Use of Draft MIL-STD-882E, Task 108 to Prohibit & Eliminate Cr$^{6+}$

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Tampa, FL
24 October 2018
CRH Program Overview

The Combat Rescue Helicopter (CRH) is an advanced variant of the UH-60M Black Hawk and it is a dual-piloted helicopter with weapons and a cabin configuration specifically optimized for combat rescue and recovery operations:
- Increased internal fuel capability for greater range
- GE T700-701D engines
- New fatigue- and corrosion-resistant machined aero-structure
- Tactical Mission Kit integrating multiple sensors, data links, defensive systems, and other sources of intel information (Weather, EO-IR, Link-16, SADL, CIB, Warning Systems for radar, laser, and missiles)

The primary mission of the CRH is to recover isolated personnel from hostile or denied territory:
- It will also execute humanitarian missions and non-combatant evacuation operations
- The platform will be capable of employment day or night, in adverse weather and in a variety of threat spectrums from terrorist attacks to chemical, biological, radiological, and nuclear threats
Occupational Safety and Health Act

- Requires employers provide an informed workplace free from recognized hazards to safety and health
- AFI 91-203, *AF Consolidated Occupational Safety Instruction*, and AFOSH STD 48-series add criteria

Exposure to hazardous material requires informed workers and PPE - the last line of defense.

Airmen sanding degraded paint coatings within an enclosure to contain hazardous material generated during de-painting.

Airman applying Hexavalent Chromium primer to an aircraft.
Pollution Prevention Act

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• Then:
  – U.S. produced millions of tons of pollution
  – Spent tens of billions of dollars controlling
  – Focused on treatment and disposal

• Now:
  – Planning provides
    • cost-effective material use
    • reduced raw material
    • pollution control
    • reduced liability
  – First - prevent or reduce at the source
  – Next – recycle
  – Last - treat and dispose

Brake plate with possibly hazardous inorganic coatings.

MC-130 Combat Talon tool kit with 200 pcs of equipment and 120 HAZMATs.

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Accomplishments

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- Used the MIL-STD-882 system safety process to eliminate hazards or to reduce risk
- Eliminated 40% of HAZMATs across airframe, avionics, and maintenance technical documentation
- Eliminate Hexavalent chromium (Cr6+) paints from BOTH the exterior and interior structural surfaces of the aircraft
- Comprehensive Hazard Tracking Database
- Environmental Impact Analysis Report
1. Qualify HAZMAT risks using the system safety process (contractor report)
   - Secure feedback from the users and maintainers
2. Develop the government HAZMAT Mgt strategy based on the risk
   - Document the HAZMAT strategy
   - Define HAZMAT (the nature of HAZMAT differs for different systems)
   - Establish prohibited, restricted & tracked categories
   - Identify the high-risk materials (e.g., Cr) & material-specific requirements
3. Implement the strategy – integrate into solicitation
4. Identify regulated HAZMAT, wastes, and pollutants (contractor plan/report)
5. Review/comment/accept deliverables; work with the OEM; assess trades; use data to mitigate HAZMAT risks to acceptable levels; coord residual risk with user

HAZMAT Management approach is based on the risk

Many legacy systems do not have an active HAZMAT Mgt Program

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3. Implement the Strategy

• Included the requirement in the CRH SOW
  – Hazardous Material section
    • Establish a program – comply with NAS 411
    – *Hazardous Materials Management Program (HMMP) Plan* and tailored NAS 411 – used data template DI-MGMT-81398B
  – MIL-STD 882D cited
    • Used elements from Draft Task 108 to implement CRH strategy

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4. Identify regulated HAZMAT HMMP Plan/Report

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(based on NAS 411)

Includes the following content, as a minimum:

- HAZMAT targeted for elimination and reduction
- The PM and contractor processes to properly identify, control, analyze, and track the HAZMAT to protect human health and the environment and to support end user needs
- The process for approving HAZMAT use where HAZMAT cannot be eliminated
  - Trade-off approach
- Milestones for process steps and deliverables

MIL-STD-882E Task 108 and NAS 411 can be the basis for the plan

The plan should balance cost, schedule, & performance considerations with the potential for adverse environmental & human impacts

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Data provided to contractor:

• Identification of the Government HAZMAT review and approval authority(ies)
• Listing of proposed prohibited, restricted, and tracked materials
• Special data elements, format, or data reporting requirements
• System life-cycle phases included in the projection of HAZMAT usage or generation
• Listing of HAZMAT management assumptions, limitations, exceptions, exemptions, or thresholds
• Requirement to report HAZMAT used by the contractor for production or manufacturing processes
Determine and document:
• The Program’s **HAZMAT definition**
• The materials that the Program plans to **Prohibit, Restrict, Track**
• The approach for special materials like **ODS, Cadmium, Beryllium, Lead & Hexavalent Chromium (Cr\(^{6+}\))**
• Contractor requirements

Document the approach to identify and manage HAZMAT risk, including ODS and hex chromium.
### “THE” CRH List

**Prohibited**

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actinolite (Asbestos variation)</td>
<td>Tremolite (Asbestos variation)</td>
</tr>
<tr>
<td>Amosite (Asbestos variation)</td>
<td>4,4’-Methylenebis(2-chloroaniline) (MBOCA)</td>
</tr>
<tr>
<td>Anthophyllite (Asbestos variation)</td>
<td>Nickel Compounds</td>
</tr>
<tr>
<td>Asbestos (friable)</td>
<td>Chloroform</td>
</tr>
<tr>
<td>Chrysotile (Asbestos variation)</td>
<td>Dimethylhydrazine</td>
</tr>
<tr>
<td>Crocidolite (Asbestos variation)</td>
<td>Hydrazine</td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>Methylene chloride</td>
</tr>
<tr>
<td>Chromium Compounds</td>
<td>Dichloromethane</td>
</tr>
<tr>
<td>Mercury and Mercury Compounds</td>
<td>Aniline</td>
</tr>
<tr>
<td>Class I Ozone Depleting Substances</td>
<td>Methyl hydrazine</td>
</tr>
<tr>
<td>See AFI 32-7086</td>
<td></td>
</tr>
<tr>
<td>Polychlorinated biphenyls (PCB)</td>
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</table>

**Restricted** (not complete)

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3-Butadiene</td>
<td>Ozone Depleting Substances Class II</td>
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<tr>
<td>4-Aminobiphenyl</td>
<td>Methyl Ethyl Ketone (MEK) 2-Butanone</td>
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<tr>
<td>Acetaldehyde</td>
<td>Acrolein</td>
</tr>
<tr>
<td>Arsenic and Arsenic Compounds</td>
<td>Lead and Lead Compounds</td>
</tr>
<tr>
<td>Benzene</td>
<td>Lithium Compounds</td>
</tr>
<tr>
<td>Beryllium and Beryllium Compounds</td>
<td>Naphthalene</td>
</tr>
<tr>
<td>Chromium Compounds</td>
<td>Perchloroethylene (PCE)</td>
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<tr>
<td>Cadmium and Cadmium Compounds</td>
<td>Tetrachloroethylene</td>
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<tr>
<td>Ethylene oxide</td>
<td>Radioactive Materials</td>
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<tr>
<td>Formaldehyde</td>
<td>Nitric Acid</td>
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<tr>
<td>Zinc Compounds</td>
<td>Sulfur Hexafluoride</td>
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<tr>
<td>1,3,5-trinitro-1,3,5-triazine (RDX)</td>
<td>Toluene</td>
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<tr>
<td>2,4-Dinitrotoluene</td>
<td>Trichloroethylene</td>
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</tbody>
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CRH HAZMAT Reduction by the Numbers

31 Technical Manuals
- 488 unique consumables
- 288 unique MSDS/SDS
- 207 updated/removed/deleted

Integrated Electronic Technical Manuals
- 434 Materials (Airframe)
  - 31 materials of concern
- 20 materials (Avionics)
  - 2 materials of concern
- 155 Materials (Maintenance)
  - 297 unique consumables
- 192 updated/removed/deleted
CRH APPROVAL
Non-Cr\textsuperscript{6+}

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- 1\textsuperscript{st} USAF platform to approve the use of complete non-chromium coating system stackup for interior airframe
- CRH System Specification changed
- Expect to carry moderate Program/Airworthiness risk until enough field data verifies assessment results (~2025)
- Annual Corrosion Prevention Advisory Board to oversee performance under the purview of Aircraft Structural Integrity Program

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CRH Program Risk

- Program Risk Generated and Accepted by Program Director
  - If corrosion on the aircraft interior occurs with the use of non-chromated coatings, then increased maintenance cost could occur.

<table>
<thead>
<tr>
<th>Multilayer Structure</th>
<th>HH-60W Paint System Stack-up</th>
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<tbody>
<tr>
<td></td>
<td>Specification</td>
</tr>
<tr>
<td>CIC</td>
<td>MIL-DTL-85054 / SS8536 Type II</td>
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<tr>
<td>Topcoat</td>
<td>MIL-DTL-53039 Type IV</td>
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<tr>
<td></td>
<td>MIL-DTL-64159 Type II</td>
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<td></td>
<td>MIL-PRF-85285</td>
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<tr>
<td>Primer</td>
<td>MIL-PRF-23377 Type II Class N</td>
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<tr>
<td></td>
<td>MIL-PRF-23377 Type I Class N</td>
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<tr>
<td></td>
<td>MIL-PRF-85582 Type I Class C2</td>
</tr>
<tr>
<td>Reactivate</td>
<td>MIL-DTL-5541</td>
</tr>
<tr>
<td>Anodize</td>
<td>MIL-A-8625 Type IC</td>
</tr>
</tbody>
</table>

Risk Closure criteria: no change in performance compared to HH-60G (Legacy)
Corrosion Analysis

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CRH vs HH-60G

+ Av-Dec® gaskets for avionics
+ Improved avionics/shelf sealing
+ High Speed Machining cabin tub and aft transition
+ ForceMate® bushings
+ Same environment

+ Polyurethane on HSM
+ Primer on Details
+ Corrosion inhibiting materials
+ New finishes and materials
- More electrical connections
- Increased airflow for cooling

Better  Slightly Better  Equivalent  Slightly Worse  Worse

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Elements of a Successful HAZMAT Program

• HAZMAT Management Program
• System Safety Program
• System Specification
• Statement of Work
• FAR/DFAR Clauses

Deliverables:
• HMMP Plan
• HMMP Report
• SSPP
• SSHA/SAR
• Env. Impact Analysis Report
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QUESTIONS?

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