Human Systems Integration In Acquisition: Honing in on the Systems Performance Specification

United States Air Force

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Overview

- **Air Force 711 HPW/HP**
- **AF HSI Domains**
- **711 HPW/HP ongoing work**
- **Honing in on the System Performance Specification**
- **Guidance Development**
- **Writing HSI-related Requirements for the SRD**
- **Summary**
- **Questions?**

Air Force 711th Human Performance Wing/ Human Performance Integration Directorate (711 HPW/HP)

…strives to ensure products and technologies are designed, developed, or adapted with human capabilities and limitations in mind.

AF Human Systems Integration Domains

AF Human Systems Integration (HSI) Domains:

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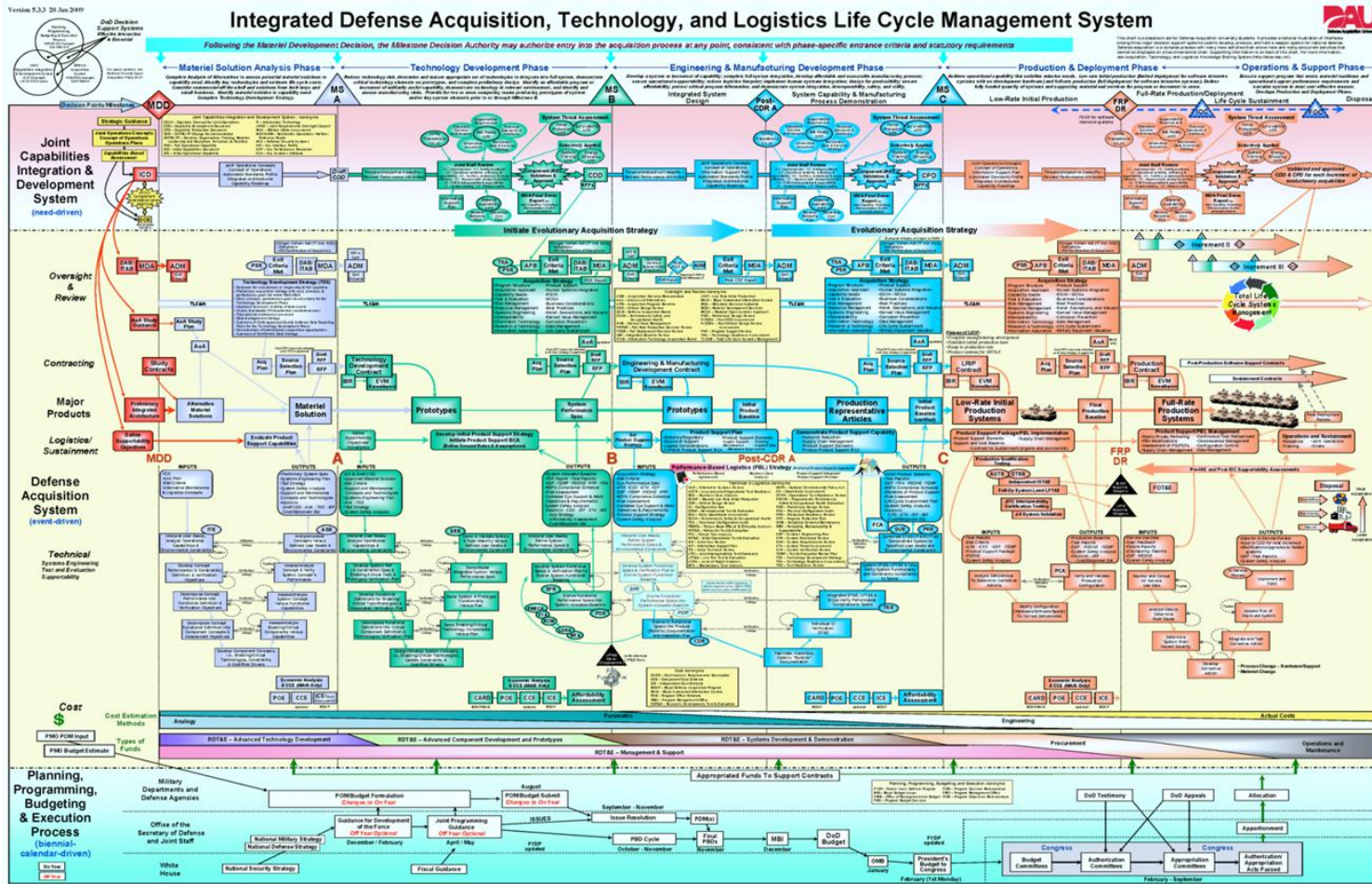- **Occupational Health**
- **Habitability**
- **Survivability**

The intent is to **create a deliberate means for accounting for the Human** as part of the system solution in **an integrated fashion**.

How do we best incorporate HSI into the design, development, or adaptation of a system?

Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System
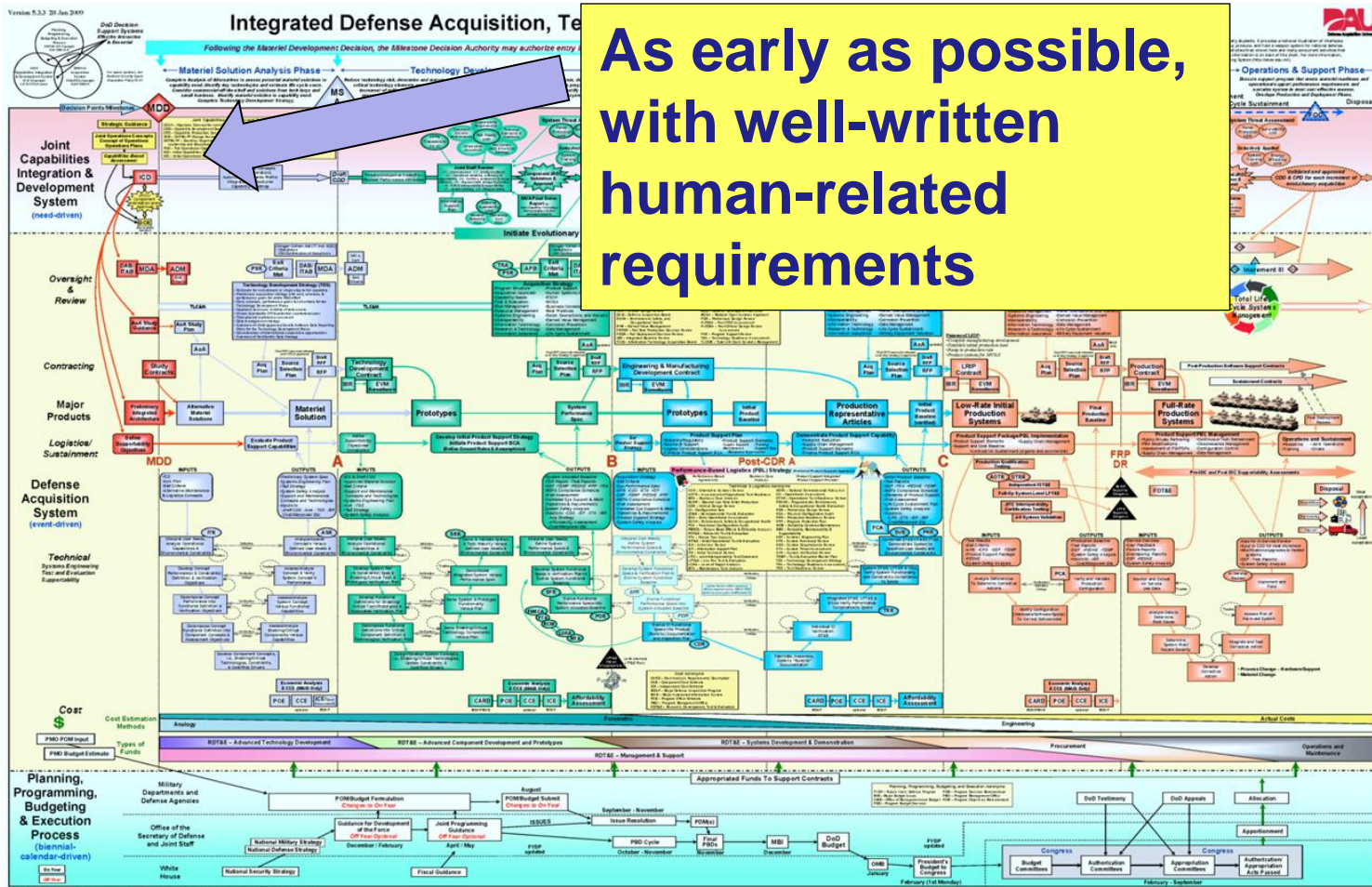
How do we best incorporate HSI into the design, development, or adaptation of a system?

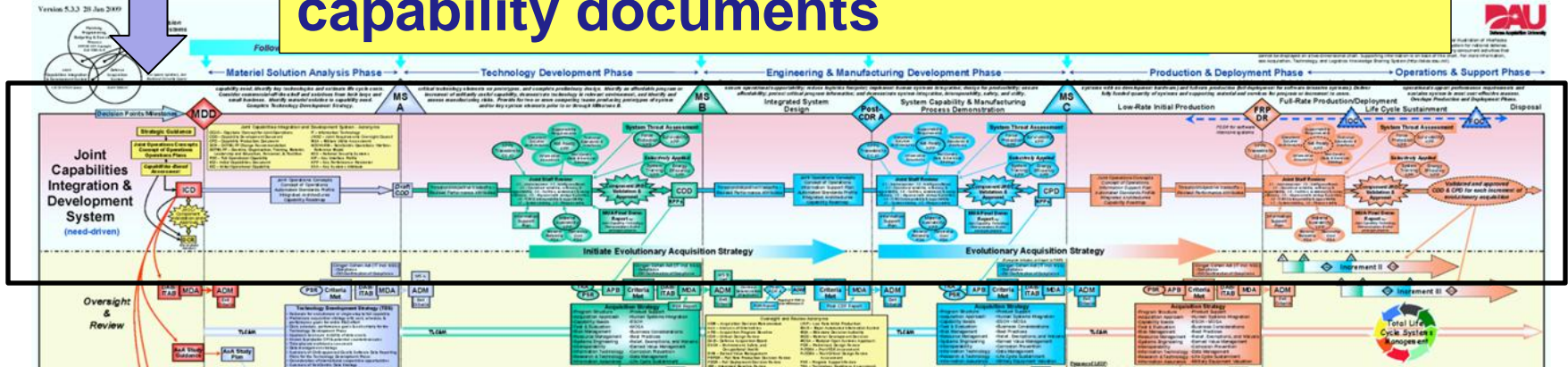**As early as possible, with well-written human-related requirements**
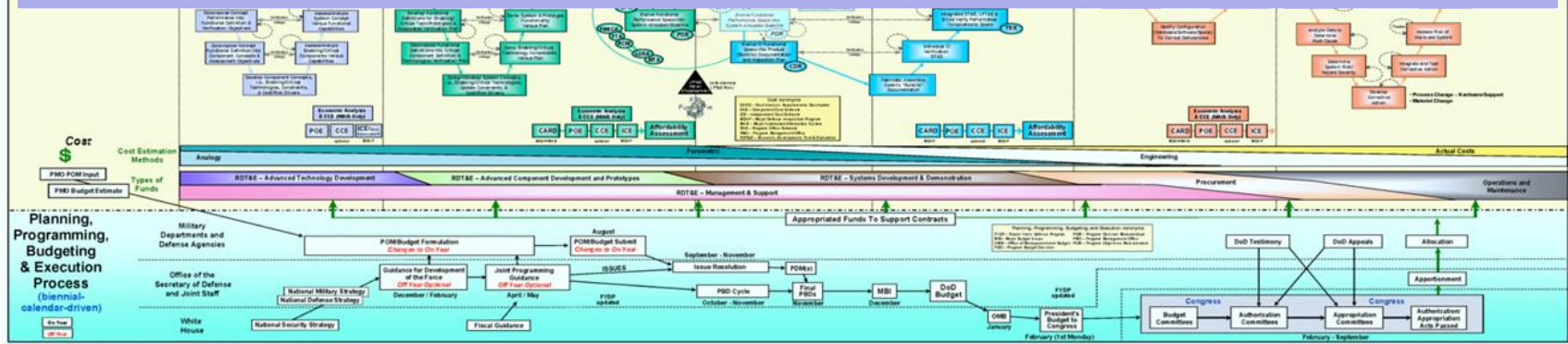
711 HPW/HP ongoing work

HSI-related requirements embedded into capability documents

Major Command (MAJCOM) representation: HSI practitioners writing JCIDS-level requirements.

Joint effort with 711 HPW/HP and AF HSI Office (AFHSIO)

711 HPW/HP ongoing work

HSI-related requirements embedded into acquisition documents
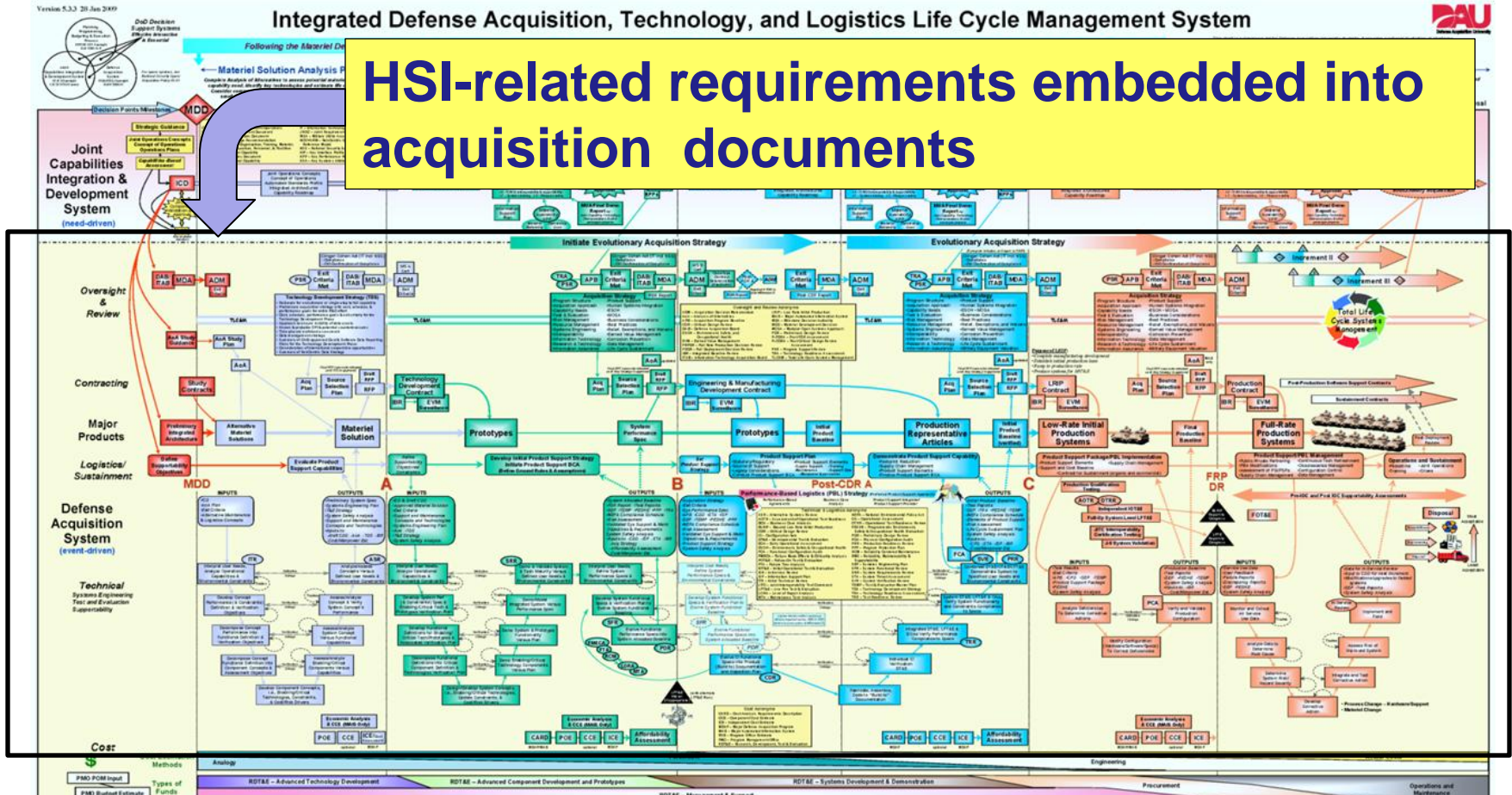
Major Command (MAJCOM) representation: Direct support for AF acquisition programs

Honing in on the System Performance Specification
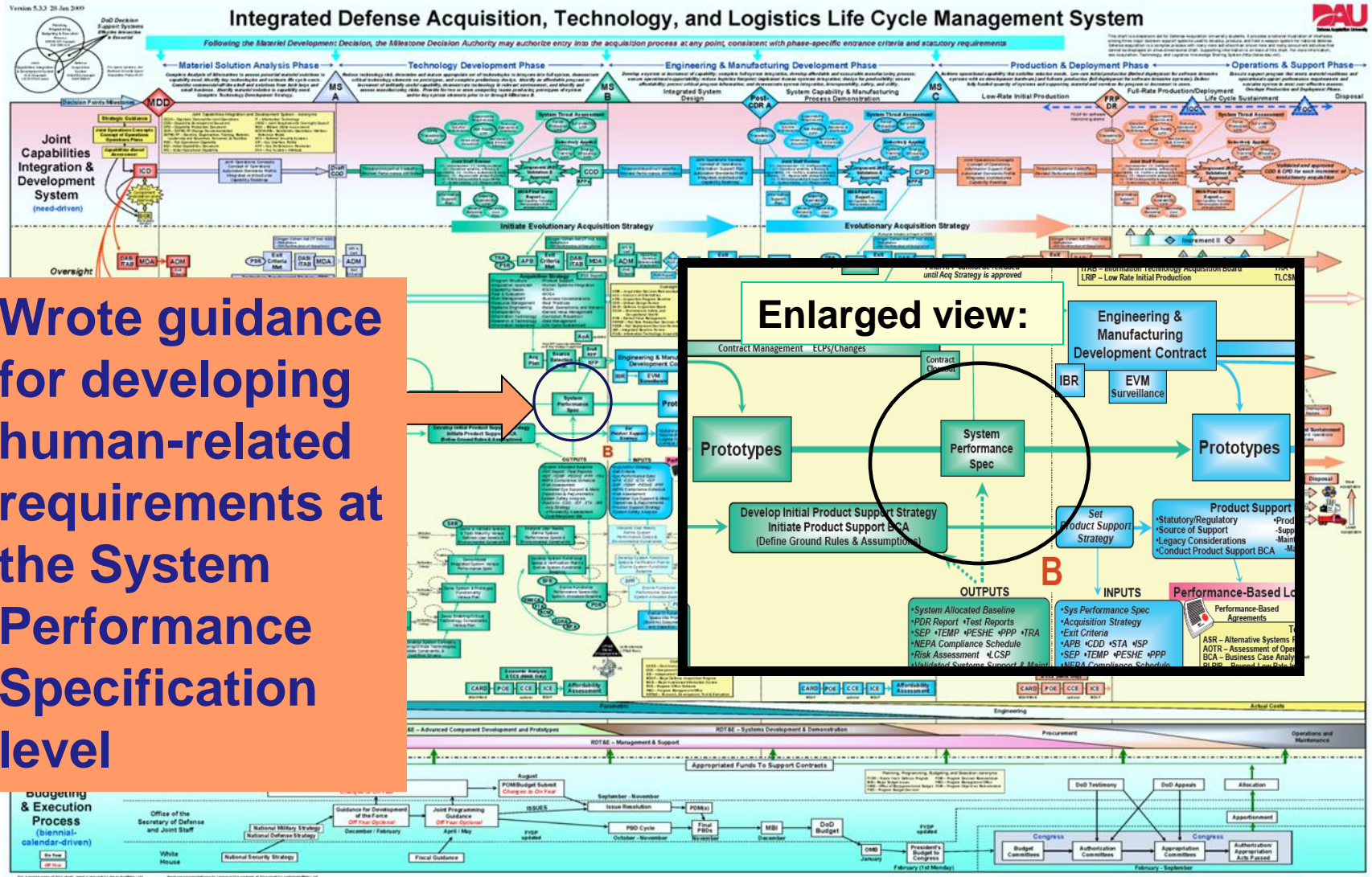
Wrote guidance for developing human-related requirements at the System Performance Specification level

Enlarged view:

Why focus on the System Performance Specification?

The System Performance Specification establishes the basis for an acquisition program's functional baseline and all lower level requirements and design details.

Honing in on the System Performance Specification

The System Requirements Document (SRD) is…

> **the Air Force's version of the DoD System Performance Specification**

> **included in the USAF Request for Proposal (RFP) for the acquisition of systems**

Key reference: Military Handbook (MIL-HDBK)-520, Systems Requirements Document Guidance

Honing in on the System Performance Specification

The SRD contains…

Requirements	**that will be translated into contractor specifications… and ultimately… into the design of the system**
Verification Methods	**to ensure the SRD requirements are met**

In other words…
Why focus on the SRD?

To ensure that HSI-related requirements and verification methodology are effectively written…
…to influence the contractor documents
…to ultimately influence the system design

Guidance Development

We developed guidance for individuals translating, writing , and assessing HSI-related requirements and verification methods for the U.S. Air Force SRD

…in a usable, easy-to-read guidebook
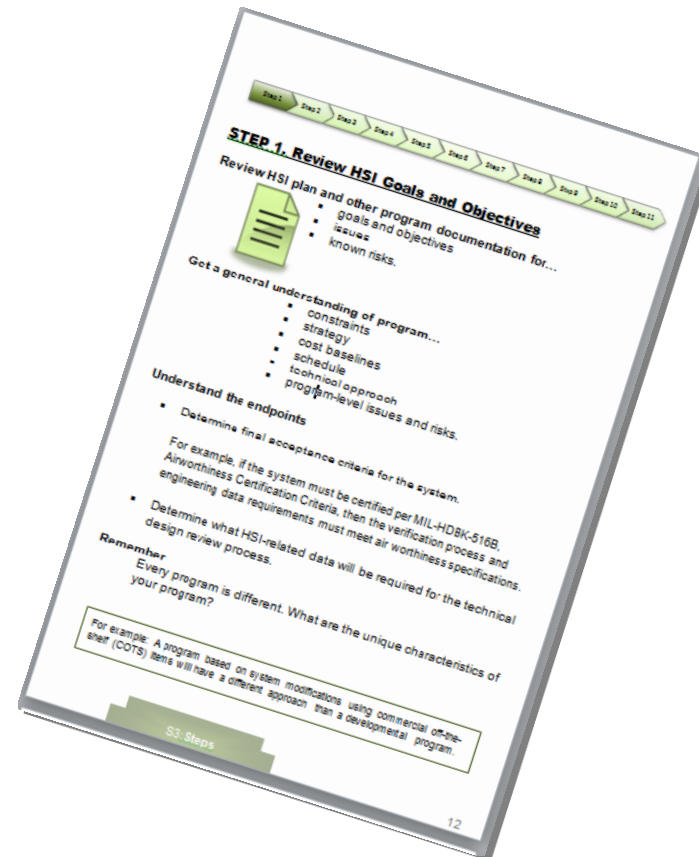
Assumptions:

- **Capability-based requirements are available**
- **Target audience of guidebook has some basic knowledge (of HSI, requirements, and of the Department of Defense acquisition lifecycle)**

Guidebook process does not describe

- **How to write user capability requirements**
- **System engineering requirements analysis processes, methods, or tools**

Guidance Development

Goal:

Having tools and resources available…

… to effectively integrate HSI into the systems engineering requirements development process

- **step-by-step guidance**
- **explanations**
- **examples**
- **consolidated list of resources and references**

Writing HSI-related Requirements for the SRD

Understanding that the SRD is not an island…

…the set of HSI-related requirements should be developed holistically within the entire contractual framework

> **Program and Technical Planning**

> **Integrated Master Plan and Integrated Master Schedule**

> **Risk Identification and Analysis**

> **Work Breakdown Structure**

> **Request for Proposal**

> **The Overall Set of Requirements**

Writing HSI-related Requirements for the SRD

Process Overview

HSI participation on functional integrated product teams (IPTs) is paramount to ensuring integrative efforts and to avoiding duplication throughout the following process:

STEP 1   **Review HSI goals and objectives**

STEP 2   **Review sources of requirements**

STEP 3   **Assess requirements for HSI implications**

STEP 4   **Cite source document**

STEP 5   **Construct primitive* HSI-related requirements statements from parent requirement**

STEP 6   **Check level of detail**

STEP 7   **State verification method(s)**

STEP 8   **Refine requirement statement**

STEP 9   **Document rationale**

STEP 10 **Verify traceability**

STEP 11 **Finalize details.**

* Jeff O'Grady, *Systems Requirements Analysis (2006)*

We developed guidance for individuals translating, writing , and assessing HSI-related requirements and verification methods for the U.S. Air Force SRD…

Currently we are in the process of
- **socializing the guidebook with the acquisition community and obtaining input**
- **finalizing the Air Force approval process**

Questions?

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Back-up Slides

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STEP 1. Review HSI Goals and Objectives

Review HSI plan and other program documentation for…
- goals and objectives
- issues
- known risks.

Get a general understanding of program…
- constraints
- strategy
- cost baselines
- schedule
- technical approach
- program-level issues and risks.

Understand the endpoints

Remember…
Every program is different.

Writing HSI-related Requirements for the SRD

STEP 2. Review Sources of Requirements

Capability-Based Requirements Documents

Measures of Effectiveness, Measures of Suitability, Measures of Performance

Information Required by DoDI 5000.02 Enclosure 4

Certification Requirements

Applicable Military Standards

STEP 3. Assess Requirements for HSI Implications

Excerpt:

"After collecting information from STEP 2:

- Thoroughly read through the documentation looking for text or strings of text for direct and indirect HSI-related requirements
- Envision how the target human audience may carry out each requirement or series of requirements
- Review for requirements dependent on human performance
- Review critical tasks for human performance implications… "

STEP 4. Cite Source Document

Cite…
the source document for traceability. Did it come from the CDD? A law?
A certification requirement?

STEP 5. Construct Primitive* HSI-related Requirements Statements from Parent Requirement

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Note: Work with the individual requirements owners to determine who will write the HSI-related requirement statements. If you are not directly responsible for actually writing the requirements, you still need to be aware of the following steps to ensure that the HSI implications are sufficiently addressed in the approved requirements.

Format the statement

Translating capability requirements and other requirements into HSI performance requirements

Determine the Measure

Consider if utilizing engineering (design standard), human performance, or subjective measurement
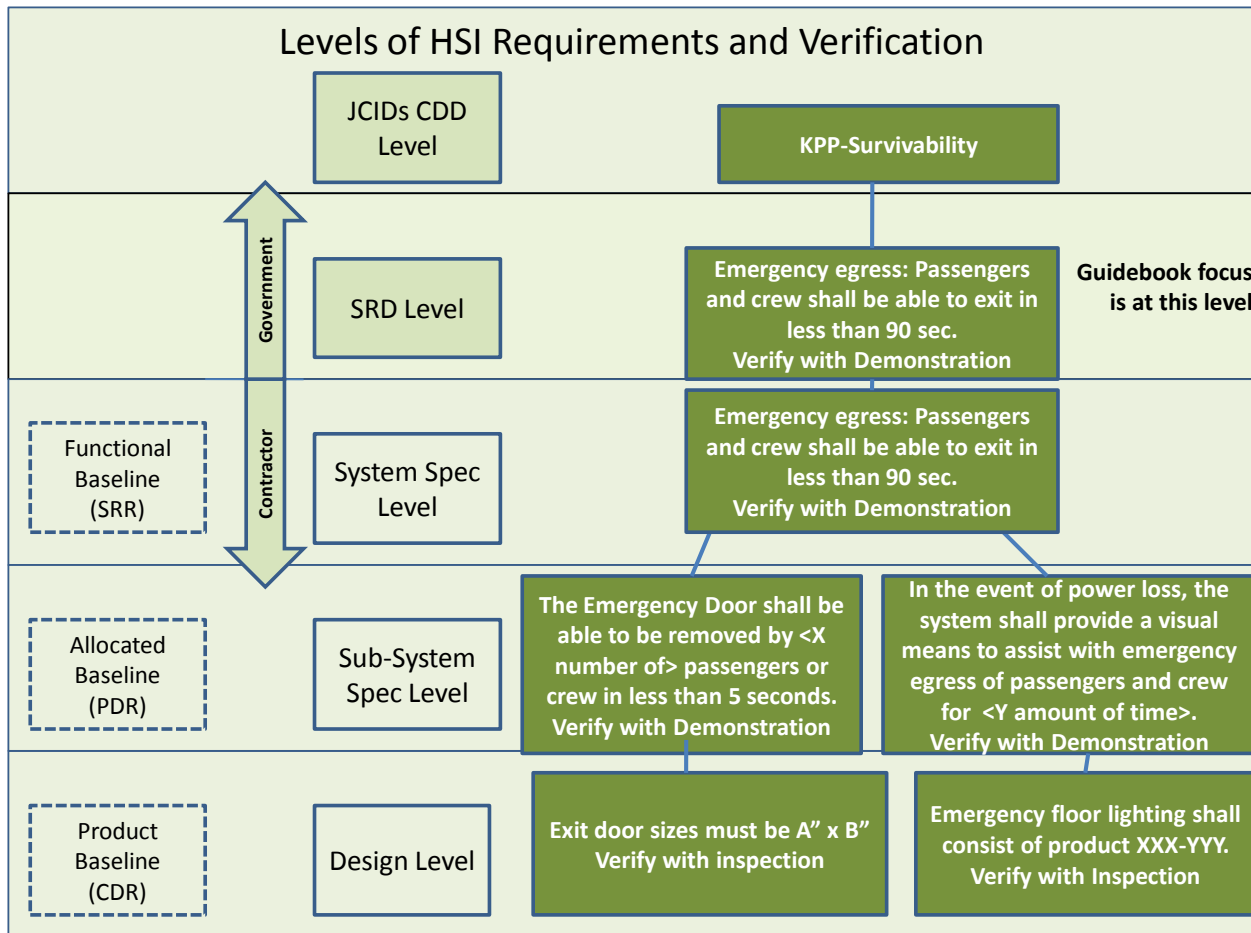
Jeff O'Grady, Systems Requirements Analysis (2006)

Writing HSI-related Requirements for the SRD

STEP 6. Check Level of Detail

Make sure the requirement is written to the right level of detail.

Levels of HSI Requirements and Verification

Government / Contractor Baselines	Levels	Requirements
	JCIDs CDD Level	**KPP-Survivability**
	SRD Level	**Emergency egress: Passengers and crew shall be able to exit in less than 90 sec. Verify with Demonstration** — *Guidebook focus is at this level*
Functional Baseline (SRR)	**System Spec Level**	**Emergency egress: Passengers and crew shall be able to exit in less than 90 sec. Verify with Demonstration**
Allocated Baseline (PDR)	**Sub-System Spec Level**	**The Emergency Door shall be able to be removed by <X number of> passengers or crew in less than 5 seconds. Verify with Demonstration** — **In the event of power loss, the system shall provide a visual means to assist with emergency egress of passengers and crew for <Y amount of time>. Verify with Demonstration**
Product Baseline (CDR)	**Design Level**	**Exit door sizes must be A" x B" Verify with inspection** — **Emergency floor lighting shall consist of product XXX-YYY. Verify with Inspection**

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STEP 7. State Verification Method(s)

Demonstration	Primarily visual observations of performance of operations at system or sub-system level.
Inspection	Visual inspection of equipment and evaluation of drawings and other pertinent design data and processes to verify conformance with characteristics, such as physical, material, part, and product marking and workmanship.
Analysis	Use of recognized analytic techniques (including modeling and simulation) to interpret or explain behavior/performance of the system element.
Test	An activity designed to provide data on the functional features and equipment operation in an operational environment under fully controlled and traceable conditions.

- ## <u>STEP 8. Refine Requirement Statement</u>

Convert the primitive requirements statement
　to a complete sentence…
　　　　by adding…

　　　　a noun, verb, and additional information such as assumptions
Clarify

Check

STEP 9. Document Rationale

Document…

- the rationale for
    - requirements
    - measures
    - verification methodology

- and assumptions

… **in the Requirements Database**

STEP 10. Verify Traceability

Verify…

- vertical traceability of requirements
    parent to child with documented source (for example, the CDD)

- horizontal traceability of requirements with the verification methodology
    - historical traceability
    - what has happened to this requirement over time?
    - how has it changed throughout development?
    - rationale
    - the responsible author or owner
    - assumptions
    - risks
    - other information related to the requirement

STEP 11. Finalize Details

Do…

- **make sure** your refined **requirements statements** (from STEP 9 or STEP 6) are included **in the requirements database**

- **ensure** that HSI-related **requirements and verification** methodology accomplished in STEPS 2–11 **are incorporated into the SRD**

- **identify and manage** HSI implications that do not become requirements as issues and risks