Human Systems Integration and Influencing System Sustainment for Affordable, Safe Solutions

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Integrity ★ Service ★ Excellence

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Mission

Optimize warfighter capability through a human-centric approach to system development, acquisition, and sustainment

USAF HSI Domains

HSI DOMAINS:

Manpower (M)
Personnel (P)
Training (T)
Environment (E)*
Safety (S)
Occupational Health (OH)
Human Factors Engineering (HFE)
Force Protection & Survivability (Sv)
Habitability (H)

*** While Environment is not a specific HSI domain per DoDI 5000.02, environment is considered an important element of the systems engineering process and is included in the holistic approach of interrelationship of ESOH with other HSI domains**

HSI Functions across AF

711 HPW/HP HSI Focus

- **Focus areas…**

Pre - Acquisition Capability Support

S & T

Req'mts & Development Planning

Acquisition & Sustainment Support

AF Medical Service Support










HSI and System Sustainment

DoD Policy

DODD 5000.01 (*May 12, 2003*)

E1.1.29. Total Systems Approach. The PM shall be the single point of accountability for accomplishing program objectives for total life-cycle systems management, including sustainment. **The PM shall apply human systems integration to optimize total system performance (hardware, software, and human), operational effectiveness, and suitability, survivability, safety, and affordability. PMs shall consider supportability, life cycle costs, performance, and schedule comparable in making program decisions.** Planning for Operation and Support and the estimation of total ownership costs shall begin as early as possible. Supportability, a key component of performance, shall be considered throughout the system life cycle."

Considerations beyond Acquisition Cost

Considerations beyond Acquisition Cost

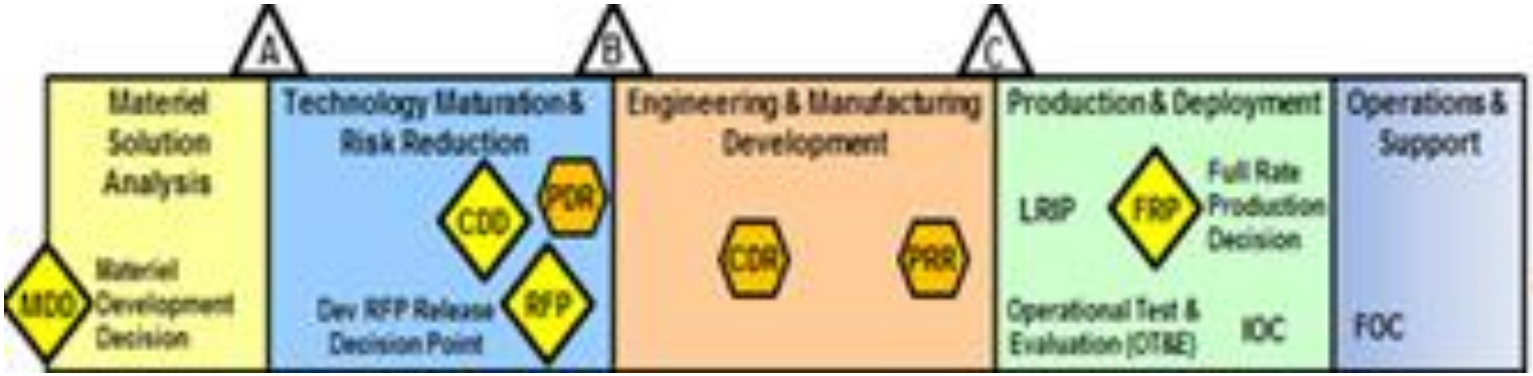
Early HSI involvement is best

- Early consideration of supportability
- Part of the design process
- Results: many years of

  -improved safety
  -improved force protection and survivability
  -cost savings
  -performance optimization
  -manpower and personnel skill levels optimized

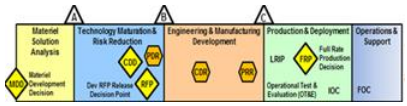
Examples

Examples



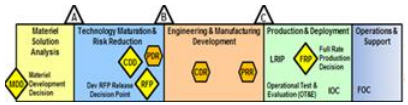
Various points along the lifecycle

Examples



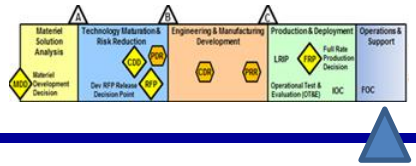
- **Corrosion**
- **Ejection Seats**
- **Exoskeleton**
- **Acquisition Maintainability/Training study**

Corrosion



Severe corrosion discovered, resulting in several aircraft being grounded

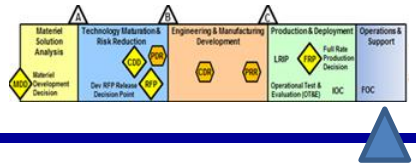
Corrosion



Severe corrosion results in several aircraft being grounded

- Severe corrosion led to early retirement of aircraft = $$$$$$... in lost DoD assets
- Fortunately no airborne mishaps or loss of life
- HSI included as part of Tiger Team IPT to trouble shoot and fix

Corrosion



Root causes:

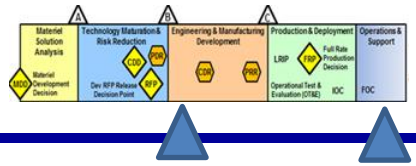
- Inadequate field and depot level inspection
- Highly corrosive operating environment

Fixes:

- Inspect more thoroughly and mitigate corrosion in a more timely manner
- Improved procedures and maintenance (MX) material
- Optimized manning & personnel qualifications
- More effective training
- Improved prioritization

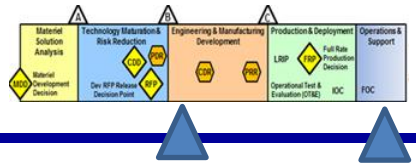
HSI DOMAINS:
M, P, T, E, S, & OH

Ejection Seats



USAF studies quantify safety and maintenance-related costs

Ejection Seats

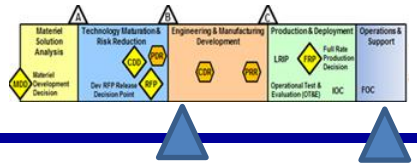


2009 study on two ejection seats

Compared costs and performance benefits

- Safety performance – mishap data
- Anthropometric range of pilots accommodated
- Maintenance capability
- Life Cycle Costs

Ejection Seats



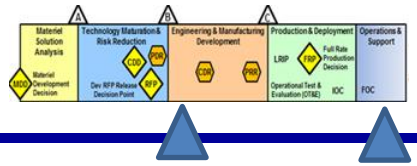
2009 study on two ejection seats

Outcome

- Combined safety, maintenance, aircraft availability, and cost factors analyzed

HSI DOMAINS:
S, Sv, M, P, T & HFE

Ejection Seats

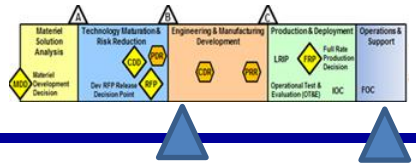


2011 cost analysis study

Compared two likely ejection seats for a program

- Included life cycle cost drivers: development, testing, certification, integration, procurement, fielding, sustainment, and disposal
- Contract Logistics Support (CLS) MX vs. Organic MX
- Contractor Furnished Equipment (CFE) vs. Government Furnished Equipment (GFE)
- LCC projected over 30-year span

Ejection Seats



2011 cost analysis study

HSI DOMAINS:
M, P, T, S, & HFE

Outcome:

Differentiators: Maintenance / sustainment of the ejection system

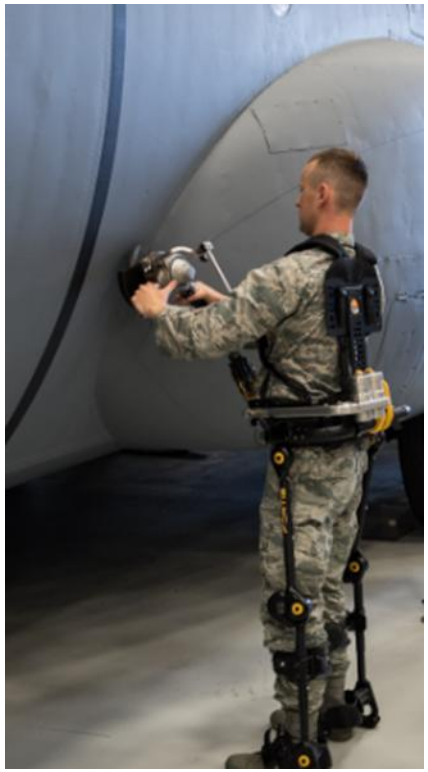
- Unique support equipment
- Replacement components (including lifed parts)
- CFE vs. GFE
- DT&E and OT&E of new seats

Exoskeleton

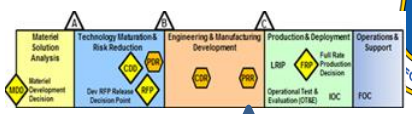
HSI participation in test of passive exoskeleton for future USAF MX use:

Relies on mechanical advantage to transfer loads to the ground

- Safety and performance testing
- Form, fit, function testing
- Anthropometric data collection



Exoskeleton



HSI participation in test of passive exoskeleton for future USAF MX use:

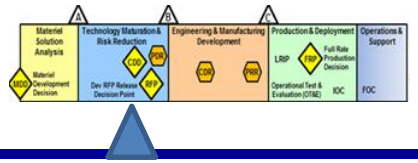
Expected Outcome:

- Fewer OH injuries
- Potential reduction in manning/man hours
- Optimized MX performance on certain tasks

Testing ongoing

HSI DOMAINS:
OH, S, Sv, M, P, T & HFE

Acquisition Programs



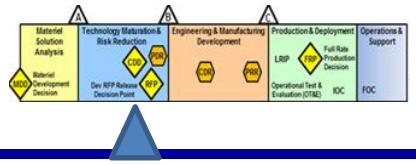
HSI involvement in Sustainment-related studies for an acquisition program

Emphasis on risk reduction & affordable sustainment

- Maintainability
- Training
- Environmental and Safety Hazard Analysis

Proactive, early design approach

Acquisition Programs



HSI involvement in Sustainment-related studies for an acquisition program

Expected outcome:

- Maintainability designed in where possible
- Optimized training program
- Positive impact on system availability
- Safer system
- More affordable sustainment

x 30-50 years of life = $$ savings

HSI DOMAINS:
HFE, M, P, T, E, S, Sv, & OH

Recap

Areas of Opportunity

- Maintainability studies
- Training requirements analysis
- Safety and OH hazards analyses & mitigation
- Environmental considerations, e.g.: preventable hearing loss, HAZMAT, CBRNE
- HSI consultation during O&S troubleshooting and process improvement
- HSI-related cost assessments can demonstrate impact of HSI domain tradeoff effects on total operating costs and total system performance

Resources

Helpful Resources

- Air Force Pamphlet (AFPAM) 63-128
- Defense Acquisition Guidebook (DAG) Ch. 4 - 6
- USAF HSI Requirements Pocket Guide
- DoD Logistic Assessment Guidebook, 2011
- MIL-HDBK-470 Designing and Developing Maintainable Products and Systems
- MIL-STD-1472, Appendix A on Maintainability

Questions