

HRP Risk Approach Plans

*For the Human Factors
and Behavioral Control Element*

June 2026

Index of Legend Symbols

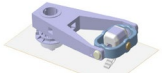


M2M Deliverable



Lunar Deliverable

For Data Field



For Legend



Animal Models



Artemis



Atmospheric Chamber



Bedrest



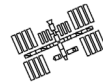
Centrifuge



CLDP



For Data Field



For Legend



Commercial Freeflyers/PAM



Drop tower/sled



Isolation



ISS



Neutral Buoyancy Lab



Parabolic Flight

Organization Graphic Identifiers



Extravehicular Activity and Human Surface Mobility



Commercial Crew



Human Landing Systems



Flight Operations



Office of the Chief Health and Medical Officer



Mars Campaign Office



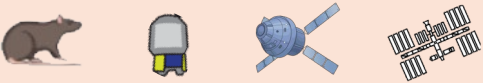
Health and Medical Technical Authority

Behavioral Health (BH) and Performance Risk Approach Plan

HRR Knowledge Gap

Risk Characterization / Formulation

BH-109: Characterize in-mission and **long-term effects** of long-duration spaceflight on behavioral health and performance.



- 1** Impacts of exploration spaceflight on in-mission and long-term behavioral health and performance: BHP Ops by 2031 (interim), 2034

CM Development / Evaluation

BH-201: Identify **indicators, measures, and thresholds**, to inform semi-autonomous behavioral health and performance monitoring

- 2** Recommendations to inform crew selection for Mars: BHP Ops by 2027 (interim), 2034
- 3** Recommendations for semi-autonomous monitoring system, integrating relevant measures and evidence/threshold-based guidelines for countermeasures: BHP Ops by 2031 (interim), 2034

BH-202: Identify evidence-based **design recommendations** for habitat/vehicle interfaces, to mitigate impacts to behavioral health and performance

- 4** Recommendations to inform habitat/sub-system design: HMTA by 2027 (interim), 2034

BH-203: Develop, test/refine, and validate **countermeasures** to support behavioral health and performance for future exploration missions

- 5** Behavioral health training curriculum/modules: BHP Ops by 2031
- 6** Countermeasures for in-mission social support: BHP Ops by 2031
- 7** Family and crew social support toolbox to enable post-mission re integration: BHP Ops by 2031
- 8** Validated countermeasures to support behavioral health & performance: BHP Ops by 2034

BH-204: Identify, test and refine **therapeutic interventions** for treating adverse behavioral outcomes associated with exploration missions

- 9** Therapeutic interventions to treat adverse health outcomes: BHP Ops by 2031 (interim), 2034

LEGEND: Isolation ISS Artemis Animal Models M2M Deliverable

TIMELINE:

2a 4a

2025



2027

Risk Maps to ESDMD-0404

1a 3a 5 6 7 9a

2031



1b 2b 3b 4b 8 9b

2034



2035

Earth Independent Human-System Operations (EIHSO) Risk Approach Plan

HRR Knowledge Gap

Risk Characterization / Formulation

EIHSO – 102: Characterize human-system performance **impacts due to increasingly Earth-independent missions** (e.g. communication delays) and determine indicators of meaningful change to enable mission objectives

- 1 **Impacts of increasingly earth-independent mission operations on human-system performance: FOD, MCO by 2027 (interim); update 2034**



CM Development / Evaluation

EIHSO – 202: Develop and validate **monitoring countermeasures** of human-system performance (procedure execution, anomaly resolution) during increasingly Earth-independent operations (e.g. communication delays)

- 2 **Recommendations for semi-autonomous monitoring dashboard: BHP Ops, FOD by 2031 (interim), 2034**



EIHSO – 203: Develop & validate candidate **requirements for design** of vehicles, habitats, interfaces (e.g. displays for complex info presentation, fine motor decrements) to support increasingly Earth-independent operations

- 3 **Recommendations to inform habitat/sub-system design: HMTA by 2027 (interim), 2034**
- 4 **Guidelines, multi-modal methods to mitigate touch screen manipulation decrements: HLS by 2027 (interim), 2031**



EIHSO – 204: Develop and validate **countermeasures** to enable human-system performance (**procedure execution, decision support**) for increasingly earth independent crews

- 5 **Task simulation tools for anomaly resolution and decision support under communication delays: FOD by 2031**
- 6 **Procedure execution guidance & requirements under communication delays: MCO, FOD by 2027 (interim), 2031**
- 7 **Recommendations: personalized, adaptive training regimens/platforms: BHP Ops, FOD by 2031 (interim), 2034**



EIHSO – 205: Develop and validate **countermeasures** to enable **safe human-robot interaction**

- 8 **Safe human robot interaction guidelines and countermeasures: FOD by 2031 (interim); 2034**



LEGEND: Isolation ISS Artemis Commercial Freeflyers/PAM M2M Deliverable

TIMELINE:

1a 3a 4a 6a

2025



Risk Maps to ESDMD–1002 through 1005

2a 4b 5 6b 7a 8a

2030



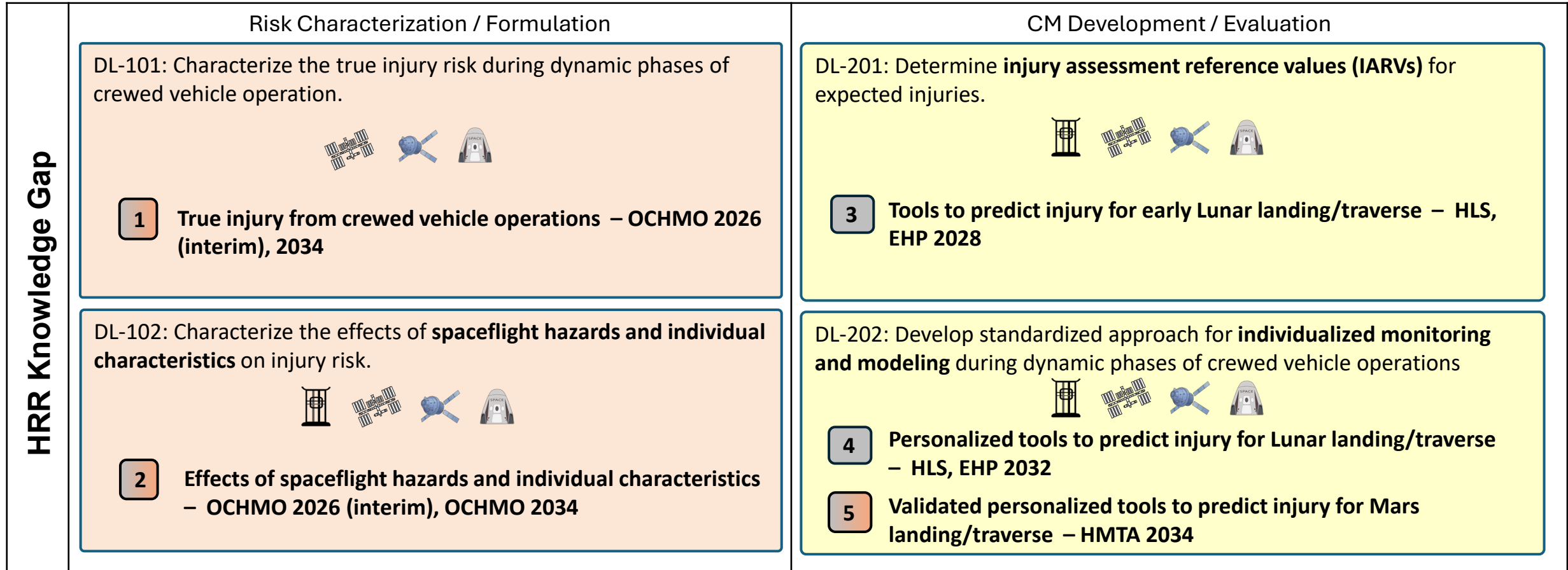
1b 2b 3b 7b 8b

2034



2035

Injury Due to Dynamic Loads (DL) Risk Approach Plan



LEGEND:  ISS  Commercial Freeflyers/PAM  Artemis  Drop tower/sled  Lunar Deliverable  M2M Deliverable



Team Cohesion and Performance (Team) Risk Approach Plan

HRR Knowledge Gap	Risk Characterization / Formulation	CM Development / Evaluation
	Team-101: Characterize the key threats, indicators, and evolution of the multi-team system under shifting autonomy, for exploration missions 1 Impacts of exploration mission characteristics on multi-team system performance: FOD, BHP Ops 2027 (interim); update 2034 	Team-201: Define indicators, measures, and thresholds, to inform semi-autonomous monitoring of team functioning and performance 2 Interim recommendations to inform crew composition for Mars: BHP Ops by 2027 (interim), 2034  3 Recommendations for semi-autonomous monitoring system, integrating relevant measures and evidence/threshold-based guidelines for countermeasures: BHP Ops by 2031 (interim), 2034   Team-202: Inform design recommendations for habitat/vehicle interfaces, to mitigate impacts to team functioning and performance 4 Recommendations to inform habitat/sub-system design: HMTA by 2027 (interim), 2034    Team-203: Develop, test/refine, and validate countermeasures to support team functioning and performance during exploration missions 5 Countermeasures for maintaining team functioning & performance: BHP Ops by 2031  6 Countermeasures for within-crew social support: BHP Ops by 2031  Team-204: Identify, test, and refine monitoring approaches and countermeasures to address the multi-team system, for exploration missions 7 Measures & Countermeasures for multi-team system: BHP Ops/FOD by 2031  8 Validated measures and CMs for multi-team system for Mars: BHP Ops by 2034   

LEGEND:  Isolation  ISS  Artemis  Commercial Freeflyers/PAM  M2M Deliverable

