Department of the Navy Perspective on Obsolescence Management

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Deputy Assistant Secretary of the Navy (Logistics)

2006 DMSMS Conference
Outline

I The Case for Managing Diminishing Manufacturing Sources and Material Shortages (DMSMS)

II DoN Status - Past/Present/Future

III Microelectronics Market

IV Technology Considerations

V Performance Based Logistics (PBL) and DMSMS
The Case for Managing DMSMS
A Government Perspective
The Case for Managing DMSMS

• Why manage DMSMS proactively?
  – Significant costs to redesign, test, qualify, certify and integrate replacement sub systems and components
  – Schedule volatility prior to introduction to the fleet
  – For deployed product, associated readiness degradation

• DOD cost estimates for DMSMS impacts on deployed systems range upward of $15 Billion
  – DoN share is significant

• A January 06 review of DoN programs showed a healthy Return on Investment for managing DMSMS
The Case for Managing DMSMS

AAIPT DMSMS TEAM COST AVOIDANCE $42,128,799 (DMEA Estimates)
275 Recommendations Made to 13 Platforms since 1/25/05
### The Case for Managing DMSMS

DoN case management data from SSB, Horizon, and OMIS

<table>
<thead>
<tr>
<th>Jun 06</th>
<th>Customers</th>
<th># of Platforms</th>
<th># of Systems</th>
<th># COTS LRUs</th>
<th># Custom LRUs</th>
<th>Est. Cost Avoidance</th>
</tr>
</thead>
</table>
| • 18 NAVSEA
• 4 SPAWAR
• 16 NAVAIR
• 3 USMC
• NAVICP-Phil
• 1 Coast Guard; 1 Army; 1 AF
• 6 Private Party (EDO; Raytheon; Boeing, Northrop Grumman) | 52 | 429 | 6,637 | 8,718 | $135.4 M |

<table>
<thead>
<tr>
<th>Jan 05</th>
<th>Customers:</th>
<th># of Platforms</th>
<th># of Systems</th>
<th># COTS LRUs</th>
<th># Custom LRUs</th>
<th>Est. Cost Avoidance</th>
</tr>
</thead>
</table>
| • 15 NAVSEA
• 1 SPAWAR
• 8 NAVAIR
• 2 USMC
• 1 NAVICP-Phil
• Private Party: EDO. | 41 | 265 | 5,038 | 5,627 | $94.2 M |
II. DoN Status – Past/Present/Future
Past

DoD 4140.1-R
Supply Chain Regulation
DMS Policy
23 May 03

DASN(L)
DMSMS Survey
9 May 04

DoN
DMSMS EXCOMM
28 June 04

DMSMS
ESG & IPT
Established
18 October 04

DMSMS PM
Plans & Metrics
12 April 05

2003

DASN(L) In-place
ASN(RD&A)
directed to address
DMSMS issue
July 03

NAVSO P-3692
ILA Handbook
30 Dec 2003

DASN(L)
DMSMS Memo
10 May 04

DASN(L)
Evaluation Criteria
for DMSMS
20 August 04

SECNAVINST
5000.2C
19 Nov 04

ASN(RD&A)
DMSMS Management Guidance
27 January 05

2004

2005
Present/Future

Pilot DMSMS effort with V-22 23 Aug 05

DON ACAT DMSMS Plans Report 13 Jan 06

DMSMS Contracts Guide 22 May 06

RoHS Implementation Effective 30 Jul 06

DoN DMSMS Strategic Plan Feb 06

NAVSO P-3692 ILA Handbook Update

Planned Completion of DoN SDW Module Oct 06

Documents available at
http://www.acquisition.navy.mil/
DoN DMSMS Contracts Guidance

- Applicable to PBL and Traditional Contracts
- Provides considerations for:
  - DMSMS Management;
  - Parts Management;
  - Configuration Control;
  - Supplier/Subcontractor Management;
  - Bills of Material (BOM);
  - DMSMS Forecasting and Notification;
  - Open Systems Architecture for Software; and
  - Incentives & Exit Clauses.

Draft ILA Handbook (NAVSO P-3692)

- Incorporates and updates DMSMS criteria from the 20 Aug 04 DMSMS supplement
- Incorporates information from the published ASN(RDA)/ DASN(LOG) DMSMS memos and guidance documents
- Emphasis placed on implementation (# BOM loaded, metrics collection, management practices, etc.)
III. Microelectronics Market
Problem & Challenge

**Problem**
Microelectronics are increasingly manufactured off-shore, and most OEMs don’t know the pedigree or location of manufacture of their microelectronics.

**Challenge**
Do you know where the microelectronics in your systems are manufactured?
Do you understand the risks associated with not knowing?
Do you know how to mitigate the risks?
Process

Sand to Silicone – Eleven Steps

1. Obtain Silicone (Sand)

2. Silicon Crystal (Ingot) 99.99999% Pure Si

3. Polished Wafer – Mirror-like surface, credit card thin 100 – 300 MM diameter

4. Dielectric Deposition (SiO2) – a non-conductive layer

5. Photo Lithography – Photo resist builds up a pattern of hardened material

6. Etching – Strips away hardened patterns to leave a pattern of dielectric

7. Doping – Implants various conductive materials

8. Metalization – Deposits the final layers of metal (copper) that provide the network of interconnects

9. Testing – Die Level via wafer probes

10. Packaging – Wire bonding and lead frame attachment

11. Testing – Package Level – via In-circuit or other test methods
Critical Manufacturing Flow (Example)
- Integrated Circuit (IC)

1. Silicon (Sand)
   - Norway/Brazil
2. Silicon Ingots
   - Netherlands
3. Wafer Slice / Polishing
   - USA
4. Foundry
   - Current: China
5. Testing
   - Malaysia
6. Packaging
   - Thailand
7. Final Test
   - USA
8. IC Distribution
   - USA / Asia / Europe
9. EMS
   - Mexico / China
10. Final Assy & Test
    - USA
11. Customer
    - USA/DoD

Source: ARROW/ZEUS Electronics
## Semiconductor Market

### Semiconductor Sales in Millions/$:

<table>
<thead>
<tr>
<th>Year</th>
<th>1995</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>46,998 (33%)</td>
<td>40,736 (18%)</td>
</tr>
<tr>
<td>EUR</td>
<td>28,199 (20%)</td>
<td>39,275 (17%)</td>
</tr>
<tr>
<td>Japan</td>
<td>39,667 (27%)</td>
<td>44,082 (19%)</td>
</tr>
<tr>
<td>ASIA/Pacific</td>
<td>29,540 (20%)</td>
<td>103,391 (46%)</td>
</tr>
</tbody>
</table>

### % Share of Global Semiconductor Consumption

- **The Americas**
- **Japan**
- **Europe**
- **Asia Pacific**

Source: SIA
Foundry Locations

More Than One-Half of the Foundry Capacity That Has Started Construction Since 2000 is in China

Capacity of Fabs When Fully Ramped (000s) of Equivalent 200mm Wafers

Quarter Fab Begins Construction

Source: Strategic Marketing Associates (October 2004)
World-wide Foundry distribution:

2002 Foundry Shares

- **Taiwan**: 63%
  - *Taiwan Semiconductor Microelectronics Corp (TSMC)*: 42%
  - **United Microelectronics Corp (UMC)**: 17%
- U.S., Europe, Singapore, Malaysia & China: 37%
- Other Taiwan: 4%

Source: iSuppli

- *Taiwan Semiconductor Microelectronics Corp (TSMC)
- **United Microelectronics Corp (UMC)
Foundry Locations

Construction Spending by Region (Millions of Dollars)

Even if you get the BOM, you still may not know the following:

- Pedigree of the part or process;
- Possibility of Hostile Code;
- Reliability / Quality;
- Lead Frame Material Coating Content;
- Date Code; and
- Fabrication Process (Die Shrinks).

Assess the criticality of the item to determine the level of data required.
IV. Technology Considerations
## Technology Considerations

**Support Characteristics**

<table>
<thead>
<tr>
<th>Component Type</th>
<th>Supply Base</th>
<th>Standardization</th>
<th>Rate of Tech Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passives</td>
<td>Broad</td>
<td>High</td>
<td>Slow</td>
</tr>
<tr>
<td>Discretes</td>
<td>Broad</td>
<td>High</td>
<td>Slow</td>
</tr>
<tr>
<td>Digital Logic</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Fast</td>
</tr>
<tr>
<td>Linear and Analog</td>
<td>Moderate</td>
<td>Low</td>
<td>Fast</td>
</tr>
<tr>
<td>Programmable Logic</td>
<td>Limited</td>
<td>Low</td>
<td>Fast</td>
</tr>
<tr>
<td>Memory – Volatile</td>
<td>Moderate</td>
<td>High</td>
<td>Fast</td>
</tr>
<tr>
<td>Memory – Non Volatile</td>
<td>Broad</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Processors and Controllers</td>
<td>Limited</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Application Specific IC</td>
<td>Limited</td>
<td>Low</td>
<td>Slow</td>
</tr>
<tr>
<td>Switches, Relays, Displays</td>
<td>Limited</td>
<td>Low</td>
<td>Slow</td>
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Source: ARROW/ZEUS Electronics
## Technology Considerations

Support characteristics compounded by temperature, packaging, factors, etc.

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<th>Standardization</th>
<th>Rate of Tech Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passives</td>
<td>Limited</td>
<td>High / Drawing Controlled</td>
<td>Slow</td>
</tr>
<tr>
<td>Discretes</td>
<td>Limited</td>
<td>High</td>
<td>Slow</td>
</tr>
<tr>
<td>Digital Logic</td>
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<td>Low</td>
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<tr>
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</table>

Source: ARROW/ZEUS Electronics
Product Life Cycle Information is a Subjective Measure

Typical life cycle characteristics for the six generic stages of a part life cycle

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Introduction</th>
<th>Growth</th>
<th>Maturity</th>
<th>Decline</th>
<th>Phase-out</th>
<th>Obsolescence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>Slow but increasing</td>
<td>Increasing rapidly</td>
<td>High</td>
<td>Decreasing</td>
<td>Lifetime buys may be offered</td>
<td>Sales only from aftermarket sources, if at all</td>
</tr>
<tr>
<td>Price</td>
<td>Highest</td>
<td>Declining</td>
<td>Low</td>
<td>Lowest</td>
<td>Low</td>
<td>Not applicable or very high of available from aftermarket sources</td>
</tr>
<tr>
<td>Usage</td>
<td>Low</td>
<td>Increasing</td>
<td>High</td>
<td>Decreasing</td>
<td>Decreasing</td>
<td>Low</td>
</tr>
<tr>
<td>Part Modification</td>
<td>Periodic die shrinks, and possible mask changes</td>
<td>Periodic die shrinks</td>
<td>Periodic die shrinks</td>
<td>Few or none</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Competitors</td>
<td>Few</td>
<td>High</td>
<td>High</td>
<td>Declining</td>
<td>Declining</td>
<td>Few</td>
</tr>
<tr>
<td>Manufacturer Profit</td>
<td>Low</td>
<td>Increasing</td>
<td>High</td>
<td>Decreasing</td>
<td>Decreasing</td>
<td>Decreasing</td>
</tr>
</tbody>
</table>

Source: ARROW/ZEUS Electronics
Technology Considerations

Time to process through the entire cycle varies for different components and technologies

Source: ARROW/ZEUS Electronics
Time to process through the entire cycle varies for different components and technologies.
Understand the Industry Technology Roadmap and Pedigree of Critical Integrated Circuits/Technologies

- Obtain BOM (or preliminary parts lists during design)
- Map those Roadmaps to the system’s Technology Roadmap and address Gaps
- Forecast for Obsolescence, Manage, Mitigate, Track
- Collect Metrics (Use ASN(RD&A) published metrics guidance)
V. PBL and DMSMS
PBL and DMSMS

PBL does not mean that you abdicate responsibility for DMSMS. You should:

• Require Incremental delivery of the BOM;
• Manage Configuration of the BOM at the piece part level;
• Require Continuous monitoring of the BOM...with periodic feedback;
• Require continuous proactive DMSMS management...employing technology roadmaps;
• Continually identify, track and manage DMSMS cases;
• Ensure cost effective solutions...“Hierarchy of Cost Avoidance Methodology”;
• Require Reporting and tracking of performance and cost metrics;
• Maintain Insight into prime contractors management of subcontractors (e.g., design for obsolescence); and
• Utilize Exit clauses that includes delivery of the above as required.

Questions/Discussion
Moore’s Law pushes Critical Characteristics Forward.

\[ \mu = 1991 \times 8^M^{0.0011} \]

Source: ARROW/ZEUS Electronics