



# Agenda

1. Lead Free Transition and Impacts
2. **Lead Free Failure Modes**
3. A Comprehensive Lead Free Strategy
4. **GEIA Lead Free Standards and Handbooks**
  - GEIA-STD-0005-1 Performance Standard
  - GEIA-STD-0005-2 "Tin Whisker Document"
  - GEIA-HB-0005-1 Program Management Guidelines
  - GEIA-HB-0005-2 Technical Guidelines
  - GEIA-STD-0005-3 Performance Testing
  - GEIA-HB-0005-3 Rework and Repair
  - GEIA-HB-0005-4 Reliability Assessment
5. **Summary**
  - Acknowledgements
  - Lead Free Links
  - Points of Contact



# GEIA-STD-0005-1

- **GEIA-STD-0005-1 Performance Standard for Aerospace and High Performance Electronic Systems Containing Lead-free Solder**
  - Defines requirements for documenting processes in a Plan that assures customers that aerospace and military electronic systems containing lead-free solder will satisfy the applicable requirements for performance, reliability, airworthiness, safety, and certifiability throughout the life of the system.
  - Lists the high-level requirements for such processes and areas of concern to the aerospace and military that must be addressed by the processes.



# What is GEIA-STD-0005-1?

- **“This document specifies that users develop and implement written Lead Free Control Plans (LFCP). The purpose of the plan is to document processes that assure the Plan owners, their customers, and all other stakeholders that aerospace and high performance high-reliability electronics systems will continue to be reliable, safe, producible, affordable, and supportable.”**

- LEAP WG White Paper, 12/2/2006



# What is a Lead-free Control Plan (LFCP)?

- **An LFCP Is not (necessarily)**
  - **A Plan to introduce lead-free solder into the Plan owner's products.**
  - **A Plan to prohibit the use of lead-free solder**
  - **A Plan to do anything the Plan Owner wants**
  
- **An LFCP is:**
  - **A set of documented processes to assure that the objectives of GEIA-STD-0005-1 are met by the Plan Owner**



# GEIA-STD-0005-1 Objectives

- **5.1 Reliability**
  - The processes and materials related to the use of Pb-free solder are capable of producing reliable products.
- **5.2 Configuration control and product identification**
  - The configurations of all systems, equipment, assemblies, sub-assemblies, and piece parts are identified and controlled.
- **5.3 Risks and limitations of use**
  - Risks and limitation of use of the Plan owner's products, due to the use of Pb-free solders, are identified, and information is provided to control them.
- **5.4 Deleterious effects of tin whiskers**
  - The deleterious effects of tin whiskers are mitigated.
- **5.5 Repair, rework, maintenance, and support**
  - Repair, rework, maintenance, and support activities are controlled in a manner that controls effects of Pb-free solder materials and processes.



## Only Two Requirements:

- **1. State what you are going to do (documented processes)**
- **2. Show how this satisfies the objectives of GEIA-STD-0005-1**



## Options (from the LFCP Template)

- 1) {LFCP owner} will make the transition to lead-free solder, including component termination materials, board finish materials, and assembly materials, by (date of completion); and this LFCP references the documented processes required to do so.
- 2) {LFCP owner} will not make the transition to lead-free electronics, and the documented processes referenced in this LFCP assure that no lead-free component termination materials, board finish materials, and assembly materials are present in {LFCP owner}'s end item products.
- 3) {LFCP owner} will operate parallel lead-free and lead-bearing assembly processes, and the documented processes referenced in this LFCP assure that those processes are controlled adequately to address the requirements of GEIA-STD-0005-1 and GEIA-STD-0005-2.
- 4) {LFCP owner} will operate a "mixed assembly" operation, in which tin-lead assembly alloys will be used in conjunction with components with lead-free termination materials or finishes, and/or printed wiring boards with with lead-free surface finishes. The processes documented in this LFCP are controlled and assure that the requirements of GEIA-STD-0005-1 and GEIA-STD-0005-2 are satisfied.
- 5) {LFCP owner} will implement processes and methods to respond to the transition to lead free electronics only as directed by individual customers.



# Stages of the Transition

- **The LFCP owner's sub-assemblies, e.g., printed wiring assemblies, may be in one of the following stages of the transition to lead-free electronics:**
  - 1) Those designed as lead-bearing, and which will remain lead-bearing.
  - 2) Those designed as lead-bearing, and which have evolved to include lead-free electronics.
  - 3) Those designed as lead-bearing, and which are intentionally transitioned to lead-free.
  - 4) Those designed as lead-free.



## Who Should Prepare an LFCP?

- **Any aerospace organization that wants to assure its customer(s) that it is in control of its products with regard to the transition to lead-free electronics.**
- **Contractual requirements may impact the preparation, content, and use of the LFCP**
- ***Every aerospace supplier and/or program has at least one LFCP***



# The LFCP Process

## Off-line (not program-specific):



---

## On-line (program-specific):

