



The Human Systems Integration Framework (HSIF)

Defining a New Role to Enhance Cross-Domain Collaboration

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Outline



- HSI Process Challenges
- HSI Process Opportunities: The HSI Framework (HSIF)
- HSIF Evolution
- HSIF Objectives
 - Develop an interactive HSIF application
 - Define and scope activities: HSI Integrator Role
 - Vet and adjudicate HSIF design and content
 - Develop training materials
- Recap of HSIF Benefits
- Technical Vision and Next Steps





- HSI and Systems Engineering have established technical processes
- Coordination and integration challenges
 - Extensive HSI-related policy, standards, and guidance
 - Inconsistent application of HSI guidance and best practices
 - Stove-piped technical efforts within HSI domains
- Impacts
 - Lack of synchronization with SETR Events and Acquisition Milestones
 - Missed opportunities to reduce HSI re-work via collaboration
 - Misalignment of HSI technical priorities with program/project cost, schedule, and performance



Challenge: Extensive HSI-related policy, standards, guidance



A sample of HSI-related documents by Service

DoDDAGDefense Acquisition GuidebookServiceNameTitleDoDSeeServiceDoD Joint Software Systems Safety EngineeringAir ForceAFD-090121-054Air Force Human Systems IntegrationDoDDoDDodNameTitleAir ForceAFD-090121-055USAF HSI Requirements Pocket GuidDoDDodNavyNETCINST 1510.4Naval Education and Trainin Duty Task Analysis User GuidAir ForceAFD-100122-034Human Systems Integration in Acqui Acquisition Phase GuideDoDDodNavyOPNAVINST 5100.19E Volume 1: Navy Safety and (vol 1)Air ForceAFI 38-201Management of Manpower Requirer AuthorizationsDoDDodNavyOPNServiceNameTit Air ForceAir ForceAFI 63-101/20-101Integrated Life Cycle ManagementDoDMILNavyOPNArmyAR 40-5Prev DeciAir ForceAFI 63-1201Life Cycle Systems EngineeringDoDMILNavyOPNArmyAR 40-10Supr DeciAir ForceAFI 63-1201Life Cycle Systems EngineeringDoDMILNavySECIArmyAR 70-75SuriAir ForceAFMAN 63-119Certification of System Readiness for Operational Testing	
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Navy 5100 Army AR 385-10 Service Name Title	
Navy SPAN Army AR 570-4 NASA NASA-JSC-65995 Commercial Human Systems Integration Processes (CHSIP)	
Army AR 602-2 NASA NASA-STD-3001 Volume 1: NASA Space Flight Human System Standard	
	-

161 HSI-related documents

- When are these documents relevant?
- What can be learned from other services? From non-DOD HSI?





- The HSIF consists of process diagrams that display HSI Domain activities across the DoD Acquisition Life Cycle
 - Includes references, products, cross-domain collaborations
 - Extracted from HSI-related guidance, standards, and best practices across DoD Services and non-DoD organizations
 - Displayed in a timeline format, referenced to Systems Engineering Technical Reviews and Acquisition milestones
- HSI Opportunities and HSIF Benefits
 - Serves as a coordinating mechanism between HSI domains
 - Makes HSI tasks and products explicit to other stakeholders: Program Managers, Technical Authority, System Engineers, and Prime Contractor
 - Leverages HSI best practices across services, organizations
 - Ensures continuity of HSI support throughout the lifecycle





- Intended uses for the HSIF
 - Describe the who, what, when, and why of ensuring humancentered system acquisition
 - Align HSI activities with Systems Engineering processes
 - Develop a roadmap of HSI workflow processes
 - Plan and scope HSI activities across the entire acquisition cycle
 - Represent what other domain SMEs are or should be doing at various points in time
 - Identify integration/trade-off opportunities between HSI domains
- HSIF is not
 - A decision-making, risk analysis, or tradeoff tool
 - A guide on how to conduct HSI activities
 - A set of HSI requirements: Activities must be tailored to program/project risks and available HSI funding



The HSI Framework (cont.)



- Example user groups
 - HSI Domain SMEs / Practitioners
 - Logisticians
 - Program Managers
 - Technical Authorities / HSI Integrators
 - System Engineers
 - Prime Contractors
- Prerequisites for use
 - Basic knowledge of HSI and the Defense Acquisition System
 - Example experience: DAU Acquisition 101 Course, DAU Systems Engineering 101 Course, DAU HSI Course (CLE062), NPS HSI Certificate



HSIF Evolution: Precursor HSI Methods



HSI ACTIVITIES GUIDE

<u>Note 1</u>. This guide was developed to assist the program manager in determining the HSI acquisition requirements. This guide may be tailored to fit the needs of each program.

HSI Activities by Acquisition Phase	0	Ι	п	ш	
Identify mission and function requirements	Х				
Provide HSI inputs to new system/NDI/PI decision	Х				
Identify HSI constraints and issues	Х				— —
Establish the HSI data base	Х				1
Identify HSI high cost drivers and lessons learned from predecessor system	Х				1
Identify system requirements that impact on the human role	Х	Х	Х		1
Identify HSI technology requirements	Х				1
Identify tools/data bases/analyses/methodologies to be employed	Х		Х]
Provide HSI inputs to the assessment of alternative concepts/designs	Х	X			
Develop HSI exit criteria considerations for each milestone	Х	Х	Х	X	1
Conduct HSI studies, analyses, and tradeoffs	Х	Х	Х	Х]
Conduct HSI front-end analysis for each alternative concept/design	Х				1
Describe how HFE and SS/HH lessons learned will be applied	Х]
Identify HSI technical risks for each alternative concept/design	Х				1
Identify manpower requirements and state manpower sources	Х	Х	Х	Х]
Define requirements for new occupational specialties/high quality personnel	Х	X	Х	X	
Identify training requirements and evaluate training system effectiveness	Х	Х	Х	X	1
Provide HSI assessment and tradeoff of alternative concepts/designs	Х]
Provide HSI inputs to life-cycle costs	х	Х	Х		
Budget MPT life-cycle costs	Х	Х	Х]
Identify and manage HSI cost, schedule and design risk areas	Х	Х			
Incorporate HSI considerations into the acquisition strategy	Х	Х	Х]
Identify HSI test and evaluation requirements	Х	Х	Х		
Identify HSI inputs to procurement packages	Х	Х	Х	Х]
Provide HSI inputs to affordability constraints	Х	X]
Provide HSI inputs to affordability assessments	Х	Х	Х		
Provide HSI inputs to the Concept Baseline	Х]
Prepare the HSI plan		Х			
Provide earlier phase products which are required in Phase I		Х]
Refine manpower, personnel and training requirements		Х	Х	X	
Prepare the Manpower Estimate (ME)		Х	Х]
Provide HSI inputs to the Development Baseline		X			
Conduct HSI test and evaluation on prototypes		Х			
Review/update HSI plan			Х	X]
Provide earlier phase products which are required in Phase II			Х		
Provide HSI inputs to the Proposed Production Baseline			Х]
Provide earlier phase products which are required in Phase III				Х	
Conduct HSI follow-on test and evaluation				Х	
Include HSI requirements into engineering change proposals (ECPs)				Х	
Acquire HSI lessons learned	Х	Х	Х	Х	1

Department of the Navy (DON) Defense Acquisition Deskbook, Feb 1997

HSI Activities Guide

- 40 HSI activities across 4 acquisition phases
- Developed to be tailored by the PM

Acquisition Phases:

- Phase 0: Concept Exploration
- Phase I: Program Definition and Risk Reduction
- Phase II: Engineering and Manufacturing Development
- **Phase III:** Production, Fielding/Deployment, and Operational Support
- Identifying phase-dependent HSI activities has been done as early as 1997
- The HSIF combines and presents existing guidance in new and useful ways to accommodate changes in acquisition strategies and HSI policy



HSIF Evolution: Analysis of existing HSI Process Tools



Tools	Similarities	Differences
DAU Timeline	 Based on acquisition lifecycle Linked to SE processes Does not identify much HSI process 	 Does not outline cross domain collaboration
<u>Air Force HSI Guidance</u> Documents	 Based on acquisition lifecycle Linked to SE processes Tool for HSI practitioners Identifies inputs and outputs 	 Not interactive Text based Does not outline cross domain collaboration
Naval Postgraduate School Defense Acquisition Framework	 Based on acquisition lifecycle 	 Developed as an educational tool for coursework
<u>Naval Ordnance Safety and</u> <u>Security Activity – Web-</u> <u>based Interactive Safety</u> <u>Environment (WISE)</u>	 Based on acquisition lifecycle 	 Solely dedicated to safety domain Does not outline cross domain collaboration
NASA: H-FAST	 Process based 	 More of a knowledge management tool Focus on HFE Does not outline cross domain collaboration Intended user is non-practitioner



HSIF Evolution: Roadmap



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• 8 HSI Domain • Acquisit Life-Cyc (Post-W • Activity content	tion cle 1DD) -level	Validation (Internal)Environment	 OPTIONS Advanced Technology Demonstrations Customized Acquisition Frameworks 	Task-level content



HSIF Evolution: Collaboration w/ Navy HSI (SPAWAR)



Date	Version	Description
Mar 2009	HSI Practitioner's Guide	A 43-page HSI guide for integrating human factors into DoD acquisition lifecycle to better communicate consistent program support activities
May 2009	HSI Framework 1.0	Visualization of the practitioner guide activities over the acquisition lifecycle, to include MPT domain activities
Sep 2009	HSI Framework 1.3	Added HSI domain collaboration points; drafted Safety and Occ Health domain activities; expanded integrated acquisition row to include documentation
Nov 2010	HSI Framework 1.4.1	Added input documentation and output products to each activity box for HFE row
Dec 2011 HSI Framework 1.5 Early HSIF focus areas		Refined activity boxes to align with SPAWAR HSI Work Package development
HFE ar		11



HSIF Evolution: Collaboration w/ USAF HSI (711th HPW)



Date	Version	Description
Feb 2013	AF HSIF 0.0	Included Safety, Occ Health, Survivability, and Habitability domain activities in collaboration with USAF HSI (711 th HPW)
June 2013 – Aug 2014	AF HSIF 1.0	Developed an HSIF interactive application . Defined and scoped technical activities for an HSI Integrator Role. Conducted a full vetting and adjudication of all HSIF content .

AF HSIF 1.0

- 8 HSI Domains, plus HSI Integrator Role
- 386 Activities across 6 Acquisition Phases
- 161 Unique References
- 215 Unique Products

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Role	User Stories
HSI Practitioner	As an HSI Practitioner, I need to identify content, timing, and collaboration points for HSI activities within the Acquisition Life Cycle, so that I can support Systems Engineering efforts timely and effectively.
	 Multi-service inputs: As an HSI Practitioner, I need to identify guidance and best practices across services so that I can conduct technical activities efficiently and accurately.
	 Product traceability: As an HSI Practitioner, I need to identify guidance and best practices across services so that I can conduct relevant technical activities.
	 Cross-domain collaboration: As an HSI Practitioner, I need to identify similar technical activities across HSI Domains so that I can leverage HSI analyses efficiently.

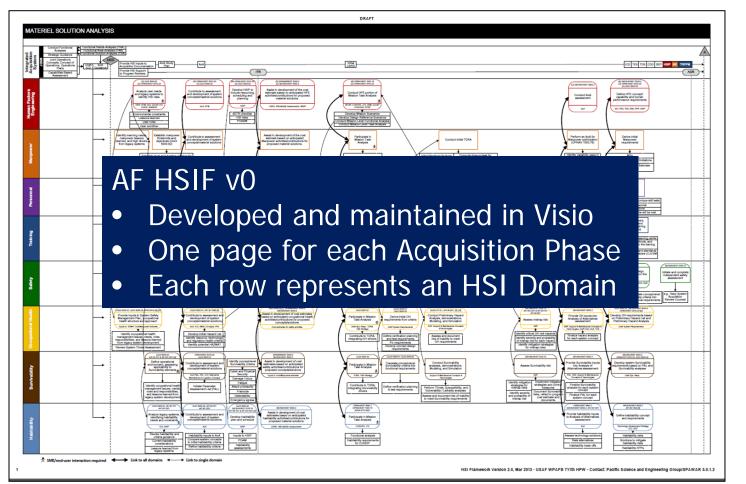
Developed use cases to identify needs, support prioritization, and facilitate design



AF HSIF v0: Static version



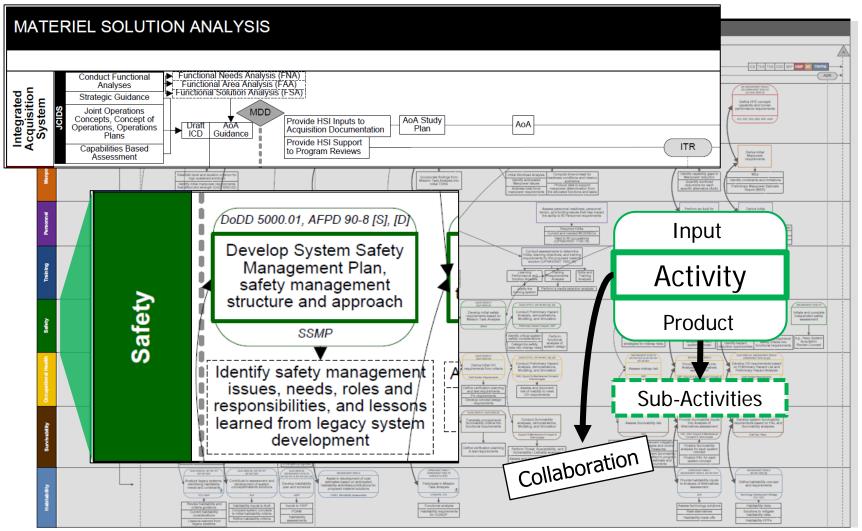
Habitability	Survivability	Occupational Health	Safety	Training	Personnel	Manpower	Human Factors Engineering	Integrated Acquisition System
								JCIDS





AF HSIF v0: Static version (cont.)





HSI Framework Version 2.0, Mar 2013 - USAF WPAFB 711th HPW - Contact: Pacific Science and Engineering Group/SPAWAR 5.0.1.2





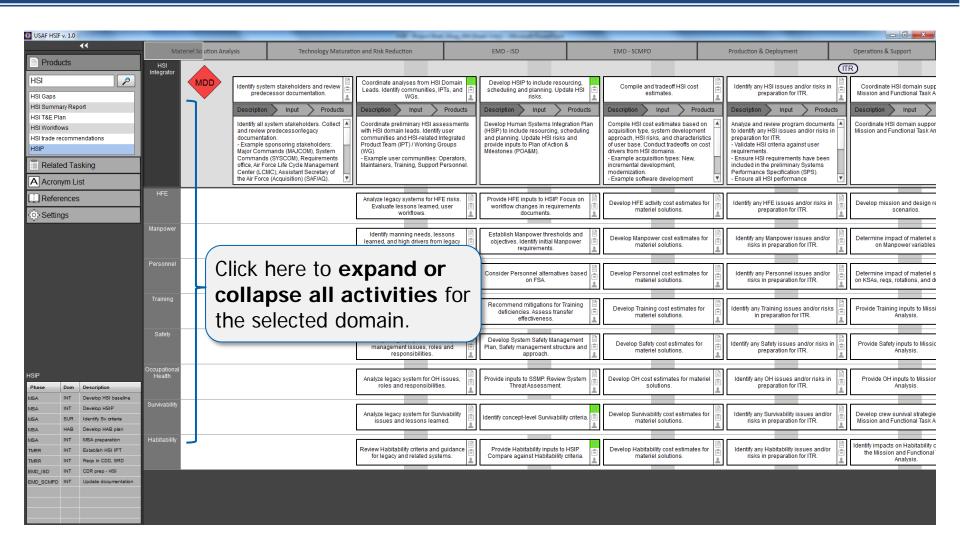
1. Develop an interactive HSIF application

- Mitigate limitations of static visualization: Clutter, accessibility, configuration management, expansion
- Add interactive features: Navigation, information access, product search, reference search, Quick Reference Guide
- Serves as a resource for the acquisition community: AFHSIO, PEOs, SPAWAR, Program Management Offices, Defense Acquisition University
- 2. Define and scope activities: HSI Integrator Role
- 3. Vet and adjudicate HSIF design and content
- 4. Develop training materials



Interactive HSIF: Overview

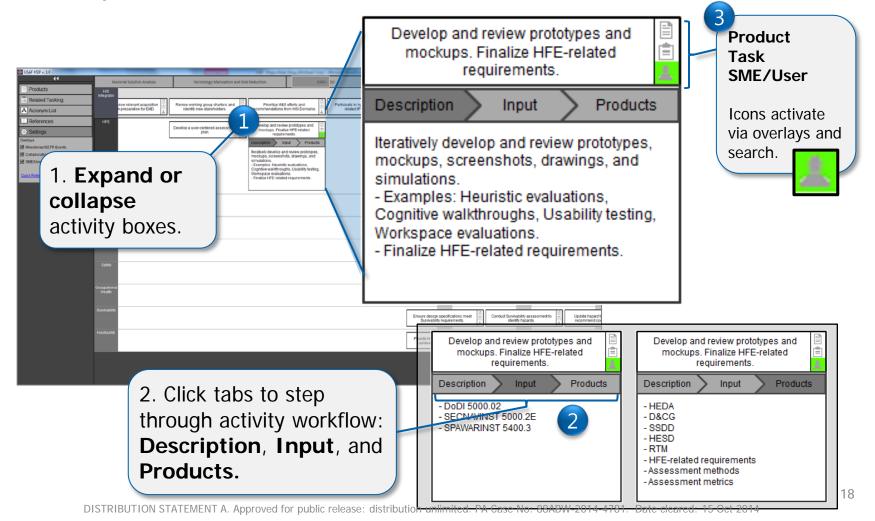








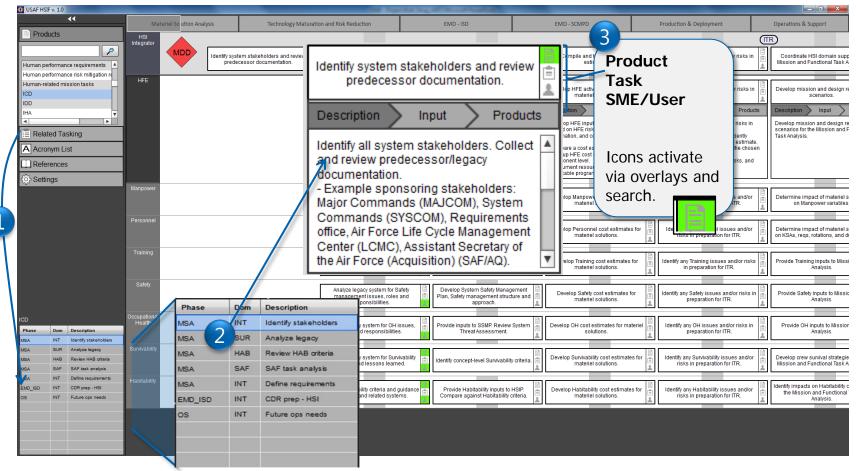
Activity boxes display task description, inputs and products. Icons highlight relationships between tasks.







Product Search, Acronym List, and downloadable References are located in the Control Panel. Search results are linked to the appropriate activity box.







1. Develop an interactive HSIF application

2. Define and scope activities: HSI Integrator Role

- Identify core HSI Integrator Role functions
 - Conduct HSI planning and trade studies
 - Exercise leadership on collaborations between HSI Domains
 - Serve as an interface between HSI and Systems Engineering, especially during SETR and Acquisition Milestone reviews
- Derive HSI Integrator Role content from core functions, as an additional row in the HSIF visualization
- Adapt and edit existing HSIF structure and content, re-establish collaborations
- 3. Vet and adjudicate HSIF design and content
- 4. Develop training materials





- Among HSI domains, responsibility and tasks to facilitate coordination and trade-offs remain unknown
- The HSI Integrator Role and related activities were developed to serve as an interface to coordinate between the HSI Domains
- HSI would benefit from a mechanism or role similar to a Chief Engineer to:
 - provide SoS/FoS oversight
 - facilitate trade-offs among domains
 - communicate HSI risk within an organization
 - Identify HSI trends across programs
- The HSIF defines these coordinating activities to facilitate the consistent application and effectiveness of HSI



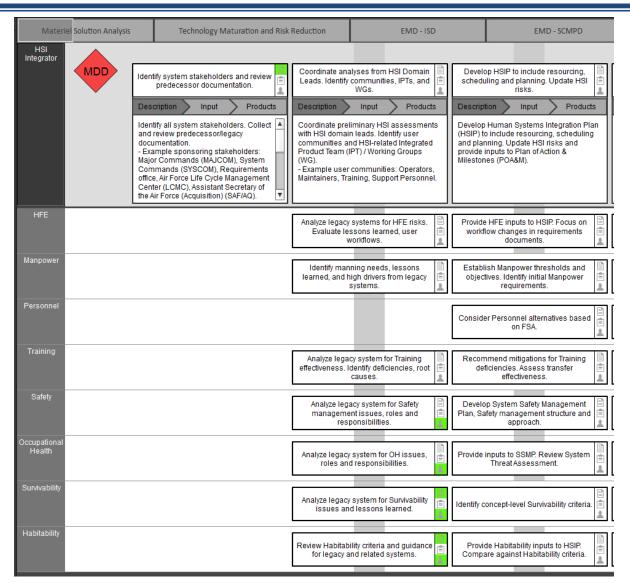


Role	User Stories
	As an HSI Integrator, I need to identify collaboration points so that I can engage HSI Domain leads timely and accurately.
HSI Integrator	 HSI Planning: As an HSI Integrator, I need to provide guidance to a program on developing a Human Systems Integration Plan (HSIP), so that HSI tasking is planned and scoped to support program needs.
	 HSI Requirements: As an HSI Integrator, I need to identify requirements-related activities, so that I can ensure timely and effective technical support for a SETR.



HSI Integrator Role: Overview

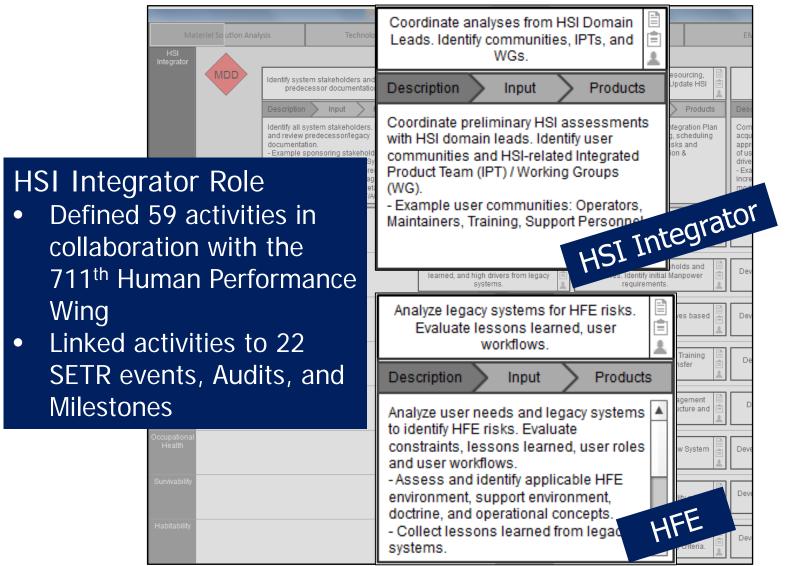






HSI Integrator Role: Collaboration w/ HFE









- 1. Develop an interactive HSIF application
- 2. Define and scope activities: HSI Integrator Role
- 3. Vet and adjudicate HSIF design and content
 - Develop criteria for integrating HSI content
 - Suitable for HSI practitioners
 - Supports a range of Acquisition programs
 - Clear relationship to SE/Acq/HSI products
 - Practitioner-friendly: Handbooks, Guidance, Data Templates
 - Conducted 10 Working Groups
 - Adjudicated 342 comments from 5 review sessions

4. Develop training materials

- Created a HSIF Quick Reference Guide
- Training Brief





- For HSI Practitioners and System Engineers
 - Provides explicit technical guidance for HSI Domains that is both policy-driven and product-focused
 - Leverages HSI best practices across services, organizations
 - Facilitates and communicates HSI planning among stakeholders
- For Program Managers
 - Provides a list of potential HSI-related activities that can be tailored to manage program technical risks
 - Makes HSI tasks and products explicit to system stakeholders
- For those serving as the HSI Integrator Role
 - Serves as a coordinating mechanism between HSI domains
 - Improved technical alignment to System Engineering Technical Review (SETR) events and Acquisition Milestones





- Add Edit capability and HSIF Knowledge Management
 - Provide user interface to edit activities, products, and references
 - Includes annotations, due date fields, activity status tracking
- Transition to web-based technologies
 - Improves accessibility and content distribution
- Pre-MDD Content Analysis
 - Include Capability Planning & Analysis (CP&A), Concept Development (CD), AoA, ICD activities
- Add Environment domain row
- Expand use cases to include additional stakeholders





Role	User Stories
Program Manager	As a Program Manager, I need to identify HSI activities for my project or program, so that I can accurately and efficiently plan and scope resources for HSI tasking.
Lead Engineer	As a Chief Engineer, I need to identify the timing of HSI activities, so that I can ensure HSI activities are aligned with SE activities.
Technical Authority	As a Technical Authority, I need to identify HSI activities to be completed prior to each SETR, so that I can scope the review and provide a relevant HSI evaluation.
Test Lead	As a Test Lead, I need to identify HSI analyses and products that involve end users, so that I can leverage operational test cases and data for T&E events.





- HSIF Content Expansion
 - Full HSI representation: Include additional DoD Services and government agencies that practice HSI
 - Pre-MDD Phase: Include HSI to "the left" to include R&D
 - Continuous content improvement
 - Working Groups to elicit feedback from HSI user base: HSI domain SMEs, system engineers, program management
- HSI Integrator Role
 - Linked to DoD-wide HSI Standards: Technical tasks derived from Standards, best practices to inform Standards
 - Expanded collaborations: Library of successful collaboration points available to all HSI Integrators and project/program managers
- HSIF Structure
 - Adapts to emergent Acquisition Models: Interim DoDI 5000.02

Questions?

For more information, please contact:

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