Lead-free Aerospace Electronics

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Global Electronics Industry Forces are Driving a Transition to Lead (Pb)-Free Electronics

Japanese marketing strategies, and European politics and legislation are resulting in a transition to lead-free technology in consumer and commercial electronics.

California, China, South Korea et al. are ostensibly following legislative suit

- For aerospace products, there is no current legislation or directive that sets schedule, form, or even applicability
- However, aerospace will be "swept along" because it depends on the larger electronics industry for electronic materials, components, and assemblies

Key Compliance Milestones

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2003	2004	2005	2006	2007/08

- **01/2003** EU WEEE, RoHS Directives Published
- **09/2003** CA WEEE, RoHS Law Signed
- **02/2004** AIRBUS Supplier Survey
- **08/2004** EU WEEE, RoHS National Laws Completed
- **08/2005** EU WEEE, Effective
- **07/2006** EU RoHS, Effective
- **01/2007** CA RoHS May Become Effective
- **07/2008** EU WEEE, RoHS Exemptions Reviewed

Situation, Target, Proposal

Situation: Commercial Electronics Industry is Transitioning to Lead-Free Electronics and will Force Aerospace also to Lead-Free Electronics

Target: Transition Path to Lead-Free Aerospace Electronics which Minimizes Impact to All Aerospace Stakeholders, and Assures that our Products are

- *Reliable*
- *Repairable*
- *Supportable*
- *Affordable*
- *Certifiable*
- *Airworthy*

Proposal: Work Through a Coordinated Industry Activity of all the Stakeholders to Define the Common Set of Standards Used by Suppliers and Customers

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Aerospace Has Limited Influence on the Electronics Industry

Electronics Market Sector	Total Market, 2004 ($B)	Market Share, 2004 (%)
Consumer	12.9	14.7
Computers	28.4	32.3
Telecomm.	36.4	41.4
Automotive	5.1	5.8
Industrial	4.1	4.6
Mil/space	0.97	1.1

We must design, produce, and support cost-effective aerospace products with electronics designed for other industries

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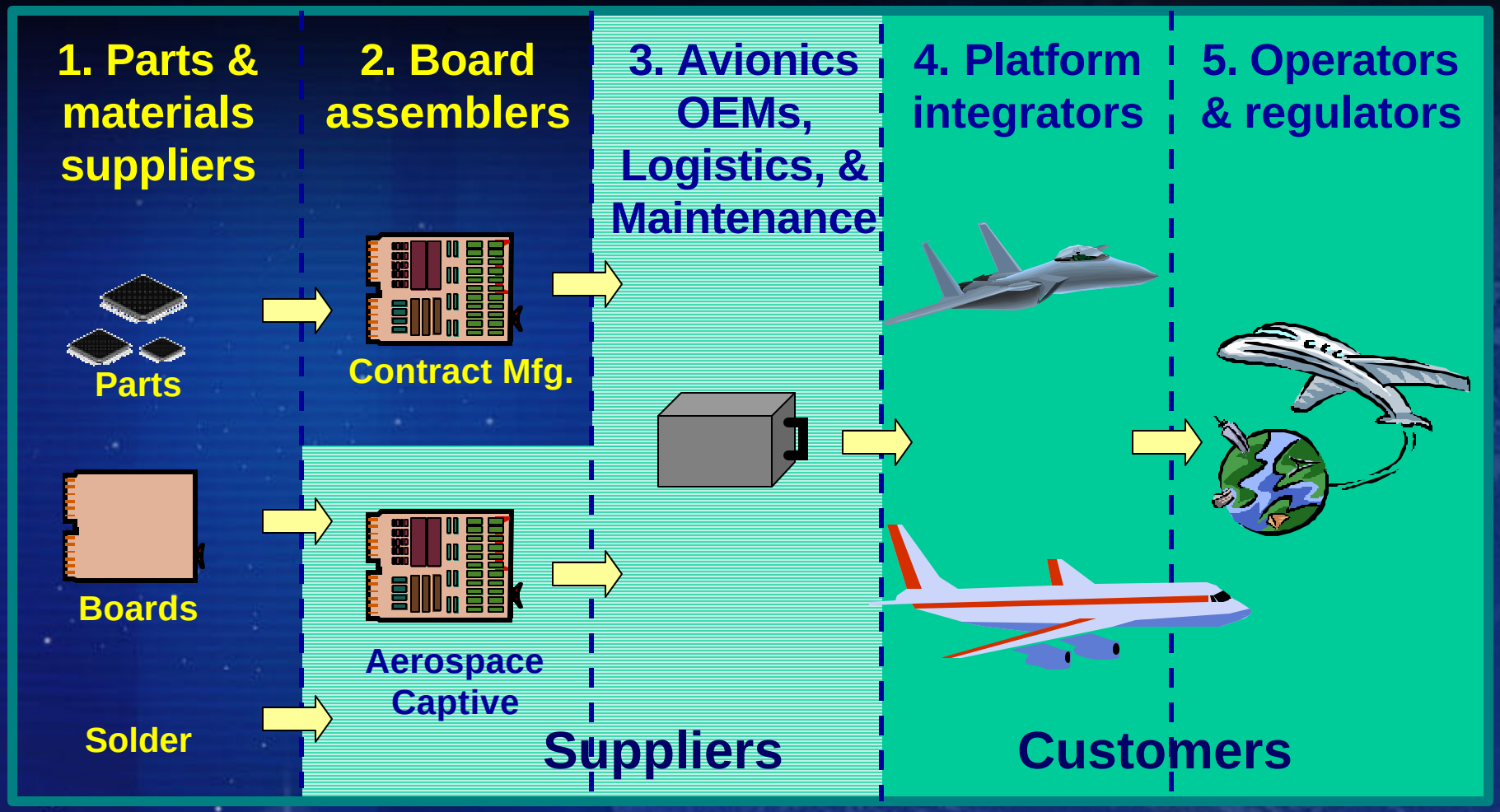
The Aerospace Electronics Supply Chain



Non-aerospace Control

Aerospace Control

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What We Don't Want

Avionics OEMs & Maintenance Shops

Integrators

Customers

- ***Airlines***
- ***FAA***
- ***DoD***
- ***NASA***

Arrows represent Pb-free electronics management requirements and processes.

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What We Do Want

Avionics OEMs & Maintenance Shops

Airlines

FAA

DoD

NASA

Common Pb-free Management Requirements and Processes

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Aerospace Industries Association Lead-free Aerospace Electronics Working Group (AIA-LAEWG)

- Authorized by AIA Technical Operations Council, February 2004
- First working group meeting May 3-4, 2004
- AIA-LAEWG leader is Lloyd Condra, Boeing
- Those interested may contact Lloyd at
  206-655-8240 or lloyd.w.condra@boeing.com
- Major Deliverables all due on or before mid 2006

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LAEWG Purpose

The purpose of the LAEWG is to develop and implement actionable deliverable items that enable the aerospace industry to accommodate the global transition to lead-free electronics. The deliverable items address problems that are unique to, and are within the control of the aerospace industry.

Success will be a new set of aerospace processes to manage ourselves in dealing with ongoing changes in lead-free materials, assembly processes etc. It will not be the "old way" with a "new solder."

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Performance Standards and Technical Guidelines

Performance Standard: A document used by aerospace electronic system "customers" to communicate requirements to aerospace electronic system "suppliers"

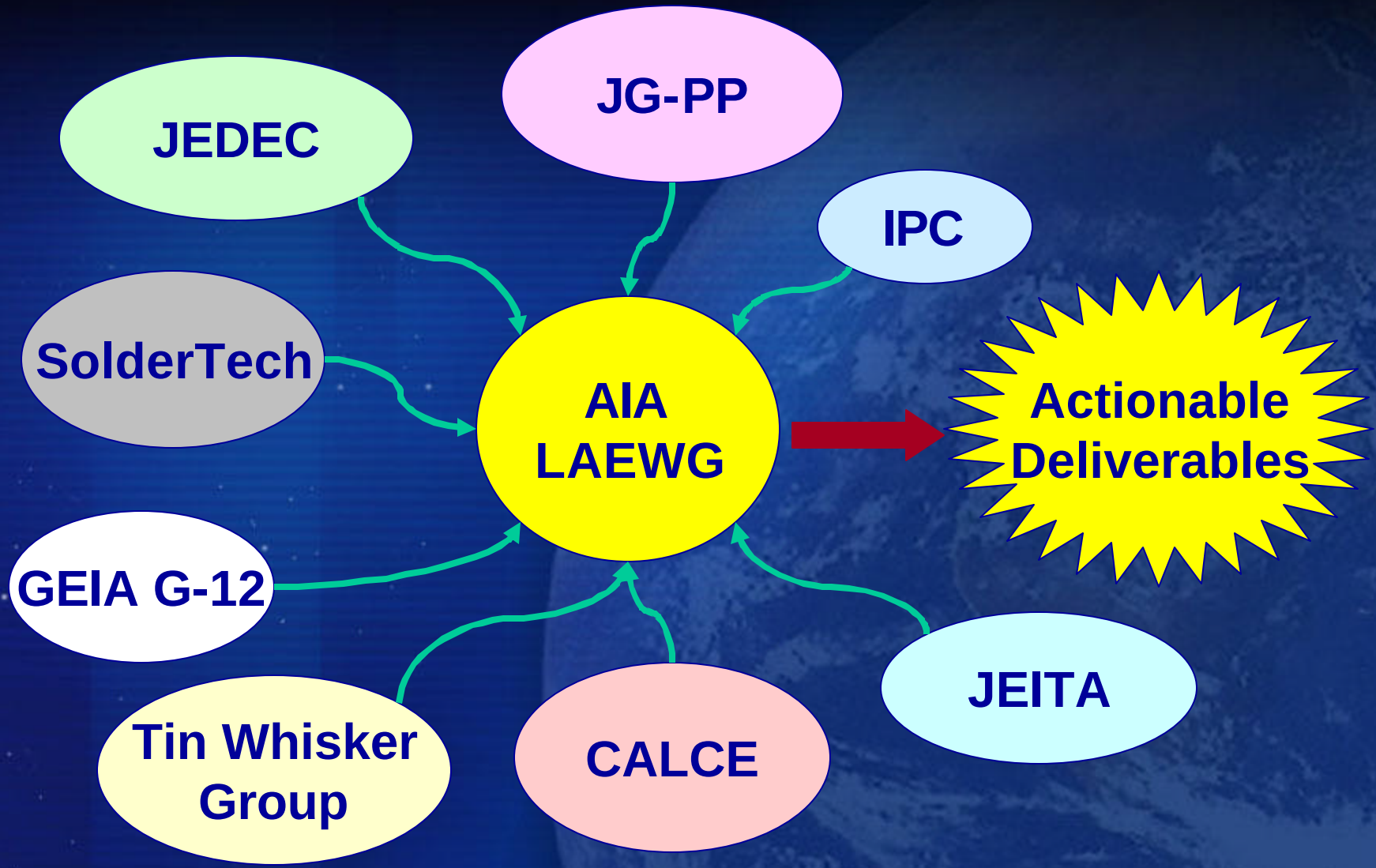
- **Quality and Reliability**
- **Configuration Control**
- **Maintenance and Support**

Technical Guideline: A document used by aerospace electronic system "suppliers" to select and use lead-free solder alloys, other materials, and processes.

- **Test Methods**
- **Acceleration Models**
- **Lessons Learned**
- **Possibly specific solutions**

Methods to Combat the Effects of Tin Whiskers in Lead-free Aerospace Electronic Systems

LAEWG Deliverables



Additional Boeing Activities

- Boeing has formed an internal, enterprise wide committee on lead-free electronics addressing design, build, and support
- We have surveyed our avionics suppliers and will be having meetings to coordinate the transition to lead-free where and when applicable
- Our activities will be in coordination with the LAEWG
- Equipment that is transitioning sooner than can be supported by the LAEWG will be dealt with on a case by case basis