Headquarters U.S. Air Force

Integrity - Service - Excellence

Human Systems Integration Translation of Capabilities Requirements to Acquisition

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Overview

- Air Force HSI
- Objectives
- Approach
- Implementation
- Resources

HSI HUMAN SYSTEMS INTEGRATION

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HSI Defined

- **"HSI is the integrated, comprehensive analysis, design and assessment of requirements, concepts and resources for systems with respect to Manpower, Personnel, Training; Environment, Safety & Occupational Health; Habitability, Survivability, and Human Factors Engineering (HFE)." – AFI 10-601**
- **"HSI considers all human-related domains in an integrated manner. It must be addressed throughout the life cycle, and must be consistently integrated into SE implementation to balance total system performance (hardware, software, and human)…" – AFI 63-1201**

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HSI Domain Considerations

Human Factors Engineering	Manpower	Personnel	Training
-Compatibility of design with human performance capability/expectations -Human-System-Environment interfaces -Impact of design on skill, knowledge, & aptitudes requirements -Workload, situational awareness, and human performance reliability -Implications of mission, system, and human performance requirements -Design-driven human performance, reliability, effectiveness, efficiency, and safety performance requirements -Simplicity of operation, maintenance, and support -Costs of design driven human error or inefficiency	-Wartime/Peacetime manning requirements -Deployment considerations -Force structure -Operating strength -Manning concepts -Manpower policies -Future technology & human aptitudes -System MERs -A76 Considerations -BRAC Considerations -Life Cycle Cost Implications of Manpower decisions 	-Personnel Selection and Classification -Demographics -Knowledge, Skills, Abilities -Accession/Attrition -Career progression & retention rates -Promotion flow -Personnel/Training pipeline flow -Qualified personnel when and when needed -Projected user population/recruiting -Cognitive, physical, educational profiles - Life Cycle Cost Implications of Personnel decisions	-Training concepts and strategy -Training tasks/training development methods -Media, equipment, facilities -Simulation/Emulation -Virtual applications -Operational tempo -Training system costs, OSS&E, efficiency -Trainer currency -Training vs. Job Aids -Timeliness of delivery -Manpower and Personnel policy implications for training flow and costs 

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HSI Domain Considerations

Habitability	Survivability	Environment	Safety	Occupational Health
-Physical living environment (e.g., berth, toilet, bath) -Support services (e.g. food, medical, clergy, recreation) -Impact on sustained mission effectiveness -Impact on recruitment of personnel -Impact on retention of personnel	-Threats -Operational arenas -Fratricide Identification Friend/Foe (IFF) -Potential damage to crew compartment & Personnel -Camouflage/ Concealment -Protective equipment -Medical injury Fatigue & Stress -Degraded mission -Long/short term	-Health hazards induced by systems, environment, or requirements -Areas of special interest including: -Mechanical -Acoustics -Biological & Chemical substances -Radiation -Oxygen deficiency & Air Pressure -Temperature & Weather -Shock & vibration -Laser protection	-Safety of design -Procedures – Normal & Emergency -Human error -Total System reliability & fault reduction -Total System risk reduction -Comprehensive Safety -Human -Flight -Weapon -Ground -NBC -Equipment -Environment -System	-Operational Health -Hazards -Environment -Systems -Health care -Diagnose, treat & manage illness & trauma -Heat, cold, hydration -Stress & Fatigue -Exercise & Fitness -Personal protection -Disease prevention (vaccines/hygiene)

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Domain-to-Attribute Interface

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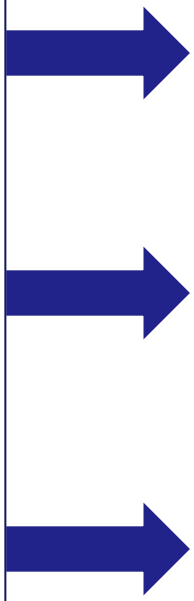
- Manpower
- Personnel
- Training
- Habitability
- Survivability
- Human Factors Engineering
- Environment
- Safety
- Occupational Health



Usability	• Operations • Sustainment	Support Training
Operational Suitability	• Utility • Interoperability • Survivability	Operability Dependability Habitability
Sustainability	• Serviceability • Availability • Dependability	Reliability Accessibility Maintainability

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AF HSI Organizations

- AFHSIO
  - Located at SAF/AQ
  - Strategic HSI organization
  - Responsible for HSI policy, guidance, and oversight
- 711 HPW/HP
  - Located within AFRL
  - Tactical HSI organization
  - Responsible for HSI implementation and execution
- HSI Cells
  - Located at Air Combat Command, Air Mobility Command, Air Force Special Operations Command, Air Education and Training Command, and Air Force Materiel Command
  - Responsible for integrating and executing HSI

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AF HSI Objectives

- ***Integrate*** **HSI processes into the integrated Acquisition, Technology and Logistics Life Cycle Management Framework to equip and sustain the warfighter**
- ***Institutionalize*** **HSI as a way of doing business to increase total systems performance and decrease total ownership costs**
- ***Sustain*** **HSI through collaboration with partners in OSD, AF, sister services, industry and academia**
- ***Improve*** **HSI processes through metrics, feedback, and lessons learned from operational, logistics and acquisition communities**

Increased HSI awareness and implementation

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Target for HSI in the AF

- Intent is to work HSI backwards through the acquisition process from Operations and Support to Pre-concept development
  - Reverse movement through Acquisition Life-cycle to become more involved pre-Milestone B
  - Early and frequent involvement throughout entire Life Cycle from concept to disposal
- Increased participation in JCIDS requirements development
  - Providing inputs for CBAs
  - Formal and informal inclusion in capabilities documents
  - Participation in HPTs
  - Participation in AoAs
- Coordination of HSI goals between AFHSIO, 711 HPW/HP and Major Commands

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HSI MAJCOM Objectives

- Integrate and Institutionalize HSI within each Air Force Major Command (MAJCOM)
- Develop HSI Cell to serve as HSI focal point
- MAJCOM Goals
  - Implement HSI through the entire system life cycle
  - Review Documents for HSI Inclusion
  - Participate in IPTs and Working Groups
  - Provide HSI expertise for MAJCOM programs

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HSI Approach

Policy – AFHSIO stood-up to impact DoD and AF policy

Support – 711 HPW/HP and MAJCOM Cells

Approach – Influence acquisition process through analysis, requirements & design

Practice – Training, Program POC, IPT, Planning, Center WG, MAJCOM Cells

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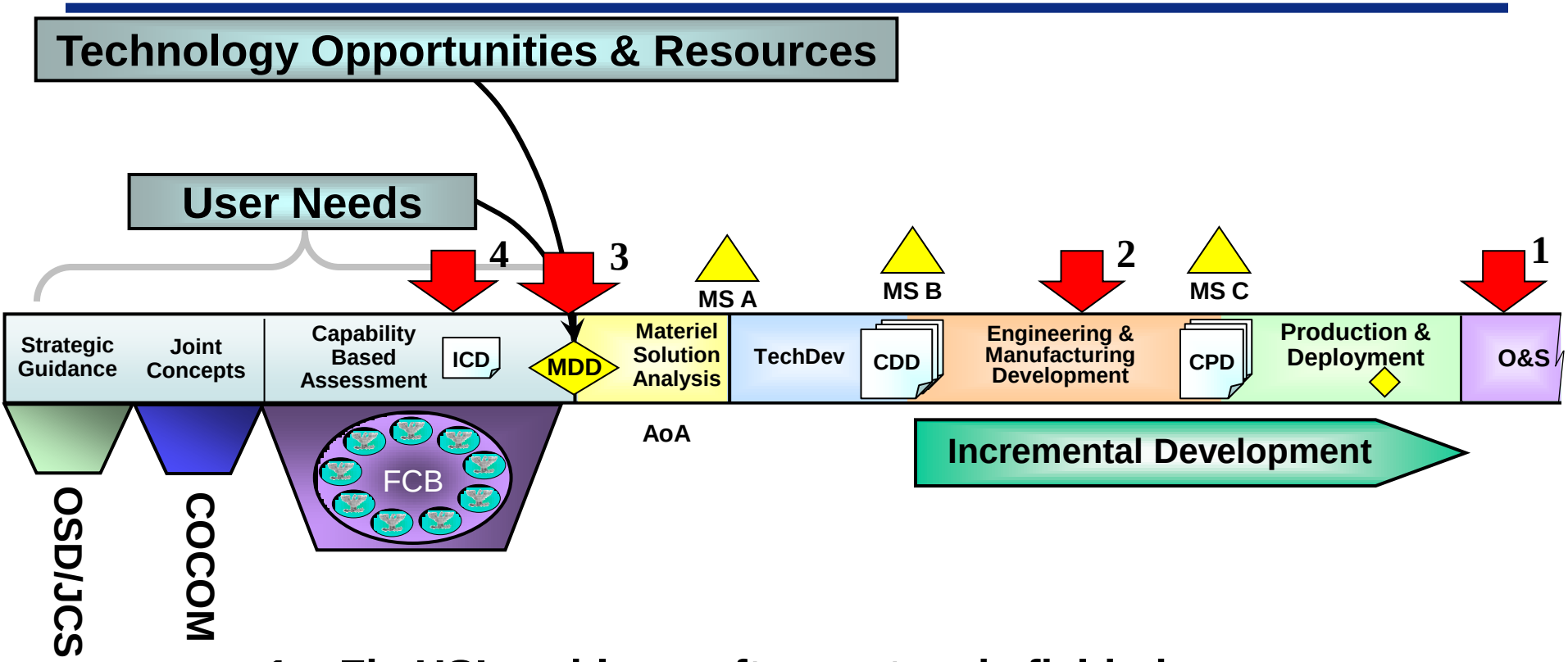
HSI → Full Life Cycle



1 = Fix HSI problems after system is fielded
2 = Prepare for HSI support before the system is fielded
3 = Use HSI as a selection criteria/consideration (and cost)
4 = Make HSI part of the trade space to solve the gap/shortfall

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HSI in Operational MAJCOMS

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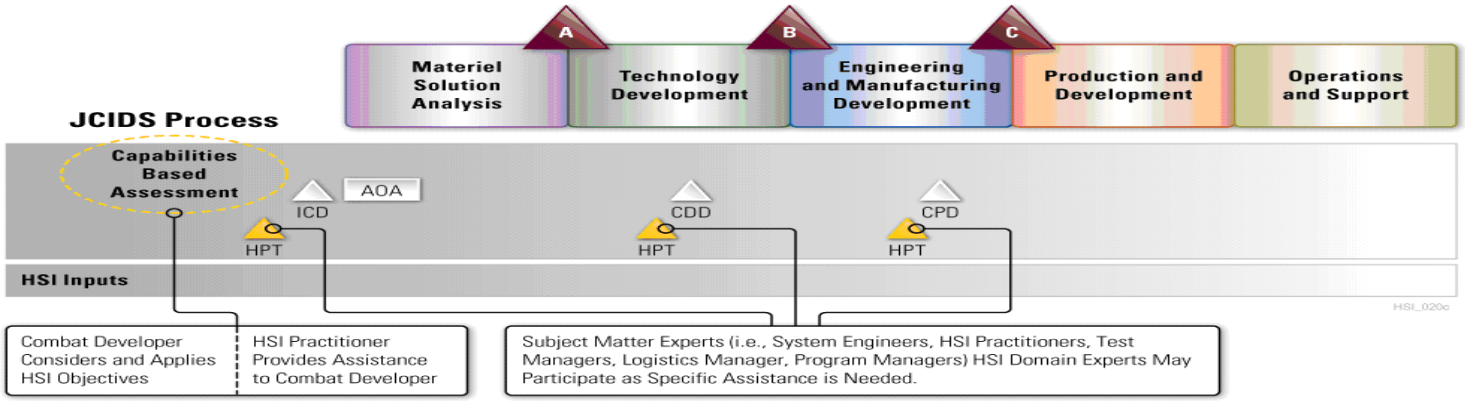
- Inclusion in Operational MAJCOM requirements processes
  - Working through the Requirements Process Owner and Requirements Managers
  - Inputs into capability requirements documents (ICDs, CDDs, and CPDs)
  - HSI inclusion in AoA Study Guidance
  - Participation on AoA Study Teams
  - Development of measurable human-related requirements



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HSI in Acquisition

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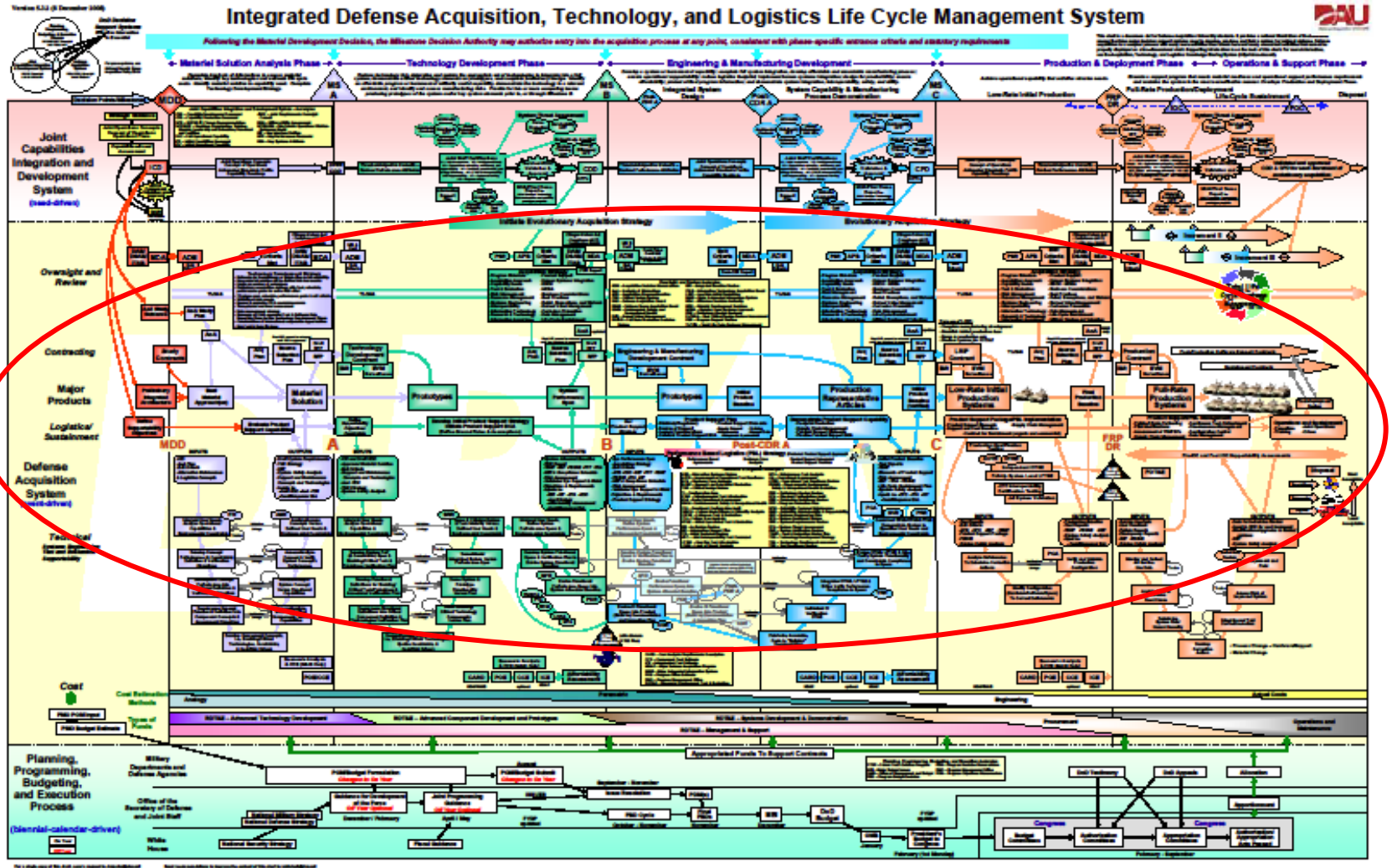

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HSI Challenge in Acquisition

Perception – Military HSI efforts are robust and exhaustive

Reality – Human Factors Research is an advanced subgroup of HSI

Problem – HSI is often minimized and pursued too late in the life cycle

Challenge – Consider the human early and frequently

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HSI in AFMC

- **Product Centers**
  - ***Acquisition***
    - Engineering Directorates
      - Systems Engineering processes/documents
    - Planning Directorates
      - Development Planning processes/documents
- **Logistics Centers**
  - ***Sustainment***
    - System Sustainment Managers/Engineers
      - System Modifications
- **Test Centers**
  - **Verification and Validation**
    - Safety Directorates
      - Safety/Occupational Health Testing
    - Engineering Directorates
      - Logistics and Human Factors Testing
- **Research Laboratory**
  - ***Research***
    - Technology Directorates
      - Systems Engineering and Human Performance

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HSI is Integral to SE

- HSI underpins Systems Engineering
- Enabling function for efficient system development
- Early inclusion results in better analysis, requirements, design, and ultimately a better end-state system
- Explores interrelationships (both internal and external) of process components
- Facilitates understanding system interactions/linkages
  - Mitigation of risks (limited understanding of system)
  - Produces “trade space” for designing and developing systems

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HSI in Early SE

- Proper translation of human-related requirements into acquisition documentation
- Inclusion in the following processes/documents:
  - Development Planning (DP) efforts
  - Concept Characterization Technical Descriptions (CCTDs)
- HSI in 'living' documents
  - SEP
  - LCMP
  - SRD
- Tools and processes
  - AoA training
  - Acquisition & Sustainment Toolkit (ASTK)
  - Human Readiness Levels
  - Systems Engineering Assessment Model (SEAM)

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Enabling Functions for HSI

- HSI community is coordinating with other enabling functions to further impact system design and provide cost savings
  - Logistics
  - Intelligence
  - Communications
  - Modeling and Simulation
- Similar goals and efforts to increase involvement in requirements and acquisition
- Early involvement decreases total ownership costs

Continuing Efforts

- Integrate and sustain early and frequent involvement
- HSI planning throughout the system's life cycle by inclusion in and update of "living" documents
- Provide training to requirements, acquisition, and sustainment personnel and communities
- Enhanced tools and processes to include and assess HSI efforts

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Resources

- **Tools and resources:**
  - **Public site: http://www.wpafb.af.mil/afrl/711hpw/hpi.asp**
  - **Closed site: https://wwwd.my.af.mil/afknprod/ASPs/CoP/ClosedCoP.asp?Filter=HP-HS-01**
- **Contact Information**
  - **AFHSIO: HSI.workflow@pentagon.af.mil**
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