Human Research Program
Long Duration, Exploration-Class Mission Training Design

Immanuel Barshi, Ph.D.
NASA/ARC HRP Training Risk Discipline Scientist
immanuel.barshi@nasa.gov

Donna L. Dempsey, Ph.D.
NASA/JSC HRP Training Risk Training SME
donna.l.dempsey@nasa.gov
TRAIN Risk Gaps Mapped to ADDIE Phases

TRAIN-06: We do not know how to allocate duties and tasks among crewmembers relative to trainability for autonomous operations for LDEM.

TRAIN-08: DESIGN PHASE: METHODOLOGY: We do not know which methods and tools make task and skill acquisition efficient and effective and maximize retention and transfer for LDEM.

TRAIN-07: DESIGN PHASE: FLOW AND MODULES: We do not know to distribute training content across the training continuum nor how to group or sequence content within each section of the training continuum for LDEM training.

TRAIN-05: We do not have an empirically valid foundation upon which to base the design of spaceflight training to adequately support long duration, exploration-class missions (LDEM).

TRAIN-09: EVALUATION PHASE: We do not know which validated objective measures of training effectiveness should be used for LDEM.

TRAIN-10: PERFORMANCE SUPPORT TOOLS: We do not have requirements for a performance support tools for LDEM relative to both trainability and autonomous job performance.

THE TRAINING CONTINUUM

Selection | Pre-Flight Initial | Pre-Flight Refresher | In-Flight Initial | In-Flight Refresher | In-Flight JIT | Perform. Support Tools | Post Flight
Train-05 – Foundations of Spaceflight Training: We do not have an empirically valid foundation upon which to base the design of spaceflight training to adequately support long duration, exploration-class missions (LDEM).

Train-06 – Analysis Phase: We do not know how to allocate duties and tasks among crew members relative to trainability for autonomous operations for LDEM.

Train-07 – Design Phase: Flow and Modules: We do not know how to distribute training content across the training continuum or how to group or sequence content within each section of the training continuum for LDEM training.

Train-08 – Design Phase: Methodology: We do not know which methods and tools make task and skill acquisition efficient and effective and maximize retention and transfer for LDEM.

Train-09 – Evaluation Phase: We do not know which validated objective measures of operator proficiency and of training effectiveness should be used for LDEM.

Train-10 – Performance Support Tools: We do not have requirements for a performance support tool for LDEM relative to both trainability and autonomous job performance.
Backup Slides
Human Research Program Elements

NASA's Human Research Program is responsible for the oversight and coordination of a wide range of ongoing studies, experiments, and projects. HRP research activities are divided among six elements: International Space Station Medical Project, Human Health and Countermeasures, Exploration Medical Capability, Behavioral Health and Performance, Space Human Factors and Habitability, and the Science Management Office.

Behavioral Health and Performance
The Behavioral Health and Performance (BHP) Element conducts and supports research to reduce the risk of behavioral and psychiatric conditions. These include performance decrements due to inadequate cooperation and communication within a team and the risk of errors due to fatigue resulting from sleep loss or work overload.

Exploration Medical Capability
The Exploration Medical Capabilities (ExMC) Element develops medical technologies for in-flight diagnosis and treatment as well as data systems to protect patients’ private medical data, aid in the diagnosis of medical conditions, and act as repositories of information about relevant NASA life science experiments.

Human Health Countermeasures
The Human Health Countermeasures (HHC) Element is responsible for understanding the normal physiologic effects of spaceflight and developing countermeasures to those with detrimental effects on human health and performance.

Space Human Factors and Habitability
The Space Human Factors and Habitability (SHFH) Element consists of three main research portfolios: Advanced Environmental Health (AEH), Advanced Food Technology (AFT), and Space Human Factors Engineering (SHFE) that includes human and robotic integration, human computer interactions, vehicle/habitat design, mission planning and task design, and training.

Space Radiation
The goal of the Space Radiation (SR) Element is to ensure that crewmembers can safely live and work in space without exceeding acceptable radiation health risks. Space radiation differs from radiation encountered on Earth.

International Space Station Medical Projects
The International Space Station Medical Projects (ISSMP) Element provides planning, integration, and implementation services for HRP research tasks. The objectives of the ISSMP are to maximize the utilization of the ISS for research to assess the effects of long-duration spaceflight on human systems, to develop and verify strategies to ensure optimal crew performance, and to enable development and validation of an integrated suite of physical, pharmacologic, and nutritional countermeasures to protect the health and performance of crewmembers.

Source: [http://www.nasa.gov/hrp/elements](http://www.nasa.gov/hrp/elements)

ITCB July 2016, Montreal, Canada
BHP Team Skills Training

ASCAN Training

- Some specific BHP and team skills training
- Analogs - NOLS, team events, etc.
- Team skills becoming more prominent with each ASCAN class
  - SFRM
  - Expeditionary Skills

Pre-Assignment Training

- Refresher Training
- Analogs - NOLS, team events, etc.

Assigned Training

- BHP / Team Skills
  - Psychological support
  - Psychological preparedness
- Analogs - NOLS, team events, etc.
  - *Exploration mission focus of BHP Element emphasizes team skills training with the intact exploration mission crew*

BHP Team Gap5 (Training) supports development and maintenance of team skills with validated training throughout an astronaut’s career.

Team skills training complements technical/task training, and follows best practices developed by SHFH TRAIN Risk.
Comparison of Opposition class and conjunction class mission profiles.

Reference: Human Exploration of Mars Design Reference Architecture 5.0, Drake ed.