NAVSEA’s Approach for Managing the Risk of Hazardous Material (HM) Usage in New Acquisition

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Why do we care about HM

- Increases Life-Cycle Costs
  - Special handling/stowage
  - Waste disposal

- Adds Compliance Constraints
  - Permitting may be required

- Presents ESOH risks
  - User safety
  - Environmental impact

- Threatens Sustainability
  - Future availability of HM may impact the lifecycle of a system
HM Historical Challenges

• Lack of common approach to HM avoidance.
  – Multiple chemical avoidance lists exist among the different Navy (and DoD) Acquisition Program Offices.

• Expansive universe of chemicals of concern
  – How to decide what chemicals to include or prioritize

• HM managed independently of system safety

• OEM’s have to stock various materials for same application based upon individual programs
  – Lack of commonality
  – Potential sustainability concerns
  – Increased cost to DoD for parts and materials
  – Inability to implement other program’s lessons learned
Efforts to Standardize HM Management

- NAVSEA technical community recognized the need to standardize, strengthen, and improve the approach to hazardous materials avoidance in acquisition programs
  - 2008: NAVSEA 04RE Prohibited and Controlled Chemical List Guidance
  - 2010: NAVSEA 05P25 HM Avoidance Process Letter
  - 2012: NAVSEA 05P5 Prohibited and Controlled Chemical List Revision 1
    - Baseline for 2013 National Aerospace Standard (NAS) 411-1
    - Knowledge sharing, lessons learned, and process improvement between NAVSEA technical community, Program Executive Offices, NMCPHC, FFC, NAVAIR, SPAWAR, Shipyards, and OEMs
  - 2016: NAS 411-1 revision
How NAVSEA is Standardizing

NAVSEA 05 HM Avoidance Process DPC Manual (T9070-AL-DPC-020/077-2)

- Signed out by NAVSEA CHENG (NAVSEA 05) on 28 Sept 2015
- Applicable to all new ship and weapon system/equipment acquisition programs, modernization programs, logistics revisions and system life-cycle management
- Outlines roles and responsibilities for acquisition programs and the technical community
  - Invoke the requirements of the DPC Manual within all appropriate documents
    - Should be integrated into the Statement of Work and/or Requirement Specifications prior to contracting
    - Can be referenced in contract documentation
    - Should be referenced in the Systems Engineering Program, System Safety Management Plan, Hazardous Materials Management Program Plan, and other design documents (as contractually required and appropriate)
  - Management of HM is based upon application and associated risk
    - Defines HM identification, risk assessment, acceptance, and tracking process

Handle HM Risks the Same as All Other System Safety Hazards
How We are Standardizing

- DPC Manual promulgates the **NAVSEA List of Targeted Chemicals (N-LTC)**
  - Standardized chemical list for incorporation into Acquisition Program documentation
  - Divided into three tiers: Prohibited, Restricted, and Tracked (aligns with definitions per MIL-STD-882E, Task 108)
  - Complements Aerospace Industry Association Hazardous Material Target List (HMTL) published in NAS 411-1
    - All prohibited/restricted chemicals listed on NAS 411-1 are listed on N-LTC
      - N-LTC updated to reflect changes to chemical tiers as accepted by DoD and implemented in 411-1
    - N-LTC includes chemicals that are unique to shipboard environment
      - **N-LTC is the NAVSEA tailored version of the NAS 411-1 as defined by the NAS 411-1 language**
      - NAS 411-1 maintained as the smaller chemical universe to control costs associated with HM management
        - Chemicals required to build an aircraft carrier are significantly different from those required to build a tank, jet, or helicopter
• Application Exceptions
  – Identification of NAVSEA 05 application exceptions to restricted tiers
    • NAVSEA technical community has identified and approved the risk associated with specific applications for certain restricted chemicals (included as notes in manual)
      – These approvals are specific to NAVSEA
      – Many of these applications are common across DoD
      – Programs still need to accept risk
    • Reduces waiver burden from chemicals in commonly accepted applications
    • Examples include:
      – Industry Standard Metal Alloys (chromium, lead, nickel, etc.)
      – Mercury used in general purpose lighting, LCD displays, and battery residual
      – Copper used in piping, cables, printed circuit boards, wire, terminals, or electrical applications that require bonding or grounding
• **Standardized severity**
  
  - NAVSEA technical community has standardized the assignment of severities associated with chemicals
    
    • Historical attempts at HM risk assessments did not have proper justifications for severity assignments
    
    • Prohibited and Restricted chemicals are listed in the N-LTC with a severity based upon MIL-STD-882E definitions
      
      - Known Carcinogens assigned Catastrophic Severity
        
        • Exposure to a known human carcinogen can result in cancer which can result in death
        
        - Likelihood of getting cancer is dependent upon the application including dose, frequency of exposure, routes of exposure, etc.
          
          • Probability
            
            - *It is at the discretion of the program to assign probabilities specific to their applications*
Manual currently being updated

- Chemical Changes
  - ODS Class II elevated to Prohibited/HFCs to Restricted
    - Montreal Protocol and Clean Air Act
  - Persistent Organic Pollutants (POPs) are prohibited
    - Includes chlordane as well as DDT, Heptachlor, Aldrin, etc.
  - Updates to NAS 411-1 from 2013 to 2016
  - Toxic Substances Control Act (TSCA) and TSCA PBT
  - PFOS (Prohibited)/PFOA (Restricted)
  - Other chemicals as directed by SECNAV and CNO

- Creation of new application exceptions

- Standardized Hazard Assessment Report (HAR) form
  - NAVSEA published a standardized form in NAVSEA 5100.12-M
  - Integrated the standardized form into the HM Avoidance DPC with instructions on populating fields related to a HM Risk
Severity assignments updated per technical paper developed by Navy Marine Corps Public Health Center (NMCPHC)

- NAVSEA worked with NMCPHC to develop a scheme to correlate the severity definition to chemicals
- The severity for personnel exposure to HM determined based upon the intrinsic nature of the chemical constituents (i.e. What information is on the SDS)
  - Correlate the classifications per the Global Harmonization System (GHS) found on Safety Data Sheets (section 2) to severities
  - Severities have been assigned to chemicals using both MIL-STD-882E and NAVSEA 5100.12-M definitions
    - Based solely on personnel exposure hazards, not environmental constraints
- Programs may vary specific HM severities from those listed for chemicals based upon information on product SDS
- NMCPHC severity assignment scheme published in NMCPHCINST 6270.8E, Health Hazard Assessment
# HM Risk Assessment Matrices

**MIL-STD-882E**

**NAVSEA 5100.12-M**

## Risk Assessment Matrix

<table>
<thead>
<tr>
<th>Frequency and Probability</th>
<th>CVN Loss (1)</th>
<th>Ship Loss (2)</th>
<th>Catastrophic (3)</th>
<th>Critical (4)</th>
<th>Significant (5)</th>
<th>Marginal (6)</th>
<th>Negligible (7)</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent (A)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Serious</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Probable (B)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Serious</td>
<td>Serious</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Occasional (C)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Serious</td>
<td>Serious</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Infrequent (D)</td>
<td>High</td>
<td>High</td>
<td>Serious</td>
<td>Serious</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Rare (E)</td>
<td>High</td>
<td>Serious</td>
<td>Serious</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Remote (F)</td>
<td>Serious</td>
<td>Serious</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Improbable (G)</td>
<td>Serious</td>
<td>Serious</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Eliminated (H)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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[1] CVN Loss: Catastrophic, High, Medium, Negligible
[2] Ship Loss: Catastrophic, High, Medium, Negligible
[3] Catastrophic: Catastrophic, High, Medium, Negligible
[5] Significant: Significant, High, Medium, Negligible

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NAVSEA HM Avoidance Process vs NAS 411-1

- NAVSEA will continue to maintain the NAVSEA HM Avoidance Process Manual
  - N-LTC updates are off-cycle with NAS 411-1
  - NAVSEA 5100.12-M risk matrix
  - Implementation of the standardized severities in accordance with NMCPHCINST 6270.8E
  - The application exceptions are unique to NAVSEA
    - Risk Assessments already executed and approved by technical community
Lessons Learned

- Legacy pull through systems with known alternatives
- TEMPALTS
- Unmanned Systems
- Hexavalent Chromium!
  - Identification
  - Asking for forgiveness rather than enact change
- Communication between design engineers and safety
- MIL-SPECs
Future efforts

• Issue HM Avoidance DPC Manual Revision
• NAVSEEA will work with SECNAV (EI&E) and SECNAV (RD&A) for publication of prohibited chemical memorandum
  – Currently, no published acceptance process for the other prohibited chemicals like there is for ODS Class 1 and Hexavalent Chromium
• NAVSEEA will continue to support DoD/AIA NAS 411 working groups
  – Updates to the NAS 411-1 list of chemicals
  – Development of NAS 411 (series) Hazardous Material Risk Assessment Guidance
  – Implementation of standardized severities across DoD
  – Common applications of chemicals
Questions or For Copies of the HM Avoidance DPC Manual

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