SHFE Risk Structure
Human Research Program
Space Human Factors Engineering

SHFE Mapping of IRP Rev B Risks to IRP Rev C Risks

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281-483-2318

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Organization of Presentation

- Overview of Rev B to Rev C Risk Restructuring, Gap Mapping
  - Includes Full Risk Titles
  - Includes recommended Short Risk Titles
- Detailed Gap Mapping of Gaps from Rev B (Old) to Rev C (New)
  - Clear identification of FROM/TO for each Gap
- Rationale for the Change
  - Cleaner Risk Statements, Less overlap among Risks
  - Alignment with DoD’s Human Factors Analysis Classification System (HFACS)
- Schedule for updating Evidence Reports
- Status/plans for RMAT vetting at HSRB
SHFE Rev B Risks

- Risk of Error Due to Inadequate Information (10 Gaps)
- Risk of Reduced Safety and Efficiency Due to an Inadequately Designed Vehicle, Environment, Tools, or Equipment (8 Gaps)
- Risk of Error Due to Poor Task Design (5 Gaps)

SHFE Rev C Risks

- SHFE-HAB
  Risk of an Incompatible Vehicle/Habitat Design (6 Gaps)
- SHFE-HARI
  Risk of Inadequate Design of Human and Automation/Robotic Integration (4 Gaps)
- SHFE-HCI
  Risk of Inadequate Human-Computer Interaction (7 Gaps)
- SHFE-TASK
  Risk of Poor Critical Task Design (3 Gaps)
- SHFE-TRAIN
  Risk of Performance Errors Due to Training Deficiencies (3 Gaps)
SHFE Rev B Risks

Risk of Error Due to Inadequate Information (11 Gaps)

Risk of Reduced Safety and Efficiency Due to an Inadequately Designed Vehicle, Environment, Tools, or Equipment (8 Gaps)

Risk of Error Due to Poor Task Design (5 Gaps)

SHFE Rev C Risks

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- SHFE-TRAIN
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<table>
<thead>
<tr>
<th>Risk</th>
<th>Rev B</th>
<th>Gap #</th>
<th>Map to New Fish</th>
<th>Proposed New Gap #</th>
<th>Rev B Gap Number and Statement</th>
<th>New Gap Number and Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate Information</td>
<td>HCI-5</td>
<td>HAB</td>
<td>SHFE-HAB-04</td>
<td>HAB-04-00-00-00</td>
<td>SHFE-HAB-04: What are the effects of the delays typical of different mission regimes on task performance and how do we mitigate those effects?</td>
<td>SHFE-HAB-04: What are the effects of the delays typical of different mission regimes on task performance and how do we mitigate those effects?</td>
</tr>
<tr>
<td>Inadequate Information</td>
<td>HCI-1</td>
<td>HCI</td>
<td>SHFE-HCI-01</td>
<td>HAB-01-00-00-00</td>
<td>SHFE-HCI-01: What are the effects of vibration and acceleration on crew task performance and how can those effects be mitigated?</td>
<td>SHFE-HCI-01: What are the effects of vibration and acceleration on crew task performance and how can those effects be mitigated?</td>
</tr>
<tr>
<td>Inadequate Information</td>
<td>HCI-3</td>
<td>HCI</td>
<td>SHFE-HCI-03</td>
<td>HAB-03-00-00-00</td>
<td>SHFE-HCI-03: Given the design constraints for cockpits and workstations, what HCI guidelines (e.g., display configuration, screen navigation) will enable the crew to perform tasks in a timely manner with minimal ergonomic problems, even when fatigued or deconditioned?</td>
<td>SHFE-HCI-03: Given the design constraints for cockpits and workstations, what HCI guidelines (e.g., display configuration, screen navigation) will enable the crew to perform tasks in a timely manner with minimal ergonomic problems, even when fatigued or deconditioned?</td>
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<td>Inadequate Information</td>
<td>HCI-4</td>
<td>HCI</td>
<td>SHFE-HCI-04</td>
<td>HAB-04-00-00-00</td>
<td>SHFE-HCI-04: What are recommended applications of multi-modal or other displays and controls based on new technologies, within nominal and off-nominal conditions of the spacecraft environment? (Display modality: What’s the best display for situations?)</td>
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<td>Inadequate Information</td>
<td>SHFE 3.1.2.2.a</td>
<td>HCI</td>
<td>SHFE-HCI-06</td>
<td>HAB-06-00-00-00</td>
<td>SHFE 3.1.2.2.a: How do we ensure that the displays and control designs and technology developed for the operational environments of the spacecraft will improve performance and reduce errors?</td>
<td>SHFE-HCI-06: How do we ensure that the displays and control designs and technology developed for the operational environments will improve performance and reduce errors?</td>
</tr>
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<td>Inadequate Information</td>
<td>SHFE 3.1.2.2.b</td>
<td>HCI</td>
<td>SHFE-HCI-07</td>
<td>HAB-07-00-00-00</td>
<td>SHFE 3.1.2.2.b (SMII): Can crewmember spatialmotor abilities be more accurately predicted and countermeasures and training techniques developed to mitigate spatial disorientation during spaceflight?</td>
<td>SHFE-HCI-07 (SMII): Can crewmember spatialmotor abilities be more accurately predicted and countermeasures and training techniques developed to mitigate spatial disorientation during spaceflight?</td>
</tr>
<tr>
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<td>3.1.2.a</td>
<td>TASK</td>
<td>SHFE-TASK-03</td>
<td>HAB-03-00-00-00</td>
<td>SHFE 3.1.2.a: How can a capability for semi-autonomous planning and dynamically replanning of crew schedules be developed?</td>
<td>SHFE-TASK-03: How can a capability for semi-autonomous planning and dynamically replanning of crew schedules be developed?</td>
</tr>
<tr>
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<td>SHFE 3.1.1.a</td>
<td>TRAIN</td>
<td>SHFE-TRAIN-01</td>
<td>HAB-01-00-00-00</td>
<td>SHFE 3.1.1.a: How can we develop objective training measures to determine operator proficiency during and after ground training?</td>
<td>SHFE-TRAIN-01: How can we develop objective training measures to determine operator proficiency during and after ground training?</td>
</tr>
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<td>SHFE 3.1.1.b</td>
<td>TRAIN</td>
<td>SHFE-TRAIN-02</td>
<td>HAB-02-00-00-00</td>
<td>SHFE 3.1.1.b: How do we develop training methods and tools for space medical application if time is minimal?</td>
<td>SHFE-TRAIN-02: How do we develop training methods and tools for space medical application if time is minimal?</td>
</tr>
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<td>SHFE 3.1.1.e</td>
<td>TRAIN</td>
<td>SHFE-TRAIN-03</td>
<td>HAB-03-00-00-00</td>
<td>SHFE 3.1.1.e: How can onboard training systems be designed to address just in time (JIT) recurrent training needs for nominal and off nominal scenarios?</td>
<td>SHFE-TRAIN-03: How can onboard training systems be designed to address just in time (JIT) recurrent training needs for nominal and off nominal scenarios?</td>
</tr>
<tr>
<td>Safety</td>
<td>PHYS-1</td>
<td>HAB</td>
<td>SHFE-HAB-01</td>
<td>HAB-01-00-00-00</td>
<td>PHYS-1: What validated acoustic model can predict the effect of structures, materials, and crew and equipment on the acoustic environment of a spacecraft or habitat?</td>
<td>SHFE-HAB-01: What validated acoustic model can predict the effect of structures, materials, and crew and equipment on the acoustic environment of a spacecraft or habitat?</td>
</tr>
<tr>
<td>Safety</td>
<td>PHYS-2</td>
<td>HAB</td>
<td>SHFE-HAB-02</td>
<td>HAB-02-00-00-00</td>
<td>PHYS-2: What tools can be used to evaluate habitability concepts for on-orbit and planetary missions?</td>
<td>SHFE-HAB-02: What tools can be used to evaluate habitability concepts for on-orbit and planetary missions?</td>
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<td>SHFE 2.1.8.1</td>
<td>HAB</td>
<td>SHFE-HAB-03</td>
<td>HAB-03-00-00-00</td>
<td>SHFE 2.1.8.1: How can we determine the effects of combined vibration and acceleration on task performance?</td>
<td>SHFE-HAB-03: How can we determine the effects of combined vibration and acceleration on task performance?</td>
</tr>
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<td>SHFE 2.3.b</td>
<td>HAB</td>
<td>SHFE-HAB-04</td>
<td>HAB-04-00-00-00</td>
<td>SHFE 2.3.b: How can existing models be modified to adequately represent the specified user population or general field of view, visibility in reduced gravity and be portable to other simulation environments?</td>
<td>SHFE-HAB-04: How can existing models be modified to adequately represent the specified user population or general field of view, visibility in reduced gravity and be portable to other simulation environments?</td>
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<td>SHFE 2.3.1.1</td>
<td>HAB</td>
<td>SHFE-HAB-05</td>
<td>HAB-05-00-00-00</td>
<td>SHFE 2.3.1.1: What is the effect of microgravity on spinal elongation?</td>
<td>SHFE-HAB-05: What is the effect of microgravity on spinal elongation?</td>
</tr>
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<td>Safety</td>
<td>SHFE 2.3.a</td>
<td>HAB</td>
<td>SHFE-HAB-06</td>
<td>HAB-06-00-00-00</td>
<td>SHFE 2.3.a: What can we easily document human factors related issues that occur on orbit?</td>
<td>SHFE-HAB-06: What can we easily document human factors related issues that occur on orbit?</td>
</tr>
<tr>
<td>Safety</td>
<td>FCBM-1</td>
<td>HCI</td>
<td>SHFE-HCI-02</td>
<td>HAB-02-00-00-00</td>
<td>FCBM-1: HAB Campaign Integrated Gap: What aspects of cognitive function change during long duration missions and are they related to neural structural changes?</td>
<td>SHFE-HCI-02: HAB Campaign Integrated Gap: What aspects of cognitive function change during long duration missions and are they related to neural structural changes?</td>
</tr>
<tr>
<td>Safety</td>
<td>HCI-2</td>
<td>TASK</td>
<td>SHFE-TASK-02</td>
<td>HAB-02-00-00-00</td>
<td>HCI-2: What model-based HF tools can assist with the design and evaluation of spacecraft systems and tasks procedures?</td>
<td>SHFE-TASK-02: What model-based HF tools can assist with the design and evaluation of spacecraft systems and tasks procedures?</td>
</tr>
<tr>
<td>Task Design</td>
<td>HR-1</td>
<td>HAB</td>
<td>SHFE-HAB-03</td>
<td>HAB-03-00-00-00</td>
<td>HR-1: What guidelines and tools can we develop to enable system designers and mission planners to conduct systematic task/needs analyses at the appropriate level of detail to allocate work among appropriate agents (human and automation)?</td>
<td>SHFE-HAB-03: What guidelines and tools can we develop to enable system designers and mission planners to conduct systematic task/needs analyses at the appropriate level of detail to allocate work among appropriate agents (human and automation)?</td>
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<td>HR-2: How can performance, efficiency, and safety guidelines be developed for effective information sharing between humans and automation, such that appropriate trust and situation awareness is maintained?</td>
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<td>SHFE 1.1.2.1.1</td>
<td>HAB</td>
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<td>SHFE 1.1.2.2.1: How can we develop standard measurement techniques and metrics for evaluating the quality of user interfaces with specific attention to the usability of an interface?</td>
<td>SHFE-HCI-05: How can we develop standard measurement techniques and metrics for evaluating the quality of user interfaces with specific attention to the usability of an interface?</td>
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<td>Task Design</td>
<td>UWS-1</td>
<td>TASK</td>
<td>SHFE-TASK-01</td>
<td>HAB-01-00-00-00</td>
<td>UWS-1: How can workload measures and tools be developed to unobtrusively monitor and trend workload throughout the mission design and verification cycle in a consistent manner</td>
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## New to Old Mapping

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<td>HAB</td>
<td>SHFE-HAB-03</td>
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<tr>
<td>Safety</td>
<td>SHFE-2.3.3b</td>
<td>HAB</td>
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<td>SHFE-2.3.3b: How can existing models be modified to adequately represent the specified population? (e.g., field of view, visibility) in reduced gravity and be portable to other simulations?</td>
<td>SHFE-HAB-04: How can existing models be modified to adequately represent the specified population? (e.g., field of view, visibility) in reduced gravity and be portable to other simulations?</td>
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<td>SHFE-2.3.3.1</td>
<td>HAB</td>
<td>SHFE-HAB-05</td>
<td>SHFE-2.3.3.1: Is the effect of microgravity on spinal elongation?</td>
<td>SHFE-HAB-05: Is the effect of microgravity on spinal elongation?</td>
</tr>
<tr>
<td>Safety</td>
<td>SHFE-2.3.3</td>
<td>HAB</td>
<td>SHFE-HAB-06</td>
<td>SHFE-2.3.3: (RIR): How can crew establish human factors related issues that occur on orbit?</td>
<td>SHFE-HAB-06: (RIR): How can crew establish human factors related issues that occur on orbit?</td>
</tr>
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<td>HR-1</td>
<td>HARI</td>
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<td>HR-1: What guidelines and tools can we develop to enable system designers and mission planners to conduct systematic task/needs analyses at the appropriate level of detail to allocate work among appropriate agents (human and automation)?</td>
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<td>HR-2</td>
<td>HARI</td>
<td>SHFE-HARI-02</td>
<td>HR-2: How can performance, efficiency, and safety guidelines be developed for effective information sharing between humans and automation, such that appropriate trust and situational awareness is maintained?</td>
<td>SHFE-HARI-02: How can performance, efficiency, and safety guidelines be developed for effective information sharing between humans and automation, such that appropriate trust and situational awareness is maintained?</td>
</tr>
<tr>
<td>Task Design</td>
<td>SHFE-1.1.2.1.1</td>
<td>HARI</td>
<td>SHFE-HARI-03</td>
<td>SHFE-1.1.2.1.1: How can performance, efficiency, and safety guidelines be developed for appropriate task automation and the effective allocation of tasks between humans and automation?</td>
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<td>HCI-5</td>
<td>HARI</td>
<td>SHFE-HARI-04</td>
<td>HCI-5: What are the effects of the delays typical of different mission regimes on teleoperations and how do we mitigate these effects?</td>
<td>SHFE-HARI-04: What are the effects of the delays typical of different mission regimes on teleoperations and how do we mitigate these effects?</td>
</tr>
<tr>
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<td>HCI-1</td>
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</tr>
<tr>
<td>Safety</td>
<td>PCBH-1</td>
<td>HAB</td>
<td>SHFE-PCHB-02</td>
<td>PCBH-1: BHP Campaign Integrated Gap: What aspects of cognitive function change during long duration missions and are they related to neural structural changes?</td>
<td>SHFE-PCHB-02: BHP Campaign Integrated Gap: What aspects of cognitive function change during long duration missions and are they related to neural structural changes?</td>
</tr>
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<td>HCI-3</td>
<td>HCI</td>
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<td>HCI-3: Given the design constraints for cockpits and workstations, what HCI guidelines (e.g., display configuration, screen navigation) will enable the crew to perform tasks in a timely manner with minimal ergonomic problems, even when fatigued or deconditioned?</td>
<td>SHFE-HCI-03: Given the design constraints for cockpits and workstations, what HCI guidelines (e.g., display configuration, screen navigation) will enable the crew to perform tasks in a timely manner with minimal ergonomic problems, even when fatigued or deconditioned?</td>
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<td>HCI-7</td>
<td>HAB</td>
<td>SHFE-HCI-04</td>
<td>HCI-7: What are the recommended applications of multi-modal or other displays and controls based on new technologies, within nominal and off-nominal conditions of the spacecraft environment? (display modality(s)) What's the best display for situational awareness?</td>
<td>SHFE-HCI-04: What are the recommended applications of multi-modal or other displays and controls based on new technologies, within nominal and off-nominal conditions of the spacecraft environment? What's the best display for situational awareness?</td>
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<td>SHFE-1.1.2.2.1</td>
<td>HCI</td>
<td>SHFE-HCI-05</td>
<td>SHFE-1.1.2.2.1: How can we develop standard measurement techniques and metrics for evaluating the quality of user interfaces with specific attention to the usability of an interface?</td>
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<td>SHFE-3.1.2.2a: How do we ensure that the displays and control designs and technology developed for the operational environments on the spacecraft will improve performance and reduce errors?</td>
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<td>Task Design</td>
<td>UWG-1</td>
<td>TASK</td>
<td>SHFE-TASK-02</td>
<td>UWG-1: How can workload measures and tools be developed to unobtrusively monitor and trend workload throughout the mission design and verification cycle in a consistent manner</td>
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<td>TASK</td>
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<td>Inadequate Information</td>
<td>SHFE-3.1.3.c</td>
<td>TRAN</td>
<td>SHFE-TRAIN-03</td>
<td>SHFE-3.1.3c: How can onboard training systems be designed to address Just in Time (JIT) and recurrent training needs for nominal and off nominal scenarios?</td>
<td>SHFE-TRAIN-03: How can onboard training systems be designed to address Just in Time (JIT) and recurrent training needs for nominal and off nominal scenarios?</td>
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DoD’s HFACS Based on Reason’s “Swiss Cheese Model of Human Error

Figure 1. The "Swiss Cheese" Model (adapted from Reason, 1990)
SHFE Research and HFACS

- The primary focus of SHFE research is on Preconditions
  - minimize the likelihood of these preconditions through relevant research
- We have the knowledge to control some preconditions; further research is not required
  - This knowledge is captured in the Human System Integration Requirements and the Space Flight Human Systems Standards, vol 2
  - We don’t know enough about other preconditions to ensure they won’t occur, especially for long duration
- Two SHFE topics, workload and training, are captured at the Organizational Influences level
DOD HFACS

Risk of injury or inefficiency due to human error

Organizational Influences
- Resource / Acquisition Mgmt
- Organizational Climate
- Organizational Process

Ops Tempo / Workload

Organizational Training Issues / Programs

Supervision
- Inadequate Supervision
- Planned Inappropriate Operations
- Failure to Correct Known Problem
- Supervisory Violation

Preconditions
- Environmental Factors (Phys & Tech)
- Condition of Individuals
- Personnel Factors

Acts
- Errors
- Violations

SHFE research risks fall here.
SHFE Research and HFACS (cont.)

• The two highest HFACS tiers (Organizational Influences and Supervision) are generally policy level or organizational level factors
  – These need to be addressed in order to implement a safety program or a risk reduction program
  – These are generally beyond the current scope of the SHFE Project (and HRP)

• Some categories are entirely within the domain of SHFE, while some categories are shared with other HRP Elements

• Some of the HFACS categories are primarily the province of other HRP Elements
  – Psycho-Behavioral Factors, Adverse Physiological States, Sensorimotor Adaptation, Self-Imposed Stress
Status of Evidence Reports and RMAT Vetting

- Draft Evidence Reports have been completed; Final versions scheduled for completion in May, to allow for Export Control processing prior to HRP’s NRA solicitation.
  - All new Risks entered in the RMAT system
  - CR presented to HSRB
    - RID resolution close to completion