MIL-PRF-32516

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Presented to:
Joint Technology Exchange Group (JTEG)

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JIT Charter

- Tri-Service Team from DoD automatic test and wiring communities.
  - IPT Lead: Mr. Greg Kilchenstein (OSD, Director of Enterprise Maintenance Technology)
    - Purpose: Leverage current and emerging commercial industry activity for demonstration, testing, and cost analysis.
      - Define and validate joint performance requirements
      - Collect and analyze data on COTS intermittent fault detection systems currently in use
      - Define the minimum fault detection threshold requirements for UUTs
      - Identify, define and validate test methods for detecting and isolating intermittent faults
      - Publish Joint performance requirement (MIL-PRF) document.
      - Brief and publish findings in a technical reports, as well as make a recommendation to Service Components on path forward

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Intermittence Scope

JIT Team Definition of "Environmentally Induced Intermittent Fault"

A discontinuity that occurs in LRU/WRA chassis and backplane conductive paths as a result of various operational environmental stimuli, including, but not limited too:

- thermal stress
- vibrational stress
- gravitational G-force loading
- moisture and/or contaminant exposure

- As well as changes in the material due to age and use, such as tin whiskers, metal migration and delamination of materials. These faults can occur individually and/or in rapid succession on any chassis or backplane circuit.

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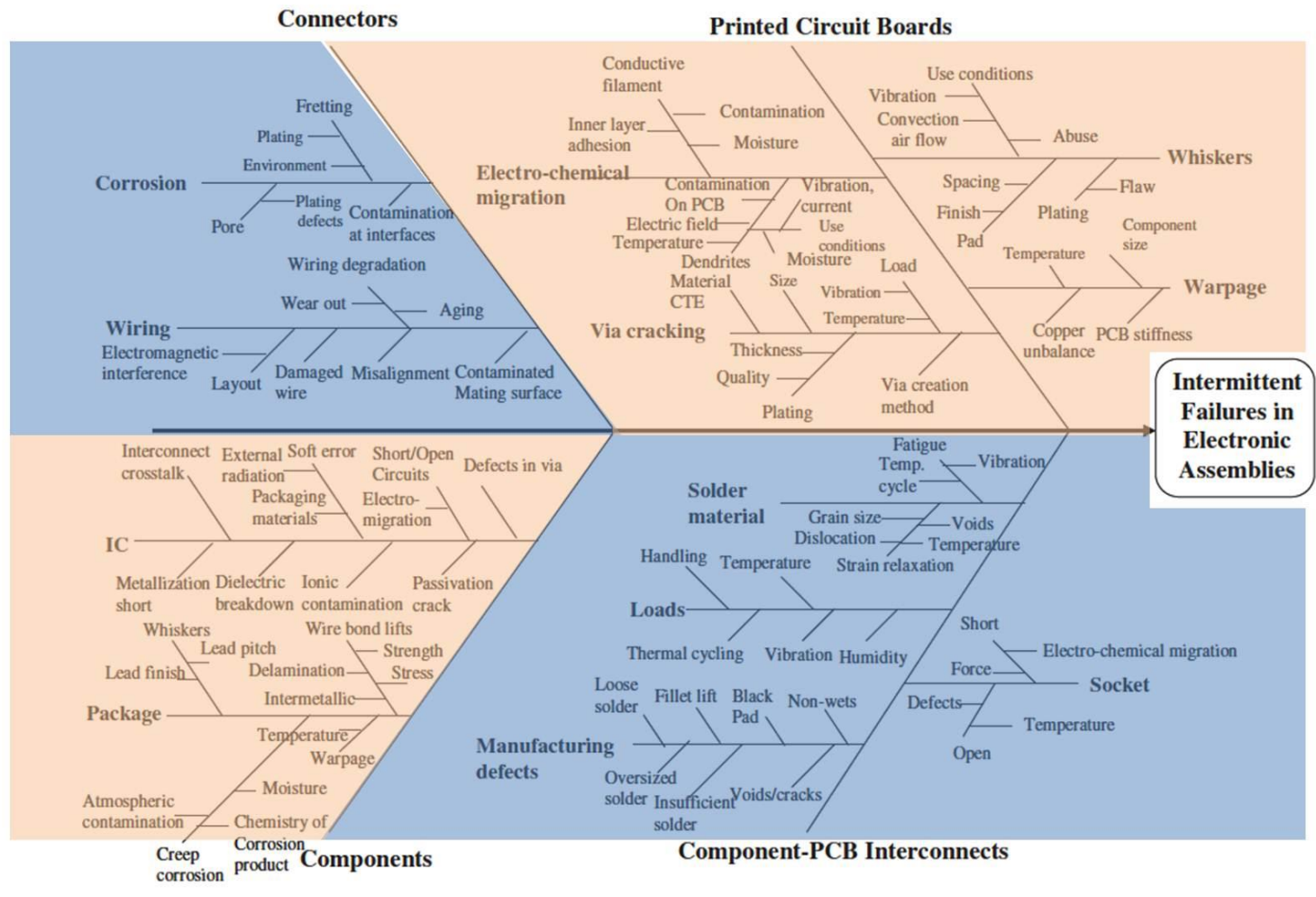
Source: H. Qi, S. Ganesan, M. Pecht, "No-fault-found and intermittent failures in electronic products", in *Microelectronics Reliability,* vol. 48, pp. 663–674, (2008).

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- "Electronic Test Equipment, Intermittent Fault Detection and Isolation for Chassis and Backplane Conductive Paths"

- Published: March 23, 2015

- Purpose: Assist in the writing of specifications for intermittent fault test equipment acquisitions

MIL-PRF-32516 (Cont)

- Scope:
  - Covers the minimum performance requirements for equipment to detect and isolate nanosecond, microsecond and millisecond conductive paths and intermittent faults.

  - Faults can occur in any and all of the hundreds to thousands of Line Replaceable Unit (LRU)/Weapon Replaceable Assembly (WRA) chassis and backplane circuits and their wire harnesses.

- Establish a tailorable performance requirements framework for intermittent fault test equipment to detect and isolate nanosecond, microsecond and millisecond conductive path intermittent faults in chassis and backplane circuits of WRAs/LRUs and their wire harness.

- Not intended to address hard opens, shorts, or constant function failures found in routine electronics repair.

Fault Classifications

- Category 1. Short duration fault which is under 100 nanoseconds across all LRU/WRA backplane circuits and their wire harness.

- Category 2. Intermediate duration fault which is 101 nanoseconds to 500 microseconds across all LRU/WRA backplane circuits and their wire harness.

- Category 3. Long duration fault which is 501 microseconds to 5 milliseconds across all LRU/WRA backplane circuits and their wire harness.

Intermittent Fault Emulator (IFE)

- Purpose
  - Evaluate the performance of intermittent fault detection diagnostic equipment (i.e. the 'Tester Under Test' (TUT))
    - Induces conductive path faults that emulate intermittent faults in Line Replaceable Units (LRUs)/Weapon Replaceable Assemblies (WRAs)

    - Per user defined requirements, provides the DoD an objective evaluation tool of the TUT's ability to detect intermittent faults

Intermittent Fault Emulator (IFE)

- Acquired through CTMA, in partnership with National Center for Manufacturing Sciences (NCMS)

- Manufactured by Copernicus Technologies, UK

- Formal Verification Complete

- 2 assets received

- Parallel Validation efforts underway at Hill AFB and NAVAIR LKE

IFE Technical Details

- The IFE is similar in appearance to an aircraft WRA/LRU

- Connects to Windows-based computer via USB, using the IFE software application

- The IFE has 8 connectors, A to H, on the front panel for connection to the tester-under-test (TUT)
  - MIL-DTL 38999 Series 1 type with a 66-pin, 19-35 insert configuration with #22D male contacts.
  - The IFE generates one of five selectable resistances to any of 256 channels, to represent intermittent fault events for the TUT to detect.
  - Sequences of these events are run from the IFE software application.
    - Event sequences can be pseudo-random or user-defined event sequences;
    - All sequences are saved and time-stamped and they can be repeated, modified, analysed and downloaded.

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Questions?