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HSI Progress & Risk Specification Tool (HPRST)

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Acknowledgement

Colleagues whose efforts, leadership, drive, expertise, and vision helped translate the HPRST concept into a reality:

- CDR Henry “Hank” Phillips, NAWCTSD
- Owen Seely, NAVSEA DD
- Dr. Jim Pharmer, NAWCTSD

Background: Tasking Evolution

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Development of Human Readiness Levels (HRL)

- Formed at direction of ASD(R&E) HPTB at TAG 68 May 2014;
- Effort funded by ONR Code 34 in July 2015

Original Mission Statement:

- Develop a system that can be used to describe progress toward acquisition review and milestone requirements and incorporation of HSI requirements into programmatic decision-making

Updated Mission Statement based on ASD Redirection:

- Wholesale change of the focus of the model to reflect incorporation of risk
- Produce a tool to help HSI practitioners quickly develop thorough, informed programmatic risks

New Model/Tool Target Audience:

- Joint DoD HSI community – not a Navy-centric product
- Journeyman-level HSI practitioners & PM/LSE stakeholders

Conveying HSI Information to a Busy Audience is a Challenge

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SETR/MS Checklists

ILA Checklists

MILSTDs

Instructions

Risk Mgt

HSI Lead

???

High info volume
Jargon

Consolidated info
Decision support
Risk Summary

Purposes of the HPRST

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- **Purposes of this tool:**
  - Communications aid to help practitioners and PMs recognize HSI requirements and consequences more readily and earlier
  - Job aid to help HSI practitioners discover and articulate risks to PMs

- The **HSI Progress-Risk Specification Tool (HPRST)** will help practitioners link HSI process issues/omissions to resulting potential risks across the ALC.

- Stakeholders will:
  - Evaluate general progress requirements by SETR/MS
  - Consult the list of problems/risks linked to domains and ALC locations when developing or updating program risks
  - Each list is accompanied by potential mitigation strategies for consideration

HPRST is not a readiness scale

HPRST Components: HSI Progress & Potential Risks

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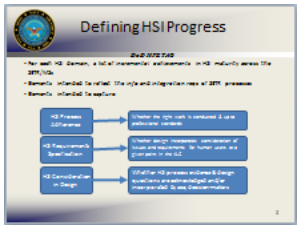

2014 HRL Model

HPRST

What should have been done by this point?

What are the consequences?

Tie to Program Specifics

Dev Plan

ASR

MS A

SRR/ SFR

PDR

MS B

CDR

MS C

DI HF SOH MP HSI Progress Hab PS T FP/S

DI HF SOH MP Potential Risks Hab PS T FP/S

Program-Specific Risks

Cost
Sys Perf
Sked
Safety

Cost
Sys Perf
Sked
Safety

General

General

Specific

HSI Progress

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Personnel Domain Glideslope

- Dev Plan — Minimal skillsets defined
- ASR
- MS A — Skillset deltas defined - what currently exists v what is needed
- SRR/ SFR — Skillset inclusions when mapping the human network
- PDR — Manpower modeling with skillsets included
- MS B — Skillset capability & limitations refined
- CDR — HSI issue/risk identification and tracking continues. Gaps between system constraints and human performance goals continue to be tracked and refine mature design
- SVR — Fully integrated & compr. HSI testing & data collection vs. domain stove-pipe execution
- MS C — Human perf factors including cognitive, physical, and sensory capabilities, knowledge, skills, abilities, and experience levels are identified to match system tasks and workload; criteria are developed to effectively recruit, select and train personnel for safe, efficient and effective system operation.
- ISR — Skillsets required not increased after post-deployment

- Progress glideslopes defined for each HSI domain and for integration requirements
- Each glideslope element includes multiple follow-up questions summarizing acq guidance across services

HSI Progress: Personnel Domain SRR/SFR

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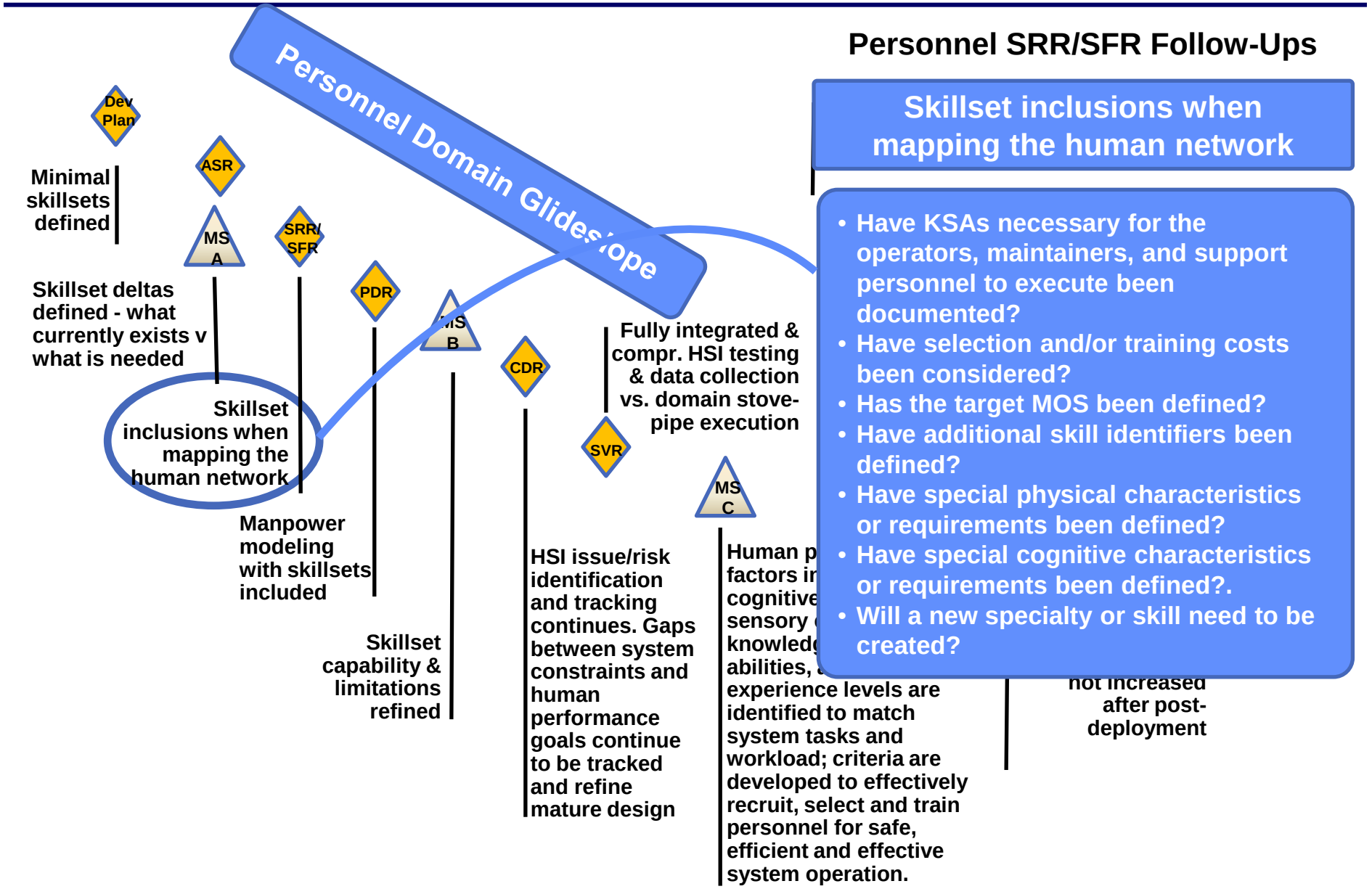

Personnel SRR/SFR Follow-Ups

Skillset inclusions when mapping the human network

- Have KSAs necessary for the operators, maintainers, and support personnel to execute been documented?
- Have selection and/or training costs been considered?
- Has the target MOS been defined?
- Have additional skill identifiers been defined?
- Have special physical characteristics or requirements been defined?
- Have special cognitive characteristics or requirements been defined?.
- Will a new specialty or skill need to be created?

Defining Consequences

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- Consequences are the problems that will likely occur when the HSI processes are not adhered to properly.
- These potential problems, if allowed to continue festering, may adversely affect the program in terms of risks to total system performance (if not directly to system performance then by extension due to decrements in human performance), cost, schedule, and safety.
- Consequences lists are specific to the HSI domains as well as to the domain integration level.

Example: Potential Consequences by Risk Area at SRR/SFR for Personnel Domain

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Skillset inclusions when mapping the human network

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- Have additional skill identifiers been defined?
- Have special physical characteristics or requirements been defined?
- Have special cognitive characteristics or requirements been defined?.
- Will a new specialty or skill need to be created?

System Performance

- Without considering personnel concerns a potential mismatch between the skill sets required for operating/maintaining the materiel solution & skill sets available in the user population could emerge.
- Operators may not have the skills necessary to operate the system, which will reduce the efficacy of the system, the system will not be used to its fullest capability and the system performance will decrease.

Cost

- Down the road, attempting to address the skill set mismatch could incur costly fixes. A mismatch could occur between what the materiel solution requires and what the services would be willing to provide regarding the structure and skill content of MOS.
- Still time to correct for deficiencies before major costs kick in.

Schedule

- Down the road, attempting to address the skill set mismatch could significantly add to the design schedule or sideline the deployed system until it can be remediated.
- Still time to correct for deficiencies before major schedule impacts result.

Safety

- If a required skill set is not part of the users MOS then the user may improperly operate or maintain the system, which could pose a potential harm to the individual, others, and/or the system.

Mitigation Action Guidance for Potential Problems

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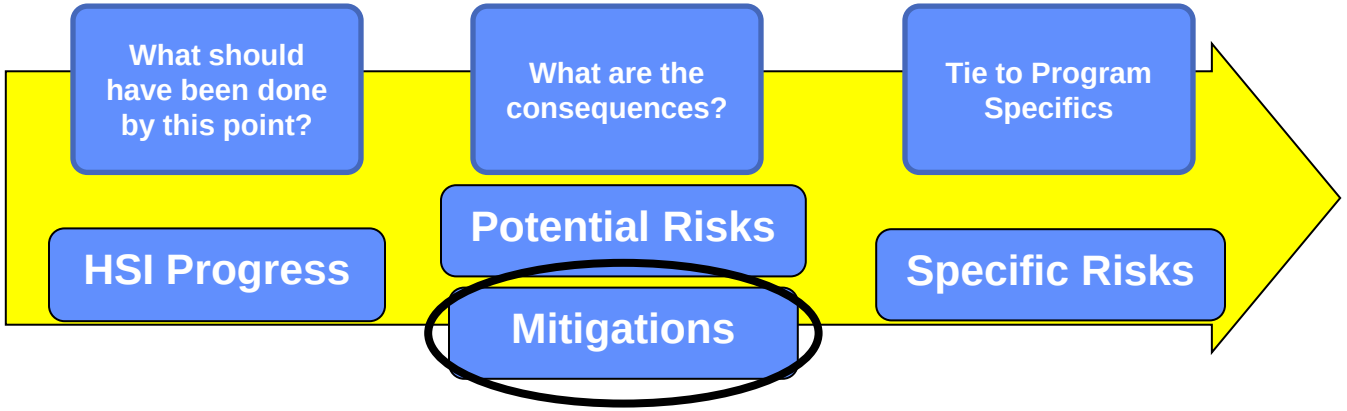
- Mitigation Actions provide general guidelines for addressing the problems faced for deficient HSI progress.
- Problems will have different mitigation approaches & strategies based on the severity of the problem and the location in the ALC.
- The mitigation strategies may be affected by the technical and financial priorities of the program (i.e., individual risks may be absorbed based on the constraints of the program).



HPRST Contents

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	DI	HFE	PS	Hab	MP	Trng	Safety & Occ Hlth	FP & Surv
Dev Plan	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL
ASR / MS A	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL
SRR/ SFR	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL
Pre-PDR	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL
PDR / MS B	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL				
CDR	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL				
SVR	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL				
MS C	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL				
ISR	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL	HSI Req Mit / PRL

For each domain, at each major SETR/MS…

- HSI Progress Requirements
- Mitigation Strategies
- Potential Risk List

Translate the Potential Problems into Program Specific Risks

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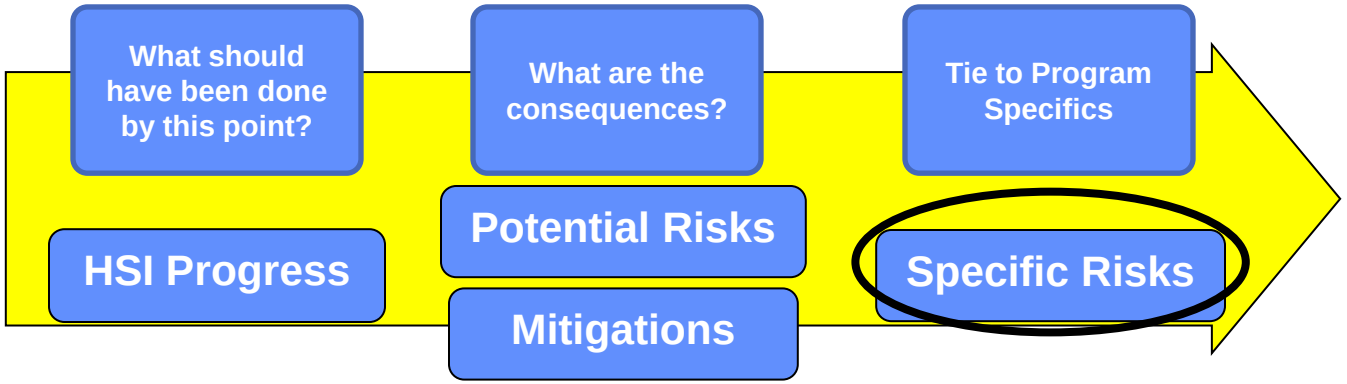
- HSI Practitioners, having identified for their program the failures to properly and accurately conduct HSI activities and the associated potential risks to Cost, Schedule, Performance, and Safety, now specify these risks in terms of their program.
- The risks are articulated in prose to show systemic ramifications (e.g., lack of training integration of GFE components will eclipse current training budget to fix)
- These risks are converted onto the standard risk matrix (i.e., Likelihood versus Consequence)



The Real Goal: Timely & Complete Program-Specific Risks & Mitigation Strategies

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Depicted: Risks across domains for Body Armor Program at SRR

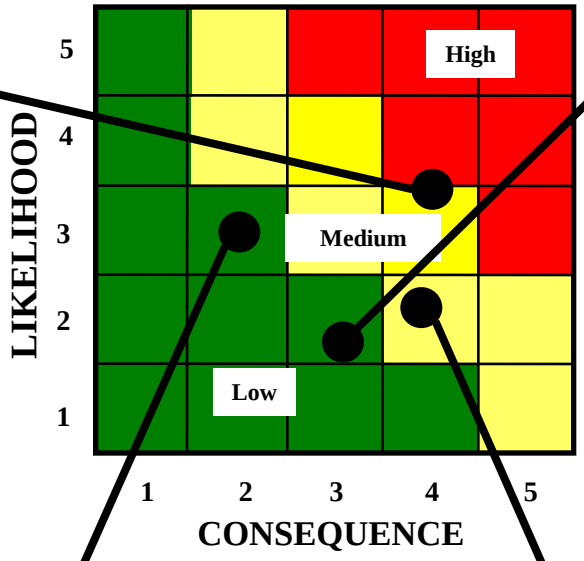
Risk 1: Personnel survivability yet to be assessed for the new body armor (P/Safety)

Root Cause: Due to contract issues, access to the Human Effects experts, and lack of a stable preliminary design, the personnel survivability requirements for the program have yet to be adequately assessed, modeled, or initially verified.

Consequence: If the analysis is delayed further, locking down the critical design will be delayed as will testing.

Mitigation: Solicit human effects experts from more than one organization and lock down parts of the design that don't have survivability impact.

Survivability-Driven



Risk 3: Software integration of two existing GOTS programs (C/P)

Root Cause: Two existing (and overlapping) GOTS software programs are planned for integration into a single app for the handheld system. Each was designed with a different usability look and feel, which may lead to usability issues during integration and when "redesign" is limited due to cost and schedule.

Consequence: If realized, forward observers will be forced to use a disjointed software app to request calls-for-fire leading to forced errors and potential C2 mission ineffectiveness.

Mitigation: Complete an analysis of each software program to determine COAs for a seamless usability approach including time, schedule, and human error analysis.

HF-Driven

Risk 2: Lack of Schoolhouse Training (C/Sk/P)

Root Cause: Given that there is the requirement to not increase manpower or create a new MOS, no formal sustainment training will be offered by the schoolhouse. Program will have to rely on NET for incidental operators.

Consequence: If fully realized, only NET will be offered and operators at each unit will have to train their replacements. This leads to a lack of standardization of trained operators and no true sustainment plan.

Mitigation: MPT IPT to continue MPTA and MPTP to determine full impacts and exploring COAs such as CDD change that requires an MOS for this program.

DI-Driven

Risk 4: System packaging and handling design (Sk/P)

Root Cause: Legacy system and increment upgrade did not utilize MIL-STD-1472 carry and lift limit criteria as a basis for packing the system.

Consequence: Required manpower to safely carry and lift the cases may not be available or feasible.

Mitigation: Conduct a full carry and lift analysis of the case designs that will be presented by the prime at PDR to determine full impact.

HF & Manpower-Driven

HPRST

QUESTIONS

Selected Reviewer Notes of Previous HRL Model

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- ASD(RE) PD Al Shaffer:
  - Doesn't like RLs in general; more interested in a tool that would make it easier for teams/PMs to track consolidated risk info
- ASD(SE) Rob Gold:
  - Looking for tools to maximize info on risk consequence and probability
- Curt Meyerhoff:
  - Take care to minimize the ways this tool could be misused and misinterpreted
  - Must be careful to specify the product the tool is to be used for
  - More applicable to some products than others
  - Tool should reflect consolidated risk, mitigation, and consequence info
  - A process metric is fine, as long as it increases visibility on program risks
- John Owen:
  - How can we be sure that all the requirements across domains and across user groups have been recognized?
  - Follow-up questions must be expanded
  - Tool would benefit from a separate, updated HSI standards of practice guide to help practitioners avoid overlooking requirements and tradeoffs

Use and Misuse of an HSI Progress and Risk Tool

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First, do no harm… How will PMs use this system?

- System must not place a significant burden on HSI team, PM/LSE
- Must capitalize on existing tools, documentation and requirements for tracking HSI progress and maturity
- Elevate HSI considerations into C/S/P discussions earlier in ALC
- Help HSI practitioners develop HSI-driven programmatic risks aligned to KPPs – must yield results in the language that PMs will care about
  - HSI is relevant to PMs only insofar as it influences cost, sked, safety & KPPs

What does this not represent?

- Does not describe the achievement of any KPPs or HP goals as directly measured using empirical data
- Note that this is not meant to provide a rating of HSI quality, only an evaluation of whether within/cross-domain requirements for a given SETR/MS ALC point have been achieved
- Does not specify any program-specific risks, only potential risks resulting from HSI omissions, implementation, or undesirable results

9th Scale to Capture System Level Progress: Human Readiness Scale

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	HURL	Definition	Description	Supporting Info
Dev Plan	1	Human-focused concept of operations (human use scenario) defined	The scenario for human use (human focused CONOPS) of the conceptualized system has been defined and developed for all end user categories. Scenario was used as basis for defining the system.	Human View (HV)-A Concept, HV-C Tasks, Task List Repository, Scenarios/CONOPS
ASR, MS A	2	Human capabilities & limitations and system affordances & constraints applied to preliminary conceptual designs	Human capabilities and limitations (for all users) and system affordances/constraints have been defined and applied to the refinement of the system concept.	HV-B Human Constraints; Published research and paper studies that identify the human capabilities and limitations; Initial set of HSI-related functional requirements
SRR/ SFR	3	Mapping of human interactions and application of standards to proof of concept	Prior to engineering design, Human to human and human to system network has been defined/refined and proven to map to technology/system architecture and functional expectations. HSI design criteria and standards have been levied to drive the system concept and pre-design.	HV-E Human Network, decomposed standards mapped to HSI-related requirements and specifications,
Pre-PDR	4	Modeling and analysis of human performance conducted and applied within system concept	Lab HSI tools and resources have been used to analyze and validate human performance within the system concept.	Workload models, anthropometric models, discrete event simulations, analysis of performance shaping factors
PDR, MS B	5	HSI demonstration and Early User Evaluation of initial and/or preliminary prototype to inform preliminary design	Initial and/or preliminary prototypes have been iteratively evaluated and demonstrated with end users. Human Performance data was collected and used to refine the system, the requirements, and drive improvements of the prototypes.	Static screen shots, CADs, working prototypes, HSI issue tracker, human performance data, Focus group data (wants vs needs), revised human task list, modeled workload (physical and cognitive) validated and/or refined, HSI Issue Tracking, HSI Trade Studies (domain goal tradeoffs)
CDR	6	System design fully matured as influenced by human perf analyses, metrics, and prototyping	System design fidelity increases and use of the system is demonstrated. Design has been modified to incorporate lessons learned to optimize human performance, workload, SA, usability, ergonomics, trainability, and safety.	Evolved and improved prototypes; objective and subjective HSI metrics, Survey data, SAGAT/SART, SUS, NASA TLX, Field User Evaluation reports
SVR	7	HSI-related requirements qualified and verified through developmental test and evaluation in a representative env	Full system capability with all levels of human users have verified human performance expectations under DT conditions.	DT reports, RTM, human performance validation data, Log/Maintenance Demo data, Survey data, SAGAT/SART, SUS, NASA TLX, Lessons Learned tracking
MS C	8	Human Performance using system equipment fully tested, validated, and approved in mission ops	Full system capability with all levels of human users (fully trained and invested) have validated human performance expectations are valid and met in under mission conditions, such as those in OT&E.	OT&E reports, Survey data, SAGAT/SART, SUS, NASA TLX
ISR	9	Post-deployment and sustainment of human performance capability	Extensive and iterative review and verification of fielded system begins, as well as post-product improvement evaluations for the next incremental builds. Activity examples include post-fielding training eval analysis and sustaining a hazard analysis for fielded system.	Post-deployment surveys, Training effectiveness evaluations, HSI as signoff to ECPs, Sustainment of HSI design concepts, end user workload stabilization (vice increase),

Human Readiness Level (HRL)Model and Incorporated Scales

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	Definition	Scale
System-Level	Degree to which integrated HSI requirements across domains *are being incorporated* by HSI team & SE lead *into decisions regarding system hardware & software requirements*	HRL Scale
Cross Domain	Degree to which the HSI team is *integrating requirements across HSI domains* to arrive at system solutions that meet perf reqs	Domain Integration Scale
Within HSI Domain	Indication of whether HSI domain lead is *conducting the right work the right way, getting that work acknowledged,* and *incorporated into domain-specific design decisions.*	Domain Scales

7 Domains

- Human Factors Eng
- Personnel
- Habitability
- Manpower
- Training
- Safety & Occupational Health
- Survivability & Force Protection

Human Readiness Level (HRL) Model Interface Example

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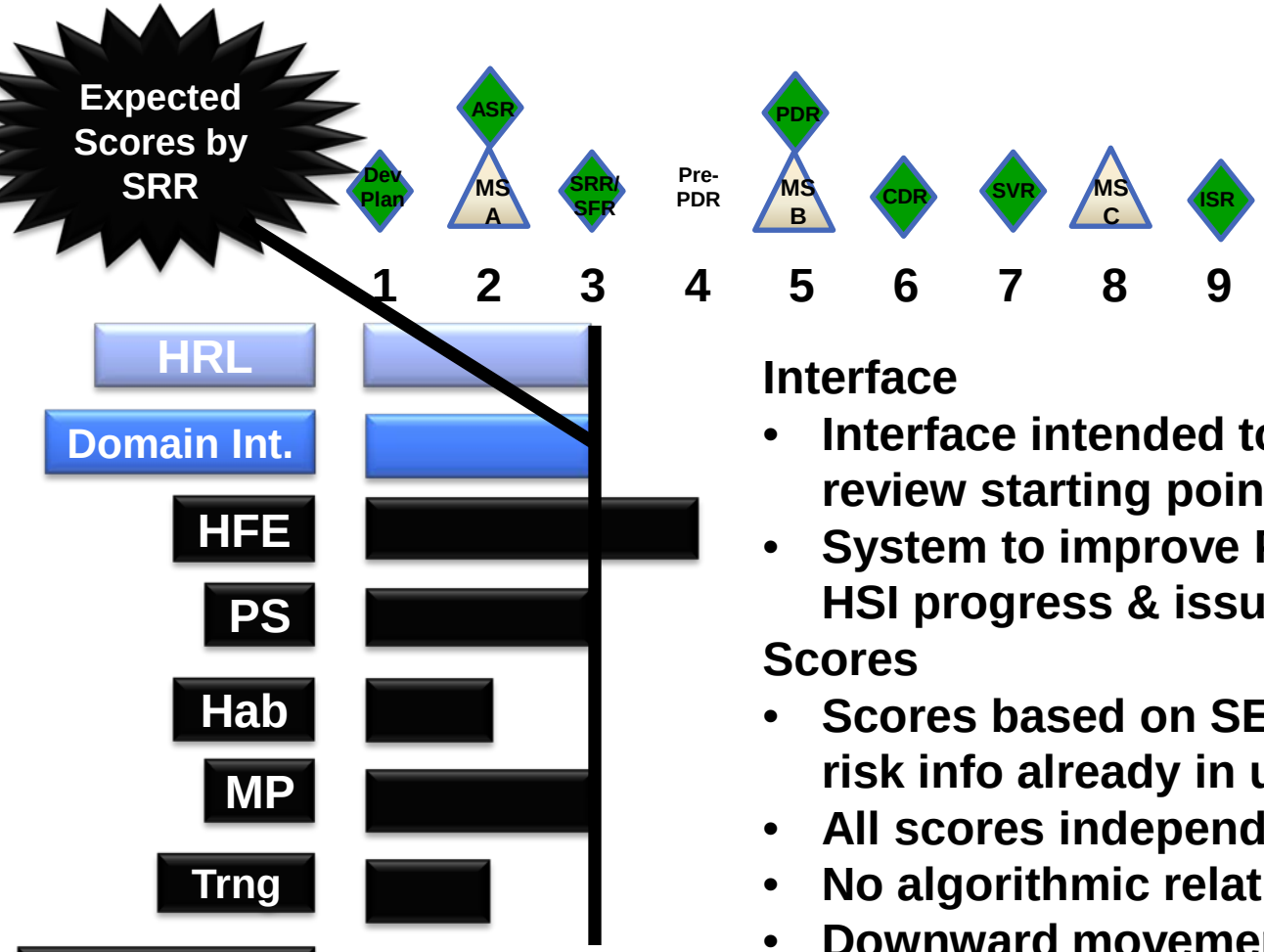

Interface

- Interface intended to serve as a PM/LSE review starting point
- System to improve PM/LSE awareness of HSI progress & issues earlier in the ALC

Scores

- Scores based on SETR/MS prep HSI & risk info already in use
- All scores independently assessed
- No algorithmic relationship among scores
- Downward movement possible

Recognition Page

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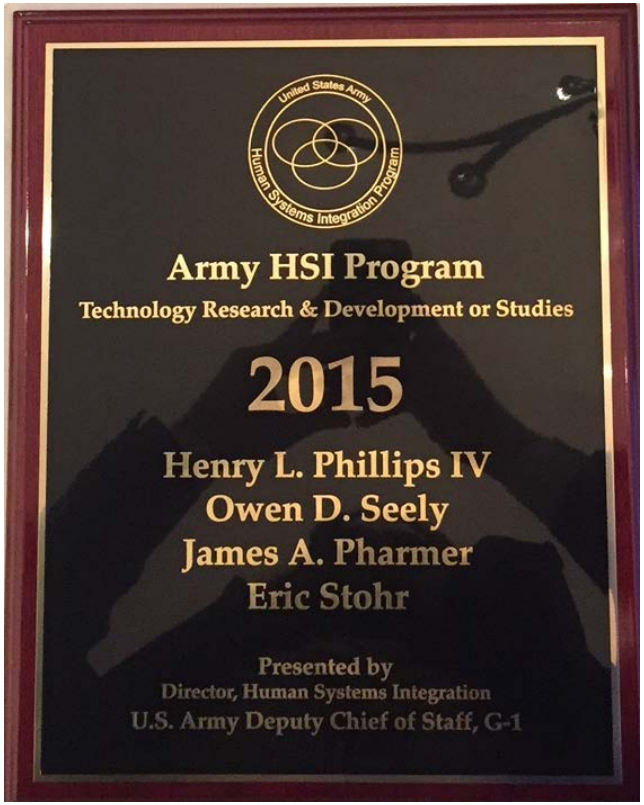

- Army HSI Practitioners' Award In Technology R&D or Studies
- Presented to HPRST Team on 2 Dec 15

- CDR Henry Phillips, NAWCTSD
- Owen Seely, NAVSEA DD
- Dr. Jim Pharmer, NAWCTSD
- Eric Stohr, BC&I