

Minutes **PERM Meeting No. 3**

1 Attendees:

List of attendees is posted to the PERM Meeting Pages.

2 Welcome and Introductions

Lloyd Condra, acting chair opened the meeting expressing appreciation to Y-12 for hosting the meeting. All participants identified themselves. Condra explained the Task Team concept and the mission of each Task Team.

Condra also cautioned that this was an open meeting with Non-US citizens present, therefore responsibility for sharing proprietary and ITAR/EARS regulated info was on the presenters.

3 Y-12 Welcome

Dennis Miller gave a brief overview of Y-12's mission and activity. His presentation is available on the PERM Meeting pages.

4 DoD Lead-free Policy Update:

Jay Mandelbaum reported that the Pb-free electronics DoD policy is being worked. Policy development is currently the responsibility of the Systems Engineering Directorate in DDR&E. AIA had an opportunity to look at the last draft and comments were submitted to the DoD in December. All comments received from the previous draft of the Policy are being vetted through Staff-level. Senior levels were less comfortable with dictating more policy in an already complex acquisition process. The DoD LSA (Lead standardization activity) for solder headed up by Gary Latta (NAVSEA Crane) has been developing additional implementation guidance to back-up the policy. The PERM group will continue to provide support to get this policy issued.

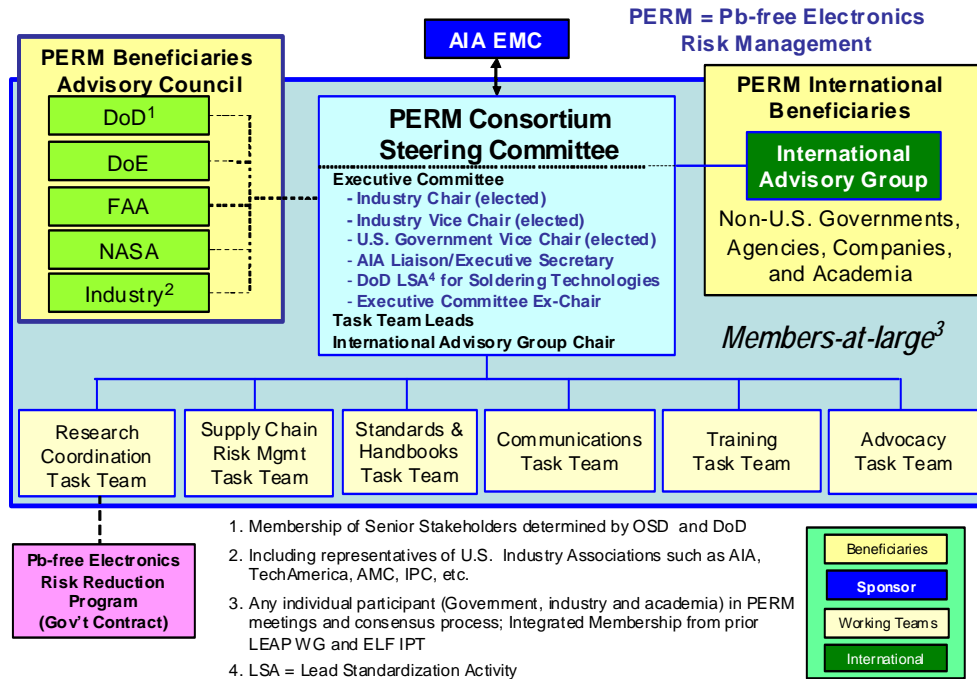
Noted that the verification process should be included in Life Cycle Sustainment and System Engineering Plans.

5 PERM Structure & Operating Procedures

Vance Anderson gave an overview of the Standard Operating Procedures. These procedures are posted on the PERM web-pages.



PERM Consortium Functional Framework



6 Election of PERM Chair & Vice Chairs

Ed Morris presented the Election process defined by the transition team. The overview presentation is posted to the meeting pages. Noted that there was a vote to waive the requirement to have candidates present was conducted and approved by the present attendees. This to accommodate members that were not able travel for various reasons.

6.1 Nomination slate of candidates:

The following is the list of candidates:

Chair Nominees:

- John Biel, GE
- Lloyd Condra, Boeing

Government Vice-Chair Nominee:

- Vance Anderson, DMEA
- Mr Mark Stibitz, AIR FORCE

Industry Vice-Chair Nominee:

- Lou Feinstein, Textron
- Tony Rafanelli, Raytheon
- Dave Humphrey, Honeywell
- Morgan Herring, Lockheed Martin
- Stephan Meschter, BAE Systems



Appointed Members of the Steering Committee Executive Committee are:

Gary Latta: DoD LSA for Soldering Technologies

Rusty Rentsch: Executive Secretary

Paper ballots were distributed in accordance with the procedure.

6.2 Elected Candidates

Lloyd Condra, was elected as chair of the PERM Consortium

Mark Stibitz, Was elected as government Vice-Chair

Stephan Meshter, was elected as Industry Vice-Chair

7 Technical Presentation #1 (Osterman)

Dr. Michael Osterman presented Center for Advanced Life Cycle Engineering (CALCE) work on “Tin Whiskers Risks and Mitigations”. His presentation is posted on the PERM Web-site.

- Tin whiskers represent a known failure risk to electronic hardware.
 - Electronic parts may not be the primary site for tin whisker formation in electronics.
 - Current whisker propensity tests are not adequate to predict whisker growth.
- Solder dipping is one tin whisker mitigation strategy
 - Tin whiskers found to grow but were generally non-needle like growths
 - Temperature cycling of SMT dipped parts found SAC dipped and SnBi Alloy 42 lead frame TSOPs assembled with SnPb paste had lower durability than Sn and SnPb dipped assemblies.
 - Mechanical Cycle findings SAC Dipped and SnBi alloy 42 lead-frame TSOPs had lower durability than Sn finished parts under mechanical testing when assembled with tin-lead. This was reversed when assembled with SAC paste.
- Conformal coating provides an insulating barrier to whisker shorting failures
 - All coatings in the present test have the potential of not being able to contain tin whiskers.
 - Conformal coverage issues are a concern on vertical and corner surfaces of the spray coatings tested here.
 - Electrical shorting prevention is provided even when coatings are thin.

8 Technical Presentation #2

Carol Handwerker, Purdue University, presented on “**Microstructure Development and Surface Defect Formation in Electroplated Tin Films**”. Her presentation is posted to the PERM Meeting pages.



8.1 Possible effects of Pb on stress relaxation in Sn

8.1.1 Pb changes mechanical behavior

- Higher intrinsic creep rate
- Lower yield stress
- Mitigates impurity effects on mechanical behavior – more uniform
- Changes stress gradients

8.1.2 Pb segregates to interfaces

- Increases or decreases grain boundary mobility
- Improves efficiency of grain boundary and surface sources and sinks for vacancies in creep
- Weaker or non-continuous surface oxide
- Changes IMC morphology
- Changes interfacial energies and diffusivities

8.1.3 Pb changes electrodeposition behavior

- Increases grain nucleation rate during electrodeposition
- Changes crystallographic texture to increase creep rate
- Changes impurity incorporation rate
- Increases hydrogen over potential
- Ni barrier works – why? Surface prep may be doing something, too.
 - IMC and Ni ? Stress development?

9 DfR SBIR Results

Joelle Arnold presented, DfR Solutions Shock, Vibe and Reballing SBIR Results and Future Work.

10 Government Briefings and Panel Discussion (Anderson/Kalt)

Noted challenges in getting policy released also include getting Services to approve the policy.

Navy is adopting the GEIA Specifications as guidance.

10.1 Path forward:

1. Government coordination and publicity for the policy.
2. Industry Coordination of a Unified response
 - a. Need Metric on usage of the GEIA Standards,
 - b. AI Lloyd Condra to ask TechAmerica for usage metrics.
3. The perception is that there is awareness of the Tin Whisker Phenomena, but not of the System performance and reliability impacts of Pb-free electronics. This awareness will not be easily adopted without some form of policy. Therefore



there was an emphasis on getting policy signed. At minimum the Defense Acquisition Guide (DAG) and the Systems Engineering Plan Guide (SEPG) need to be reviewed a Pb-Free Electronics guidance inserted as appropriate.

Discussed the possibility of writing a follow-up letter to the Marion Blakey, letter requesting Pb-free Electronics Policy. Advised that that would not be appropriate at this time.

10.2 Crane Public Lead-Free Telecon

- First Friday of the month, 12 PM Eastern
- Phone: Phone - 877-336-1275 Code: 230571
- Crane work team report – grad students, team project coordination
- Solder joints, whiskers, copper erosion, mixed metal joints, element detection
- NASA/DoD, IPC, PERM, CALCE reports

11 Industry Briefings and Panel Discussion

Scott Newland – Harris GCSD, Pb-Free Risk Management COTS subsystems

Matt Hamand – Rockwell Collins, Pb-Free ‘new’ process failures

Terry Munson – Foresite Inc Pb-Free materials, new failure modes

Presentations are posted to the PERM meeting pages.

12 NASA-DoD Project Update

Kurt Kessel provided an overview of the NASA NASA-DoD Lead-Free Electronics Project.

12.1 NASA DOD Test References

Project documents, test plans, test reports and other associated information will be available on the web:

- NASA-DoD Lead-Free Electronics Project:

http://www.teerm.nasa.gov/projects/NASA_DODLeadFreeElectronics_Proj2.html

- Joint Test Protocol
- Project Plan

National Aeronautics and Space Administration NASA-DoD Lead-Free Electronics Project 2

- JCAA/JGPP Lead-Free Solder Project

http://www.teerm.nasa.gov/projects/LeadFreeSolderTestingForHighReliability_Proj1.html



12.2 Lead-free Technology Experiment in a Space Environment (LTESE)

Lead-free assemblies are currently in a test running on the space station. The assemblies are continuity monitored and are located in an electronic box mounted outside the station. Presentation is posted to the PERM Meeting Pages.

13 Manhattan Project Report (Morris)

Ed Morris Reported:

- DoD Lead-free Risk Reduction program
- The third phase of the DoD Lead-free Manhattan project has been rebranded to be the DoD Lead(Pb)-free electronics risk reduction program.
- Ed Morris, Lockheed Martin, is continuing to work on getting funding. He met with Arun Seraphin, a senior staffer from the senate armed services committee, and Arun came away with an understanding of the Pb-free issue. Arun has since left the SASC to go to a White house position. Ed now needs to provide additional briefings to the SASC staff.
- \$95M Risk Reduction Program results would provide cost avoidance ROI in 2 years at full DoD Pb-free electronics implementation
- Pb-free electronics are fundamentally and drastically changing the way electronic products for A&D are designed, procured, manufactured, tested, and supported
- Need a coordinated, proactive DoD-wide Pb-free Electronics Risk Reduction Program to deal with the issues and ensure highest quality, best value electronic products for the Warfighter
- The “Cultural Issues” for Pb-free Electronics are as challenging as the Technical Issues, making it more difficult to obtain risk reduction funding
- Good News: The “Manhattan Project” concept has been validated as a viable approach to deal with complex issues that demand a radical approach – A focused team of Government and Industry Subject Matter Experts is recommended!

14 Lead-free Manhattan Project Technical Review

The Lead-free Electronics Manhattan Project assessed the impact of Pb-free materials on design, manufacturing, sustainment, testing, and reliability of Aerospace and Defense equipment. The Phase 1 Report is available for download at the B2P COE Website (http://www.navyb2pcoe.org/b2p_news.html) and the Defense Acquisition University Lead-free Website (<https://acc.dau.mil/leadfree>). The team focused their assessment on the use of Pb-free materials in complex assemblies intended for critical systems that are subjected to harsh environments and have long term sustainment requirements. A summary of the key technical gaps was provided for the following areas:

- Tin Whiskers
- Manufacturing and Repair
- Solder Joint Reliability
- Component Issues
- Printed Circuit Board issues



Presentation is posted to the PERM Meeting Pages.

15 AIA TOC Action item review

Lloyd Condra reported the TOC Strategic Goals for 2010 related to Pb-Free Electronics.

15.1 Strategic Goal

Publish a risk management plan for lead-free electronics technology that maintains the performance, reliability, and safety characteristics required in aerospace-defense electronics.

15.2 Milestones

1. Publication of a risk management plan for lead-free electronics transition.
 - a. Draft Risk Management Plan Completed - 6/25/10
 - b. Final Risk Management Plan Completed - 9/3/10
2. Launch compilation of research data in a single shared electronic repository.
 - a. Data structure established for single shared electronic repository - 2/26/10
 - b. PERM Consortium Research Data Compilation launched on AIA electronic repository - 5/14/10
3. Publish Strategic Standards Roadmap.
 - a. Draft Strategic Standards Roadmap Completed - 9/17/10
 - b. Final Strategic Standards Roadmap Completed - 11/12/10

16 Breakout Activities

16.1 Standards and Handbook Task Team

- New leader Dan Foster (Defense Acquisition Inc., DAI)
- New deputy Lead Linda Woody (Lockheed Martin)

16.1.1 Updates:

16.1.1.1 GEIA-STD-0005-1

- Performance Standard for Aerospace and High Performance Electronic Systems Containing Lead-free Solder (Current lead: Dave Burdick)
- In Revision working on updates
 - Completion date 3Q2010

16.1.1.2 GEIA-STD-0005-2

- Standard for Mitigating the Effects of Tin Whiskers in aerospace and High Performance Electronic Systems (Current lead: Anduin Touw)
- Revision in progress completion 3Q2010



- Survey on rank of mitigation to be sent out end of this month
- Working with IPC to develop coating assessment for tin whisker mitigation
- GEIA-STD-0005-3 Performance Testing for Aerospace and High Performance Electronic Interconnects Containing Pb-free Solder and Finishes (Current lead: Tony Rafanelli)
- Early in process of revision
- Completion date not known at this time

16.1.1.3 GEIA-HB-0005-1

- Program Management/Systems Engineering Guidelines for Managing the Transition to Lead-Free Electronics (Current leads: Pat Amick, Tony Rafanelli)
- Need government lead on this handbook
 - Ask TOC for leadership help
 - Funding issues with Pat
 - Working on document but slow

16.1.1.4 GEIA-HB-0005-2

- Technical Guidelines for Aerospace and High Performance Electronic Systems Containing Lead-free Solder and Finishes (Current lead: Steph Meschter)
- Steph has new position in PERM
 - He needs assistance to help continue with updating

16.1.1.5 GEIA-HB-0005-3

- Rework/Repair Handbook to Address the Implications of Lead-Free Electronics and Mixed Assemblies in Aerospace and High Performance Electronic Systems (Current lead: Tim Kalt)
- No revision planned at this time
- Dan Foster to contact Tim Kalt to look at the IPC and GEIA document.

16.1.1.6 GEIA-HB-0005-4 (in process draft)

- Reliability Assessment for Lead-Free Electronics (Current lead: John Biel)
- In progress
 - Problem with technical information
 - Committee stated that this document is critical
 - Need to publish by 3Q2010 what you have at this point. It will not be perfect but it is a start.

Note: It was later decided that we do not have enough knowledge to proceed with the handbook. Lloyd Condra to write a 1-page white paper proclaiming that Data is needed to produce a practical handbook



16.1.1.7 GEIA-STD-0006

- Requirements for Using Solder Dip to Replace the Finish on Electronic Piece Parts (Current lead: Anduin Touw)
- No planned revision at this time
 - Need to revise sample sizes
 - Looking at reballing information

16.1.1.8 TechAmerica STD-0015 BGA

- Requirements for BGA Reballing in Aerospace and High Performance Electronics (Lead Joe Zaccari)
- In progress
- Adding “How to” Appendices

16.1.1.9 IPC Standards

- IPC J-STD-609
 - Amendment 1 Published
- IPC 610 and 001 Revisions E due out 2Q2010
- IPC 7711/7721 no updates planned at this time. Reopen document 3Q2010 to add more information on Lead Free as it pertains to Defense and Aerospace

16.1.2 Actions:

- Andy Ganster to provide Defense Acquisition Guide (DAG) link for committee and provide Sustainment and Acquisition Executive Secretary Integrated Process Team (IPT) Lead 1Q2010
- Jay Mandelbaum to provide information to the Technical Operations Council (TOC) for someone from Sustainment Logistics 1Q2010
- Need POC from AIA for Sustainment and Acquisition
- Jay Mandelbaum to provide link to Systems Engineering Plan (SEP) and SETRL
- Committee to review DAG Chapters 4,5,11
- Dave Locker and Fred Verdi to lead and Coordinate Government lead-free program management guide

16.2 Advocacy Task Team

David Burdick reported.

16.2.1 Members:

- David Burdick
- Dr William Procarione
- Gino Spinos
- Tom Eden
- Dan Kaspari
- Joe Zaccari



- Bob Landman
- Dennis Fritz
- Stephen Meschter
- Gary Latta
- Ed Morris
- Bob Cashman
- Dennis Miller
- Richard Conrad
- Robert Vanderwiel
- Joseph Kane
- Dennis Ahern
- Rusty Rentsch

16.2.2 What we do.

- Analyze pending legislation and draft a document describing reasons why our industry approves or opposes these changes.
- Within our industry work with NASA, DoD, FAA, etc to help with policy or procedure changes.

16.2.3 and How?

- Google Alerts
- IPC
- EIA-Trac
- Chemicals Policy & Science Initiatives WEB Site

16.2.4 Issues

- HR-2420 “Environmental Design of Electrical Equipment Act”
 - Wait & Watch.
- Canadian Ban on Resin & Rosin
 - Monitor and advise.
- Future Rewrite of the Toxic Substances Control Act (TSCA)
 - Focus of attention.
- Reduction of Hazardous Substances (RoHS) Revision
 - Focus of attention.
- Greenpeace 'Guide to Greener Electronics' release at CES
 - We will work with the Communications Task Team.

16.2.5 Actionable Deliverable

- A letter to FAA persuading them to release a Pb-Free policy

16.3 PERM Communications Team

Joe Zarcari reported:



16.3.1 2009 Deliverables

- Establish PERM email communications network – 2Q CY09 Complete
- Establish PERM website – 3Q CY09
- Develop and Distribute PERM Whitepaper to users – 3Q CY09 Complete
- Develop PERM communications strategy outline 4QCY09 In process

16.3.2 Communications Strategy

16.3.2.1 Scope/Expected Results

- Share information from the Aerospace & Defense Pb-free Electronics Risk Management (PERM) Steering Committee, Advisors, and Task Teams:
- Provide conduit for wide data dissemination to the Aerospace and Defense High Performance (ADHP) electronic industries
 - Website
 - The PERM Consortium email distribution list
 - Task team distribution
 - AIA membership
 - AIA Communications Division

16.3.2.2 Media Interface

- Press releases
- Press conferences
- Press Kits
- Media Contact list
- Videos

16.3.2.3 Communication Audience

- Aerospace and Defense High Performance (ADHP) electronic industries
- Government
- Media
- Professional technical societies
- Technical conferences

16.3.2.4 Communication Channels

- Technical papers
- Conference participation
- Website
- Webinars
- Email
- Newsletters
- Press releases
- Media articles/professional journals



- AIA Update & Daily Lead
- Meetings
- Teleconferences

16.3.2.5 Messages

- Strategic targeting and consistency are key to PERM's messages.
- Create a clear message covering all key points
- Tailor the different elements of the message for different audiences.

16.3.2.6 Resources and commitments

- Ensure that our communications content is driven by the PERM Consortium objective to make the A&D community aware of the lead-free issue and develop solutions.
- Base expectations on our resources and make achievable commitments.

16.3.2.7 Evaluation and revision

- Periodically perform a communications audit to assess the effectiveness of our strategy with both our internal and external audiences.
 - What works/doesn't work?
 - What do you want to see more of?
 - What information do you need that we are not currently supplied with?
 - How often do we want us to communicate with you?
- Review the results and use them to improve our strategy.

16.3.3 2010 Actionable Deliverables

- Populate the PERM Consortium Data repository: (Schedule: End of Q1)
 - Presentations from PERM Consortium meetings
 - Other current lead-free technical data useful for engineers
 - Links to other sources of lead-free information
- Assemble vetted Presentations and Briefings for Consortium members to use to present on the PERM Consortium
 - Schedule: End of Q1
- Develop a Press Kit (AIA Com Division support)
 - Schedule: End of Q2
- Have an article published in Aviation Week (AIA Com Division support)
 - Schedule: End of Q3

16.3.4 Additional 2010 Tasks

- Website development (www.permfree.org, www.permleadfree.org)
 - Data repository
 - Team pages (members)
 - Calendar (public)
 - Lead-free activities (public)



- Newsletter (Monthly)
 - Communicate PERM Consortium and lead-free news
 - Highlight new information on website

16.3.5 Communications Task Team Charter

- Objective/Goal
 - The aerospace and defense community needs an efficient mechanism to disseminate information about Pb-free electronics
 - The information types include new issues/problems caused by Pb-free electronics (i.e., bad news), new research findings and solutions (i.e., good news), funding opportunities, and international and domestic legislation activities on the subject
 - Communication types cover all of the options, including email, websites, to teleconferences, to face-to-face meetings and conferences

16.4 Research Coordination

Stephan Meschter reported.

16.4.1 Provide updated GAPs analysis

- Working with the phase 2 Pb-free electronics risk reduction program to finalize. The Phase 2 provides a gap summary and a time line and cost for gap closure.
- The current effort compliments the Phase 2 by providing a more complete summary of the existing DoD project funding and the various consortium efforts.
- Effort delay due in part by the Phase 2 report shift to the right.
- Due date: End 1Q 2010

16.4.2 Research Coordination Task Team Deliverables

16.4.2.1 Provide data structure for technical data repository.

- Working with the phase 2 Pb-free electronics risk reduction program to finalize. The Phase 2 provides a gap summary and a time line and cost for gap closure.
- The current effort compliments the Phase 2 by providing a more complete summary of the existing DoD project funding and the various consortium efforts.
- Effort delay due in part by the Phase 2 report shift to the right.
- Due date: End 1Q 2010

16.4.2.2 Provide an assessment of completeness of data so that it would be useful for comparison with other work.

- Intend to work with communications team on website structure
 - Abstract.
 - Citation and/or link to paper if available.
 - Assign papers to one of our gap areas and not applicability to life cycle.



- Need to be careful of our scope
 - John Barnes' web site has over 16,000 articles related to Pb-free solder
 - <http://www.dbicorporation.com/rohsbib.htm>
 - Which ones will we include?
- Due: end 2Q 2010 (after the June Meeting)

16.4.3 2010 Gap Presentation Next Tasks

- Finish adding cost and schedule information
- Include “flavors of money” (R&D, prototype, sustainment...)
- Compile summary power point similar to Melbourne 2008 presentation

16.5 Training Task Team (T³)

Tim Kalt reported

16.5.1 Introduction

- Statistics
 - 21 Participants yesterday
 - 8 New Participants
- Overview:
 - Recap of previous Face to Face meetings
 - Charter Review
 - Industry Training Survey (2nd Attempt)
 - Deliverables
 - Path Forward

16.5.2 Deliverables

- T3D1 – Proposed Changes to Charter 2QCY09
 - COMPLETED
- T3D2 – Logo 2QCY09
 - COMPLETED
- T3D3 – Existing Training List 2QCY10
 - Sub Team established
- T3D4 – Training Audience & Needs 2QCY10
 - Sub Team established
- T3D5 – Industry Training Survey (Results) 2QCY10
 - Sub Team established
- T3D6 – Training Gap Identification 3QCY10
 - Sub Team TBD

16.5.3 Path Forward

- Increased Participation
 - Additional Telecons between F2F Mtgs



- Increased Focus
 - Three Sub Teams working their Deliverables
 - Sub Team Leaders & members chosen
- Projected Deliverables (not shared yet....)
 - Future strategy discussed

16.6 International Advisory Group (IAG)

Bob Gregory reported.

16.6.1 Objective/Goal

Establish and convene an International Advisory Group(IAG) to define and agree on clear and realistic goals in concert with the PERM Steering Committee that will assure ongoing international cooperation on technical, implementation and verification issues related to lead-free transition

16.6.2 Scope/Expected Result

- This IAG should include members from interested countries and organizations who are working to manage the common risks faced by the aerospace industry
- It will cultivate support and help facilitate the following and similar cooperative activities
 - Release of IEC standards and handbooks that manage and reduce the risks of lead-free changes
 - Identification and documentation of gaps
 - Determination of common goals and concerns
- They should also track and assess related and emergent regulations and activities world- wide that impact or may impact aerospace stakeholders during the lead-free transition
- Note: The international rules, limits and regulations regarding cooperation must be followed by the committee as governed and agreed to by the organization from which they come.



16.6.3 IAG Roster

Michelle	O'Neill	Honeywell	Belgium
Daniella	Pandrea	Honeywell,	Brussels
Barrie	Dunn	European Space Agency	Holland
Laurent	Cretinon	EDF	France
Frédéric	Relmy-Madinska	Airbus	France
Michael	Jeremias	EADS Deutschland GmbH	Germany
Mordechai	Kirshenbaum	MOD,	Israel
Norio	Nemoto	Japan Aerospace Exploration Agency (JAXA)	Japan
Tadahiro	Shibutani	Yokohama National University	Japan
Katsuaki	Suganuma	Institute of Scientific & Industrial Research Osaka University	Japan
David	Akhurst	General Dynamics United Kingdom Limited	UK
Bob	Gregory	Rolls-Royce	UK
Kieth	Harney	MoD	UK
Chris	Hunt	National Physical Laboratory	UK
Richard	Matthews	Spur Electron	UK
Dave	Sidgwick	GE Aviation	UK
Vance	Anderson	DMEA	US
David V	Burdick,	Boeing,	US
Bob	Cashman	Parker Aerospace	US
Lloyd w.	Condra	Boeing,	US
Tom	Eden	Gables Engineering	US
Dennis	Fritz	SAIC inc	US
Chuck	Griffin	NASA	US
Paul	Hagen	Beveridge & Diamond (Attorney)	US
Joel	Heebink	Honeywell Aerospace	US
Gary	Horan	FAA	US
Dave	Humphrey	Honeywell	US
Tim	Kalt	USAF	US
Chas	McCallum	Lockheed Martin	US
Ed	Morris	Lockheed Martin	US
Bob	Vanderwiel,	Lockheed Martin	US
Taly	Walsh	TIA	US
Joe	Zaccari	Corfin	US
Jim	Carrigan	Premier Semiconductor Services LLC	US

16.6.4 IAG Objectives

- Monitor developing legislation.
- Collate notes on developing situations
- Produce briefing notes
- Support non-US PERM meetings

16.6.5 Deliverables

- Produce 2 briefing notes
 - June 30th
 - December 23rd

16.7 Supply Chain Task Team report

Bill Procarione Reported.

16.7.1 Objectives

- A reduced probability of unknowingly accepting either non-compliant electronic components and subassemblies or unannounced changes in materials use.
- Actionable recommendations that can achieve more commonality in requirements and processes along the supply chain



16.7.2 Barriers to Achieving Objectives

- Knowledge (i.e., malignant ignorance)
- Policy (lack thereof)
- Information / Data
- Direction
 - Standards (how to...), design and process
 - Supplier engineering requirements
 - Supplier quality criteria
- Money – How much are you willing to pay to get what you want?
- Reliability – No quantitative reliability assessment capability to guide requirements “accommodations.”

Noted difficulty in specifying what is needed.

Pb-Free Electronics is not compatible with systems engineering today

16.7.3 What We Need to do to be Finished:

- “Finalize” the current situation assessment
 - Get TOC visibility and feedback
- Define an attainable, and presumably workable future situation
- Provide actionable recommendations that, again presumably, can be executed can by those with responsibility, accountability and authority
 - Request a response from the TOC

More Specifically...arrange a preliminary supplier/aero industry conference (mid-year) and plan for a more inclusive conference for late 2010.

2nd Quarter need to have preferred specifications for P/N and Configuration meet.

3rd and 4th Quarter push awareness of the position.

Reach out to SAE and need to work with the AIA Supplier Management Council (SMC).