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American Competitiveness Institute

ACI Lead Free Manufacturing for Navy Systems

13 July, 2005

Lead-Free Manufacturing for Navy Systems



- **Project Goals**

- To develop Lead Free Soldering Process for Navy applications
- To “functionally test” deliverable Navy hardware soldered with Lead Free solders

- **Project Output**

- Lead Free Soldering Guidelines For High Reliability Applications
- Anticipate guidelines will be updated periodically as technology matures



F-18 and AEGIS Systems for Demonstration
Vehicle Selection

Project Number: TBD

Title: Lead Free Manufacturing for Navy Systems

Objective: Enable the manufacturing of avionics for the F/A-18 and electronic components for the AEGIS weapons system using the Lead Free Manufacturing processes now becoming mandatory in the industry

Performing Activity: EMPF

Start / End Dates: February 2005 – April 2006

Project Cost: \$1.12M + \$2.0M/year Industry Cost Share

ManTech Cost: \$1.12M + \$2.0M/year Industry Cost Share

Systems Application: F/A-18 Avionics and AEGIS Radar

PERFORMING ACTIVITIES

EMPF – Project Management
Boeing – IPT Management, F-18 avionics testing
Rockwell Collins f-18 mixed technology avionics build
ITT – F-18 Surface mount avionics build and test
Lockheed Martin – AEGIS surface mount hardware build and test
Honeywell – F-18 plated through hole avionics hardware build and test
BAE Systems – Technology transfer

ACHIEVEMENT / MILESTONES

Select Pb Free Alloys/Test Vehicle	5/2005
Define Process Parameters/Test Plan	9/2005
Build Functional Hardware	10/2005
Environmental Stress Screening of Hardware	2/2006
Pb-free implementation Guidelines	4/2006



IMPLEMENTATION PLAN

PMA-265 F/A-18: Certify Lead Free F-18 avionics hardware thru same testing as used for tin-lead based assemblies.

PEO IWS: Certify Lead Free AEGIS Radar hardware through same testing as used for tin-lead based assemblies

PAYOFF

Demonstrate Lead Free Manufacturing of functional deliverable Navy electronic hardware that will enable uninterrupted supply of electronic assemblies after the change of the commercial industry to Lead Free components and manufacturing in 2006.

Generate Guidelines for Manufacture of Naval electronics hardware in compliance with worldwide Lead Free electronics manufacturing mandate.



Lead-Free Manufacturing for Navy Systems

- IAB Collaboration

- IAB Members:
 - ACI
 - ITT Avionics
 - Rockwell Collins
 - BAE Systems
 - Boeing
 - Lockheed Martin
 - Honeywell
- All IAB members are involved in Pb-Free risk mitigation activities either through other consortiums, working groups, and/or their own internal funded projects
- IAB and ACI can provide a centralized focus to help converge the myriad of Pb-Free projects toward risk mitigation techniques and guidelines for the Navy community



Lead-Free Manufacturing for Navy Systems

- IAB Collaboration Efforts, Pb-Free Manufacturing

- Project selected deals with a widespread issue
 - ***The Global electronics supplier transition to Pb-Free***
 - *Validated as a common problem/issue among IAB industry partners including the respective customer base*
 - *Business case supports a significant pay back through collaboration to mitigate this issue*



Lead-Free Manufacturing for Navy Systems

- Current Program Tasks

- **Select Demonstration Vehicle Hardware from target programs:**
 - *F-18 Avionics Program*
 - *AEGIS Integrated Warfare System*
- **Build/Rework Demonstration Vehicle Hardware using Lead Free Solders**
 - *Functional test Demonstration Vehicles*
 - *Environmental test Demonstration Vehicles*
- **Select Relevant Hybrid SnPb/Lead Free Scenarios**
- **Build Hybrid Scenario Hardware**
 - *Functional Test Hybrid Solder Systems*
 - *Environmental Test Hybrid Solder Systems*
- **Publish Lead Free Soldering Guidelines for High Reliability Military and Aerospace Applications**



Lead-Free Manufacturing for Navy Systems

- Other Lead Free Guidelines

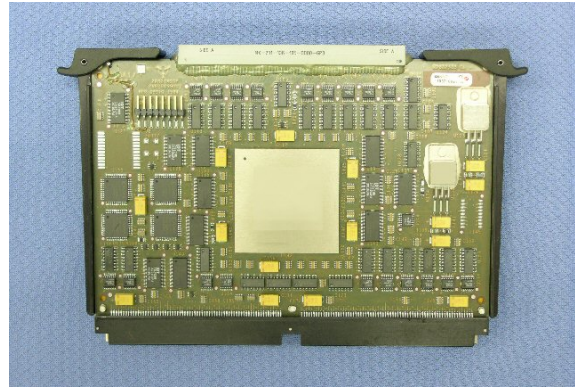
- **JGPP (Joint Group on Pollution Prevention)**
 - *Non-functional daisy chained assembly data generated*
 - *No functional hardware data will be generated*
 - *Limited rework and repair information*
 - *ACI presence on JGPP program ensures synergy with IAB Guidelines and process.*
- **AIA (Avionics Industry Association)**
 - *Programmatic document*
 - *ACI presence on AIA Guidelines writing committee ensures synergy with IAB Guidelines.*
- **IPC (Association Connecting Electronics Industries)**
 - *No official Guidelines underway*
 - *No new process data will be generated*
 - *Parts of other IPC documents have sections on Lead Free*
 - *ACI tracking IPC/ANSI commercial Lead Free efforts to ensure synergy with commercial guidelines.*
- **ACI Lead Free Guidelines**

Lead-Free Manufacturing for Navy Systems

- Test Vehicle Assemblies Selected

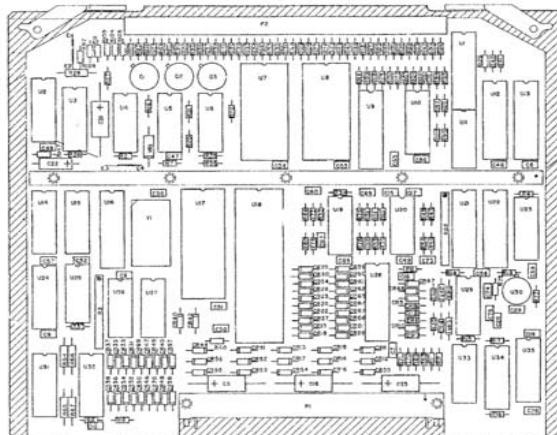


ITT Avionics



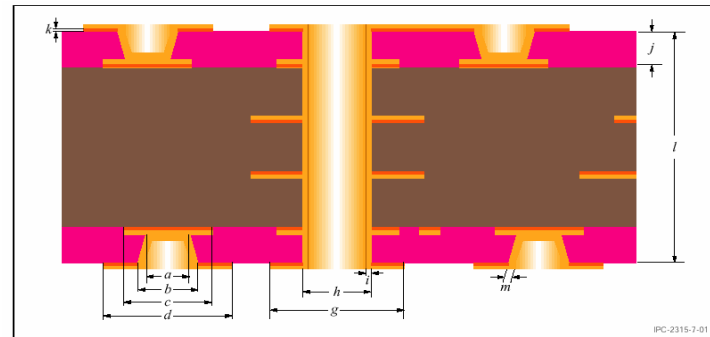
IDECM Module for F/A-18 Avionics

Rockwell Collins



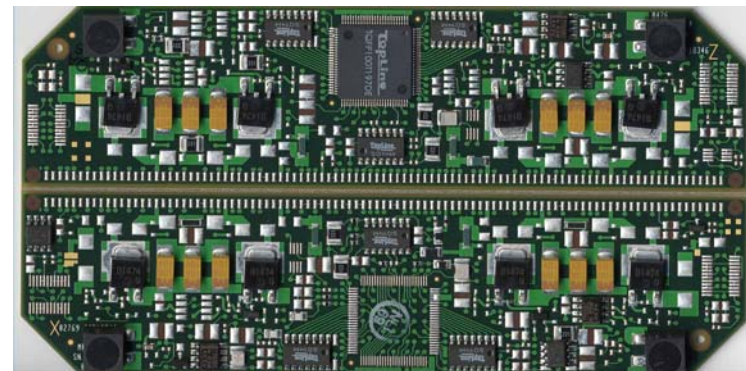
All Plated Through Hole Mount Board used in F/A-18 Avionics

Boeing



Generic High Density Interconnect (HDI) Printed Wiring Board Assembly as used on F/A-18 Avionics

Lockheed Martin



All Surface Mount Phase Shifter Driver Printed Wiring Assembly used in AEGIS System



Lead-Free Manufacturing for Navy Systems

- Solder Alloys Chosen for Test Vehicles

	Subcontractor			
	Lockheed Martin	Honeywell	Rockwell Collins	ITT
Module	AEGIS	HUD I/O Processor P/N 131220-14A	APN-194 Radar Altimeter (F-18 131220-19A)	IDECM Electronic Countermeasures System
PWB finish (es)	ENIG	Pb-free and Sn/Pb	Sn/Pb and Pb-free	Lead-free (ENIG) and SnPb
Lead-free finish (component)	Any (SAC 305 preferred), but documented			
Lead-free wave solder	N/A	Tin-nickel-copper (Snic)	SAC 305	SAC 305
Lead-free surface- mount solder	SAC 305	SAC 305	SAC 305	SAC 305
Rework solder	SAC 305			
Quantity	6	3 - Pb-Free, 3 - SnPb	3 SnPb, 6 lead free, and 3 spares	2 each (mixed and lead-free)
Mixed Pb/Pb Free (Yes/No)?	No	No	No	Yes
Through hole (Yes/No)?	No	Yes	Yes	No
SMT (Yes/No)?	Yes	Yes	Yes	Yes

Lead-Free Manufacturing for Navy Systems

- Program Schedule

