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ESOH in Systems Engineering Across the Entire Acquisition Life Cycle

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Environment, Safety & Occupational Health (ESOH)

- **Impacts on Acquisition**
  - **More stringent ESOH regulations increase risk**
    - **Hexavalent Chrome Minimization**
    - **European REACH policy**
  - **O & M phase is ~60% of systems life cycle**
    - **ESOH costs can equal 20-30% of some O&M tasks**
  - **$1 = $10 of hidden hazardous materials costs**
    - **$10 in related costs over life cycle**
    - **Controls, monitoring, record keeping, disposals, etc.**
  - **DoDI 5000.02 lists several ESOH requirements**
    - **Across several disciplines & all life cycle phases**

ESOH Drivers

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LAW — 42 USC 4321-4370d, 11001 et seq. & 13101 et seq.

EO — Executive Order 13423 Executive Order 12114

CFR — 10 CFR 30-36 49 CFR 172.101
40 CFR 112, 261.32, 279 & 1500-1508

DOD — DODD 4715.4 DODI 5000.02 DODD 6050.9

AFI — AF Instructions 32-7061, 7080, 7086

AF POLICY — SAF/AQ Policy Letter 94A-003
AF Policy Directive 32-70

Oc. & Environmental Health Exposure — **AFM 48-155**

AF Drivers

- **AFPD 32-70 Environmental Quality**
- **AFPD 90-8 Environment, Safety, and Occ Health**
- **AFI 32-7110 Environmental Budgeting**
- **AFI 32-7080 Pollution Prevention Program**
- **AFI 48-145 Occupational Health Program**
- **32 CFR 989 Environmental Impact Analysis Process**
- **AFI 63-101 Operations of Capabilities Base Acq Sys**
- **AFI 63-1201 Life Cycle Systems Engineering**
- **AFI 91-202 US Air Force Mishap Prevention Program**
- **MIL-STD-882D Standard Practice for System Safety**

ESOH Risk

- **Minimized ESOH risk across life cycle**
  - **Prevent ESOH risk when possible**
  - **Manage ESOH risk when unavoidable**
  - **Def Acq Guidebook: three types ESOH risks**
    - **Adverse effects from routine system development, testing, training, operation, sustainment, maintenance and demilitarization/disposal**
    - **Mission readiness impacts from system failures or mishaps, including critical software failures**
    - **Impacts to program lifecycle cost, schedule and performance from ESOH compliance requirements**

ESOH Compliments Weapon System Goals

- **Two of ASC's Strategic Priorities**
  - Implement Integrated Life Cycle Management
  - Develop and Care for Our People
- **Engineering problems have ESOH solutions**
  - F-16 coatings drying faster improve PDM cycle
  - Hydraulic Fluid Purification increased MTBF
- **Ideally addressed in Systems Engineering**
  - Coordinate with program mangers, operators, users, testers, maintainers and manufacturers
  - Included ESOH in trade-offs with other "ilities"

ASC ESOH Risk Management

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ESOH Risk Management

- **Institutionalize ESOH into Acq Process**
  - **Requirements in Systems Requirements Document, Life Cycle Management Plan, Request for Proposal, Test Evaluation Master Plan, etc.**
  - **Summarize Strategy & Risk in Programmatic Environment, Safety & Health Evaluations (PESHE)**
- **Institutionalize ESOH into Sys Engineering**
  - **Summarize ESOH approach in Sys Eng Plan**
    - **Address ESOH risk in design reviews**
    - **Assess impacts of updates to laws/regulations**
  - **Seek material substitutions or identify needs**
- **Work ESOH across entire life cycle**

ESOH into Acquisition & Systems Engineering Process

- **Acquisition Planning & Review**
  - EIAP, ODS Approvals, SEP, LCMP, ASP
- **Request for Proposal**
  - RFP (Sections H, I, L & M), SOO or SOW, CDRLs
- **Source Selection Evaluation**
  - Statement of Work and Integrated Master Plan
- **Design Reviews**
  - Alternative processes and/or material
- **Test & Evaluation Master Plan**
- **Modification Processes**
  - ECPs, Deviations and Waivers

Acquisition Strategy

- **Acquisition Strategy Panel**
  - **ESOH ASP representative**
  - **ESOH template slide with calculate risk (i.e. ESOH Prg Risk Tool)**
- **Life Cycle Management Plan**
  - **Required to summarized ESOH Strategy**
- **Programmatic Environment Safety and Health Evaluation (PESHE)**
  - **Program office developed document**
  - **Summarizes ESOH Strategy & known risk**
  - **Required regardless of Acquisition Category**

ESOH ASP Template Example

- **Date of PESHE completion or recent update**
- **National Environmental Policy Act (NEPA) Compliance Strategy/Schedule & Coord. Status**
- **Ozone Depleting Substance (ODS) Use/ Waivers**
- **Hazardous Materials Use**
  - **Hexavalent Chrome Certification**
- **Demilitarization & Disposal Strategy**

AFI 63-1201

Life Cycle Systems Engineering

- **ESOH Requirements**
  - **Development, acquisition, and sustainment efforts must also address ESOH Integration**
  - **Integrate ESOH into the Sys Engineering process**
    - **Using MIL-STD-882D system safety practices**
  - **Identify basic ESOH strategy in Sys Eng Plan**
  - **PESHE elements in Risk Mgmt Plan, Integrated Master Plan, and Integrated Master Schedule**
  - **PESHE documents status of ESOH hazard identification, assessment, mitigation, verification, and residual risk**
  - **PESHE contains National Environmental Policy Act (NEPA) compliance schedule**
  - **Technical and program reviews must include ESOH risk management status**

Systems Engineering Plan

- **The SEP should include a section on ESOH Management that documents the approach.**
  - **23 Sep 04 USD (AT&L) Memo**
    - **Incorporate DoDI 5000.2 requirements to integrate ESOH strategy into systems engineering**
  - **AFI 63-1201 Requires ESOH summary in SEP**

Request For Proposal

- **ESOH language should be included in the RFP (Sections H, I, L, & M)**
  - **ASC Templates for ESOH verbiage**
- **System Safety & HazMat Management Plans**
  - **National Aerospace Standard 411**
  - **MIL-STD-882D**
  - **Address hazardous material use/disposal, system safety hazards, occupational health concerns, and pollution prevention initiatives**

Source Selection

- **Examine Offeror's ESOH Program to determine if critical requirements are satisfied**
  - **Integrated Master Plan/Schedule**
  - **Draft System Safety or Hazardous Materials Management Plan**

Design Reviews

- **23 Sep 04, USD (AT&L) Memo**
  - **Identify, assess, and mitigate ESOH risks**
  - **Report residual risk at technical reviews**
- **Treat ESOH as a normal part of the Design Review (DR)**
  - **Address ESOH in PDR/CDR reports**
  - **ESOH checklist in DoD Acquisition Community Connection**
- **DoDI 5000.02 requires SME participation**

Design Review Considerations

- **Alternative processes and/or material**
  - **Reduce flow time**
  - **Increase cost savings**
  - **Provide P2 needs during annual data call**

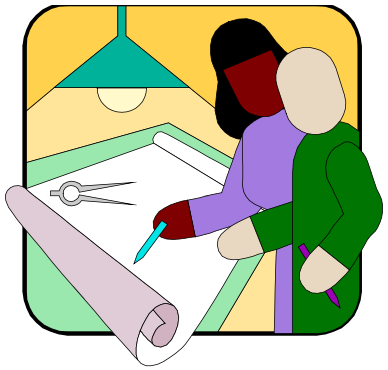
  - **Examples: Laser Stripping,O2 Line Cleaning, Flashjet®, High Performance Coatings**

Test Planning

- **NEPA Planning**
  - **Coordinate with test organization to support their NEPA documentation requirements**
  - **Place NEPA data requirements on contract**
- **Safety analyses document the hazards associated with operating the system**
  - **List procedural controls needed during test**
  - **Safety design/mitigations often verified through tests**
- **Early identification of requirements is necessary to properly scope the test effort**
  - **Ex. High noise levels**

Modifications

- **Contract Change Proposal (CCPs) and Engineering Change Proposal (ECPs)**
  - **SOW requires contractor to determine the ESOH impacts as part of the submittal process**
  - **If ESOH impacts unknown- contractor specify actions to identify, categorize, and minimize the potential impacts**
  - **Ideally, ESOH Rep on Configuration Control Board**



ESOH During All Life Cycle Phases

- **Material Solutions Analysis**
- **Technology Development**
- **Engineering & Mnfg Development**
- **Production & Deployment**
- **Operation & Support**
- **Disposal**

ESOH needs to be accomplished during all life cycle phases of weapon system acquisition

ESOH During Material Solution Analysis

- **Identify ESOH requirements for AoAs**
- **ID responsibilities for ESOH integration**
- **Complete Preliminary Hazard List**
  - **For each concept**
- **Starting point for Hazardous Materials**
  - **EPA 31 Priority Chemical List**
  - **Ozone Depleting Substances**
  - **Chemical & Material Risk Management Directorate**
    - **Formerly MERIT**

ESOH During Technology Development

- **Strategy for integrating ESOH into Sys. Eng.**
- **Identify emerging ESOH technologies & hazards**
- **Update PESHE for Milestone B Review**
  - **SEP should have addressed ESOH @ MS A**
- **Summarize ESOH Risk at Pre-Milestone B PDR and in PDR Report**
  - **DoD Acq. Community Connect checklist**

Identifying Hazardous Materials

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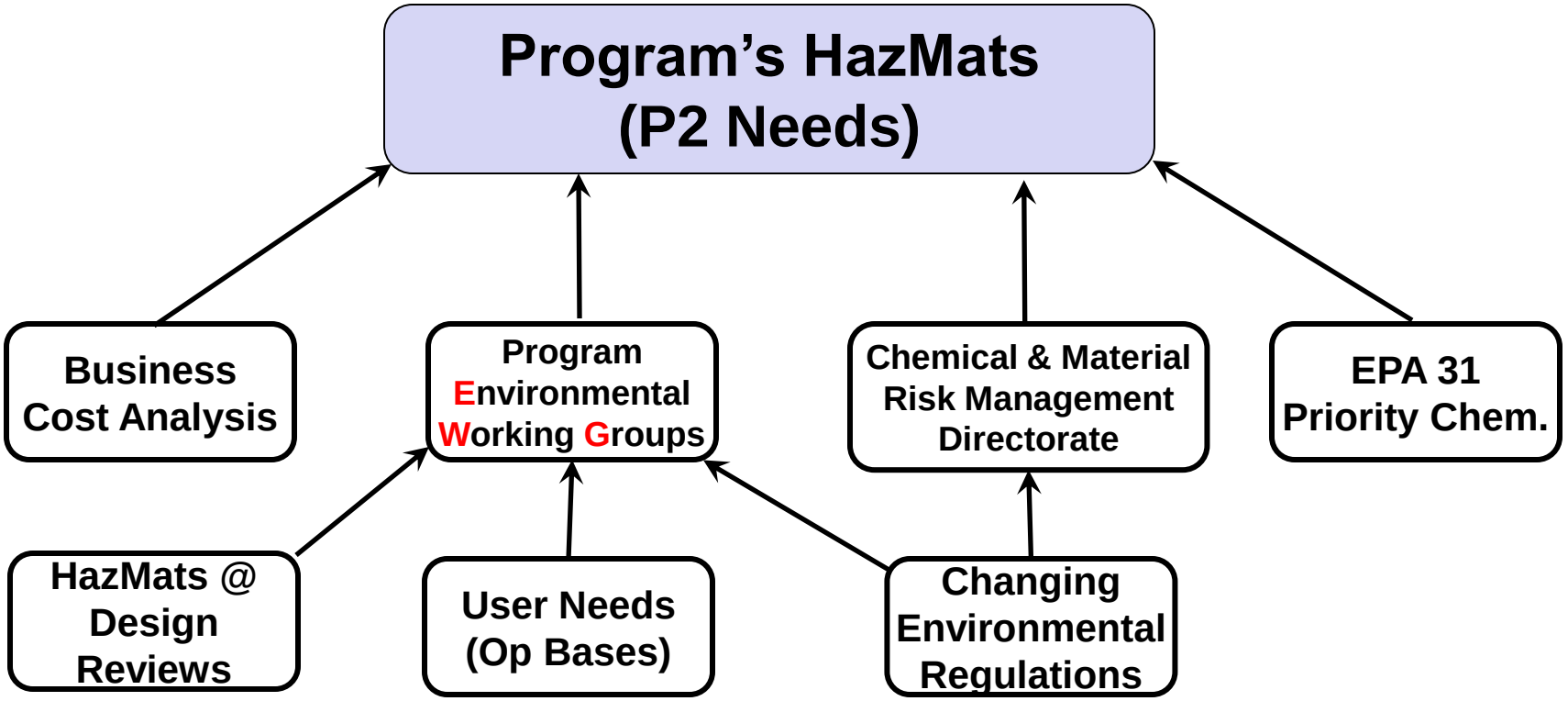

Recommend Program Office hold EWG or address ESOH matters through System Safety Group

ESOH During Engineering & Mnfg Development

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- **Address ESOH in CDR & CDR report**
  - **DoD Acq. Community Connect checklist**
  - **Document Hazardous Materials**
- **Green Procurement**
- **Substitutions**
  - **Hexavalent Chrome and other P2 alternatives**
- **Flight Test NEPA**
- **Health Risk Analysis**
- **Document ESOH Risk in the PESHE**
  - **Updating for Milestone C**

ESOH During Production & Deployment

- Update PESHE for Full Rate Production DR
- Operational Base HazMat "Pharmacies"
- Depot Repair and PDM processes
- Coordination with Logistics
  - Green Procurement
- Bed Down NEPA
  - Encroachment, noise, waste streams, etc.
- Host Nations
  - REACH
- Sustain ESOH analysis for next increment
  - Or for similar systems

ESOH During Disposal

- **List of Hazardous Material**
  - **Special considerations at AMARG**
- **Disposal Plan**
  - **Recycle**
  - **Special landfill requirements**
  - **De-militarization precautions**

Aeronautical Systems Center Acquisition ESOH Tools

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- **ESOH Programmatic Risk Model**
  - **Lessons Learned**
- **PESHE Templates**
  - **PESHE Checklist**
- **Other ASC Acquisition ESOH Tools**
  - **ESOH Circular and NEPA Circular**
  - **NEPA Compliance Checklist**
  - **Environmental criteria for pre-award documents**
  - **Acquisition ESOH Training**

Developed with System Safety, Occupational Health, and Environmental Subject Matter Experts

Aeronautical Systems Center Acquisition ESOH Training

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- ENV 101 – Intro to ESOH in Acquisition
- ENV 110 – ESOH Programmatic Risk Model
- ENV 120 – Developing the PESHE
- Integration of ESOH into System Engineering for Weapon System Acquisition
  - SYS 196* (Complete)
    - Overview
  - SYS 197* (30 Aug 10)
    - Material Solutions Analysis – Technology Development
  - SYS 198* (TBD)
    - Eng Mfgr Development – Disposal

*AFIT Distance Learning Courses

Conclusion

- **Establish ESOH strategy early in the acquisition life cycle to maximize risk reduction & cost savings**
- **There are ESOH efforts required across all phases of the acquisition life cycle**
  - **Document in acquisition planning/strategy**
  - **Implement through systems engineering**
- **Assess ESOH in systems engineering as part of other "ilities"**
  - **Existing sys eng process can easily be adjusted to incorporated ESOH considerations**

- **Backup Slides**

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Life Cycle Overview

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