
Notes From:
1999 Government/Industry Microelectronics
DMSMS Workshop
Orlando, FL
October 14, 1999

Welcome and Introduction – James Korn, Lockheed Martin

Opening Remarks – Ted Glum, DMEA Director

Question and Answer Session – Ken Bollinger Chairman

Q to Ken Fehr F-22: What has F-22 done to manage Diminishing Manufacturing Sources and Material Shortages (DMSMS)?

A: The number one lesson learned was to ensure that a funding source is included in the program plan. That plan must also be able to identify funds for future unknown part issues (pop-up parts). Ken Fehr noted the following lessons learned:

- The need to put together both a business and technical plan
- Work the funding source to implement the plan
- The plan includes all known Diminishing Manufacturing Sources (DMS) items through production
- Funding allocation for Pop-ups (future or currently unknown DMS items) for next few years
- Create historical database to put an unknown factor into the plan

- Make design more DMS resistant.
- Use Out of Production Parts (OPP) Tools during the design process
- Developing strategies for dealing with memory chips – Obsolete about every18 months
- Select widely used parts and widely used standards (architectures)
- Biggest problems are currently the Application Specific Integrated Circuits (ASICs), try not to be locked into a single supplier or be the only user of a chip
- Limit retrofits to module replacement (more robust backplane)
- Place voltage regulators on cards to account for lower voltages (3 to 1.8 and lower)

- Balance engineering redesigns against parts buys
- Bridge buys, No life type buys yet
- Form, Fit, Function and Interface (F3I) redesigns
- Plan for technology insertion upgrades and capability increases at the same time

- Explore new contract clauses (e.g. How do you work DMS issues for F-22 Life-of-Type (LOT) buys that are currently not on contract?)
- Termination and Liability Clause – This allow the Original Equipment Manufacturer (OEM) to purchase material to support future manufacturing, and if the government fails to order some of the OEM and Subs will get back some of advanced material costs

Comment from John Fink – because of "self fulfilling prophecy" manufacturers will wait to last minute to designate parts as obsolete... no one will buy the product once it is announced.

Q to Henry Livingston Sanders: What is the status of the DMS Best Practices in development for industry use?

A: The member Electronic Industry Association (EIA) companies are emphasizing pro-active DMS management over the entire life-cycle. Best practices will state to use planning, DMS forecasting and case identification methods, and technology road maps. Additionally, we are seeking input from the Engineering Operations Counsel of the Government and Industry Association with respect to design considerations and how to make design incorporate DMS resistant designs.

The best practices will:

- Establish parts selection guidelines which balance part life-cycle and technical requirements
- Discuss the use of modular designs, standard inputs and architecture
- Provide guidance for use of plastic encapsulated microcircuits (PEMS)
- Document the "traditional DMSMS" mitigation strategies developed in the past
- Develop cost trade-off study methodology. The acquisition community will need to justify their budgets and show the business case that following best practices is worthwhile.

Early drafts of some documents are available for review and comments. (No Web Address available)

Two levels of best practices are envisioned: level 1 – minimum practices industry should be following regardless of whether it is on contract, and level 2 – additional practices that industry should be doing that will require industry and customer coordination (more customer funding would be required or required by contract).

Panel Discussion on the merits of DMS Management and its perceived value added vs. OEM only performing work required by contract. For example, Mr. Buss stated, "will the customer buy more services or more hardware? Obviously the customers will buy more hardware." Additionally, their needs to be documented business cases that show the "cost avoidance" as compared with actual cost savings in real Dollars.

Q to Ron Shimazu DMEA: How can DoD put more emphasis on addressing DMS in the world of acquisition reform

A: We need to develop acquisition guidelines that address DMS risk management by the contractor. One of the goals should be to maintain cost and schedule program profiles when DMS problems occur. That means advanced planning/funding in place to resolve obsolescence we know will occur during follow on phases of program.

Also, in the Request for Proposal (RFP) specify that contractors proposals not only show what DMS programs are in place for that project but what is the company (at the corporate level) doing to address DMS. For example, sharing solutions across different business units, leveraging the IC marketplace by utilizing company-wide group purchase agreements, etc. The guidelines should provide source selection evaluation criteria. These new acquisition guidelines will cover the phases from development through sustainment. Industry needs to be a part of the discussion as to what level of DMS management is right for each program. But we need to still mandate DMS programs and performance in contracts.

Comment from John Fink – Commonality is a solution to manage supplier risk. Future issue is the area of IC wear out because the new smaller feature sizes.
Comment from Jerry Watts – Color of money is a problem, acquisition cost versus sustainment cost.
Comment from Eileen Foley – Color of money is not the only issue, "the lack of this year money" also hurts the ability to acquire the parts need in future acquisitions.

Q to Steve Buss Northrup Grumman: If the contractor makes a LOT buy for future production should the Government share that risk?

A: First off I am not a proponent of LOT buys. LOT buys will do more harm than good for the program, and will probably cost you more. I think you are better off using a phased approach and bridge buys. You should step back and look at the situation, and when it is the right thing to do a LOT buy. At Northrup Grumman, LOT buys have to be approved by the VP and will come out of his budget, may even affect his bonus. A strong business case is needed for CEO approval, the business case will look at where used, how many programs, cost and schedule impact if they don't do a LOT buy or if there is a firm requirement needed to maintain a standard configuration. For the Government to share that risk progress payments and/or termination liability clause should be investigated. One other technique is to perform reliability, maintainability, and availability analyses to determine technology insertion for a reduction in Total Ownership Cost.

In the future, performance based specifications will allow the OEMs to maintain the functions of box, without maintaining configuration control at the piece part level.

Basic Criteria for LOT Buy Business Case:

- What is the part?
- How critical is it to the system?

- What is the impact on system and across system? Is the parts or parts used on one or more systems?
- What are cost and schedule impacts of that part not being available?
- Where is the program in the Life-Cycle? It makes less sense to do LOT buys early in the program.
- Is there a requirement to maintain a fixed configuration?
- Check with "designers" do they think a LOT buy is justified?
- What are the sustainment requirements? Who is going to perform sustainment?

Possible methods of sharing risk in contracts

- Termination clause where government pays a percentage of the if the parts are not used
- Progress bill cost of material at a fixed percentage
- Government supplied material
- Contractor supplied material
- Give OEM responsibility to resolve DMS up to a certain limit

Q to Jerry Watts WR/ALC: What is the latest information on solutions for low voltage technology?

A: We know that with the advancing technology, density, speed, resolutions will become more difficult. We have to look at obsolescence versus sustainment. Throw away avionics is still not happening for the military. We have to change the focus from an individual solution for one device and look for solutions for the whole technology.

The problems faced by sustainment today are centered on the components that were manufactured in small quantity for a specialized military marketplace (for example, the gate arrays and logic arrays).

Being able to sustain systems (using low voltage technology) will depend more on the design and sustainment strategy that is developed, as well as the deployment of the parts in the commercial marketplace. The sustainment and transition of these technologies to the depots are still in the future.

Printer Wiring Boards (PWBs) are being repaired today where a F3I replacement could be manufactured cheaper.

The technology challenge of going to lower voltage is not the only challenge, others are:

- Density of packaging and the operational frequencies
- Developing tests
- Removing and replacing failed parts
- PWB repair given the number of pin on the devices

Q to John Fink – How are the commercial airlines handling avionics sustainment? The commercial airlines are moving away from three level of maintenance and towards 2-level maintenance. PWBs are repaired when possible, however, part availability and

PWB densities affect this strategy. Boards are redesigned and provided as functional replacements (with FAA oversight) much like the DoD performance specifications.

Comment by Ken Fehr – Even with Contractor Logistics Support (CLS), the Air Force wants to stay involved in the change planning. One reason cited is capability upgrades. For example, the OEM may be considering a change because of DMS in Block 6, however, Air Combat Command (F-22 Users) may be wanting a capability upgrade in Block 7. These changes must be balanced so that total program costs are minimized.

Q to Joe Chapman TI (retired): What is the status of the DoD report on upscreening

A: The definition of upscreening is using commercial parts beyond the specified temperature range of 0 to 70 – "parts used in an application that it was not designed or manufactured to be used." Greg Saunders, head of Commercial Off the Shelf (COTS) standardization, was asked the question "what is the DoD policy on using upscreened parts," since he did not have an answer, I was tasked to conduct a microcircuit upscreening study (complete about 6 months ago). The survey is still ongoing [no completion date was provided]. A number of organizations and industries were surveyed. The semiconductor industry is adamantly against upscreening—no one can test the part without all of the test vectors like the manufacturer can. Naval Warfare Center Surface (NSWC) states that upscreening is not allowed. Other documents that address upscreening are:

- NAVSEA parts requirements and application manual suggests that part must match environment will become a DoD handbook.
- International Electrotechnical Commission Quality (IECQ) Avionics Working Group
  - Management Plan, avionics parts selection document
  - Reliability guidance
- Guidance on how to use components outside the designed temperature range. This was published to account for legal issues—establishes accepted practices for doing something out of ordinary.

Computer Aided Life-Cycle Engineering (CALCE) classes conducted by Michael Pecht has not provided the guidance needed but has stated all the warnings and legal ramifications. Using up-screened parts should always be the "last engineering choice," you should have exhausted all other options.
A new term component source facilities (CSF) is a significant concern to the IC manufacturer.
Dangers identified from survey

- Handling of parts is still causing Electro Static Discharge (ESD) problems.
- An upscreened lot is a snapshot in time

DoD should provide advice not direction. The two reference points will be the NAVSEA manual and the IECQ Guide for using parts outside of temperature range

Q to Eileen Foley U.S. Army: Are operating environments accurately specified?

A: The Missile Command's point of view is different from the Air Force's. We put a missile in a box and leave it there until it is ready to be fired. The missile must meet the reliability requirement, but we don't continually use them or continually repair them, and we don't have a mean time between failure data for them.

Even though the requirements for the missile are –50 to 125 degrees C, however, it doesn't mean that the individual components will see that environment. The Army is using commercial and modified commercial parts within the missile. Commercial cards have been placed in a sealed, gas filled environment for protection. The Army has had success with using commercial parts, and having them pass Hardness Critical, Environmental, and EMI tests.

The Army is looking at the requirements, and using commercial product within its design constraints. We are not currently upscreening. The packaged commercial parts are subject to all the same testing (e.g. environmental test, temperature cycling, Highly Accelerated Stress Test, and stresses within the missile).

With commercial parts and plastic (PEM) components, we have to worry about long-term storage not necessarily the temperature range. Current efforts center on determining if the long-term storage requirements can be met. The Army has pulled together a committee to look at PEMs and develop a PEM management plan and policy. This policy will be applied to all programs to ensure consistent PEM usage. The Army is supporting the MANTECH Program, by looking at hermetically coating at the PEM level for long-term storage.

DoD needs to develop a means of sharing PEM data, to save cost by not performing multiple tests on the same component.

Q to John Fink Honeywell: What does DoD and industry need to do to better leverage the IC industry?

A: We are not insignificant as a group, but historically, we have not acted like one. We concentrate on our own companies and jobs.

As the IC industry was telling us to go away, they made an interesting comment – "If you (the military IC users) can act as one customer, we might treat you different."

Avionics OEMs have banded together under the umbrella of the Stack International organization. (www.stackinternational.com) Under this cooperative organization, OEMs combine for more buying power, act as one customer. Stack provides a legal umbrella to keep companies out of legal and anti-trust issues. Stack is working towards common parts list for member OEMs and common parts buys. The procurement personnel are having some problems with this trend due to competition issues.

In short, we've got to act as one group. We are making progress.

Also, check out the IECQ document on upscreening at
http://www.iecq.org/_private/AWG.htm

Question and Answer Session:

A lengthy question and answer session followed the panel discussions. Roughly twenty questions were posed to the panel members from the audience and responses were provided.

Summary and Conclusions:

After reflecting on the day's discussions from the speakers and audience, it was decided that there were four main issues that needed to be pursued further. These issues, which DoD and Industry should focus on are: DMS best practices, acquisition guidelines, upscreening, and leveraging the semiconductor industry.

After clarifying the key issues, the panel was invited to comment on each one. Some of the key points are summarized below:

Best practices

- Continued education on DMS, investigate buying spare parts at same time. Need to get word out to other activities.
- Checkout information on Best Management Practices (BMP) website
- Need an overview briefing describing problem
- Program managers have to be convinced with a business case that following best practices is worthwhile.
- Government Electronic Industry Association (GEIA) engineering council is developing a best practices guide
- Need to work together
- The use of best practices will be a sales and marketing job. A Defense Systems Management College (DSMC) course should be developed for best practices

Acquisition Guidelines

- Combine acquisition guidelines with best practices
- Check acquisition strategy as system evolves
- No matter how good…it has to be in contract despite current acquisition reform guidelines
- Education of management is needed. Integrate DMS into acquisition plan.
- More collaboration needed

Upscreening

- Upscreening should be utilized only as a last resort.
- We need "buy-in" on DMS policies and recommendations on upscreening.

Leverage

- Need a parts list
- Need to work together
- The future will be more functions with less weight…we will not be using military Qualified Manu factor Listing (QML) parts. We will need latest parts, latest capabilities, which are not QML.
- Need consortiums
- Whatever we do Semiconductor Industry Association (SIA) folks need to be involved
- Use designs common to commercial sector

Other observations

- Who funds DMS management efforts- corporate level or program level – if it is not in the contract it will not be done.
- Must show business case to implement best practices.
- Retesting of parts when another military program may have already tested it – the DoD is paying for the same tests more than once.
- Use of performance based specifications and wider use of COTS make adoption of common documents (best practices) difficult.
- Transition to open systems.

Final Comments:

DMEA volunteered to spearhead the effort to pursue the four key issue areas identified by the panel members and audience. These issues will be the topics of further meetings, and follow-on workshops. It was concluded that the workshop was a worthwhile success and that this type of Government-Industry cooperative effort was worthwhile, productive, and must continue.

End of meeting.