Aeronautical Systems Center

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ESOH in Systems Engineering Across the Entire Acquisition Life Cycle

(27 Oct 10)

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Environment, Safety & Occupational Health (ESOH) Dominant Air Power: Design For Tomorrow...Deliver Today



- 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





AF Drivers



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AFPD 32-70 Environmental Quality

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- 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 Dominant Air Power: Design For Tomorrow...Deliver Today



- 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









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 Dominant Air Power: Design For Tomorrow...Deliver Today



- 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



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Acquisition Strategy Panel

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- 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



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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



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

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



ESOH During Material Solution Analysis Dominant Air Power: Design For Tomorrow...Deliver Today



- 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 Dominant Air Power: Design For Tomorrow...Deliver Today



- 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







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



- 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 Dominant Air Power: Design For Tomorrow...Deliver Today



- 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** Dominant Air Power: Design For Tomorrow...Deliver Today



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





Aeronautical Systems Center Acquisition ESOH Tools Dominant Air Power: Design For Tomorrow...Deliver Today



- 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 Dominant Air Power: Design For Tomorrow...Deliver Today



- 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







- 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





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Backup Slides



Life Cycle Overview



