MCM > SIP ?

2002/2003 IPC roadmap included tables of

- Test conditions
- Performance requirements

IPC specs, JEDEC, Auto, Military

- In light of the rapidly changing technology environment and new developing markets appearing, in your opinion is the industry properly focused on reliability and reliability protocols??

- Taken as a group, is there something different the trade organizations and consortia could do to improve the situation??

Test Type	Index	Title	Conditions	Uses	Comments
A) T&H (Moisture and delamination sensitivity)	A-1 (IPC)	**IPC-TM-650 2.6.16** Pressure vessel method for glass epoxy laminate integrity	15psi /30 min + Solder dip	PWB slugs	Still widely used laminate test except: PCT times > 15 minutes and sample thicknesses > 1/16" are common today.
	A-2 (IPC)	**IPC-TM-650 2.6.2.1A** Water absorption, metal clad plastic laminates	24 hrs in H20 at 23C (prebake: 1 hr at 105-110C)	PWB slugs	Standard for Laminate weight gain (relative moisture absorption measurement).
	A-3 (Jedec/ IPC)	**JSTD-020C** Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices	Varies per Levels 1 – 6: Soak 30C/60% to 85C/85% 3x reflow, 225, 245, 250, or 260C (standard reflow to Pb free).	Components	Widely used for components to determine moisture level for assembly ("popcorn" mechanism), and as precon before other tests.
	A-4	**JESD220-A102C** Accelerated Moisture Resistance-- Unbiased Autclave	1210C / 100%RH (A)24 – (F)336 hrs, +Electrical test	Components	Pure moisture resistance (no solder dip or reflow).
	A-5	**JESD220-A118** Accelerated Moisture Resistance-- Unbiased HAST	130C / 85%RH, 1100C / 85%RH 96 – 264 hrs	Components	Pure moisture resistance (no solder dip or reflow).

Aerospace Issues

Unique to Aerospace:

- Long service lifetimes
- Rugged operating environments
- High consequences of failure
- Repair at circuit card level (mixed alloys)
- Quantify reliability at design
- Strict configuration control requirements (obsolescence)

Beyond Aerospace Control (most of the time):

- Alloys on part terminations
- Alloys on printed wiring pad finishes
- Reliability tests conducted by suppliers cannot be assumed to assure reliability in aerospace applications

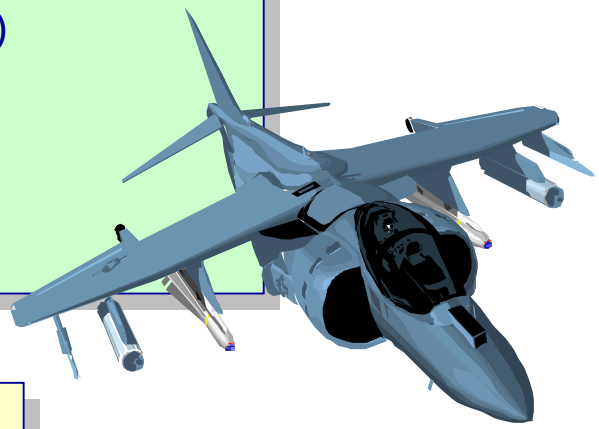
Major Aerospace Technical Issues (From an AIA Position Paper, January 2007)

- Specific aerospace risks:
  - (1) unproven reliability of solder joints
  - (2) degraded reliability due to “tin whiskers,”
  - (3) loss of configuration control
  - (4) impaired reparability
- Most urgent needs:
  - (1) methods to analyze, test and qualify lead-free electronics for aerospace applications;
  - (2) methods to assess and quantify effects of lead-free electronics in aerospace system safety and certification analyses;
  - (3) better understanding of the causes and mitigation methods for tin whiskers; and
  - (4) better understanding of the reliability of lead-free solder joints especially those associated with surface mount area array packages.

Technical Issues (GEIA-STD-0005-3)

Operating environments

- Steady state temperature (max, min, average)
- Temperature cycling (upper and lower limits, ramp rates, dwell times)
- Vibration (sine, swept sign, random, coherent-incoherent)
- Mechanical shock
- Combined environments
- Duty cycles



Material properties of solder alloys and alloy mixtures

- Tensile strength
- Young's modulus
- Yield points
- Creep properties
- Poisson's ratio
- Etc.

How do they vary with temperature?

Acceleration models

- Thermal cycling
- Steady state temperature
- Vibration

Summary

- The Markets are changing
- The Products are changing
- Failure Modes are changing
- Risks are changing
- Reliability Standards must:
  - Address the expectations of the Customer
  - Reduce the risk of the OEM
  - Reduce the risks throughout the supply chain
- Reliability Test Methodologies must:
  - Be correlated with known failure modes
  - Minimize real risks throughout the supply chain.
  - Be Risk-Benefit effective
  - Provide quick response
- To succeed we must prioritize and focus our efforts
- We Need a Major Change in our Methodologies

- Put in place a feedback system for reporting on failure modes. SIP project from iNEMI, (iNEMI volunteer to collect)
  - What is in it for reporting companies?
- Develop a guidelines for reliability testing but targeted a market segment
- Increase spec harmony
- Harmonization of whisker dox? GEIA, JEDEC, IPC, Japan work to IEC

- Push for case studies. No more widget testing
- Modeling with data sets
- Hot topic copper erosion?
  - What data is being collected
- Clearing house of reliability efforts (promo)
  - Standards, test programs (thermal, vibe shock), modeling, data sets (contact list)
- Vibration and shock needs
- Rework

- Press fit and LF?
- Fretting corrosion
- Hi speed/Hi frequency event detection
- Lead free for dummies (beyond solders)
- Reliability for dummies
- Cookbook DFR