Implementation of Human System Integration Workshop at NASA for Human Spaceflight IAC-19,D1,4B,3,x51158

Jackelynne Silva-Martinez, Nicole Schoenstein, George Salazar, Tiffany Swarmer, Herbert Silva, Natalia Russi-Vigoya, Alicia Baturoni-Cortez, John Love, Doug Wong, and Rachel Walker

NASA Johnson Space Center
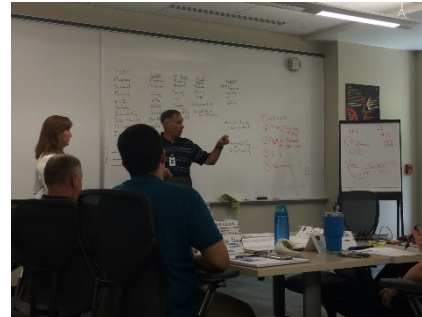Human Systems Integration Employee Resource Group

Outline

- **What is Human Systems Integration (HSI)?**
  - NASA HSI Domains/Interaction
- **JSC HSI Employee Resource Group (ERG)**
- **HSI Workshop**
  - Planning
  - Goals
  - Program structure
  - Working groups
- **Results**
- **Conclusion and future plans**
- **Acknowledgments**
- **References**

About HSI ERG

- Promotes education and awareness of HSI in support of Inclusion and Innovation at JSC
- Supports recruitment, onboarding, and outreach activities of HSI employees in support of NASA's mission
- Promotes cross-directorate interaction in support of establishing an HSI vision, methodology, and implementation plan

- HSI is defined as the interdisciplinary **technical and management processes** for integrating human considerations within and across all system elements to enhance human system design, **reduce life-cycle ownership cost**, and optimize total system performance
  - Human treated equally with H/W and S/W
  - Designing systems with human capabilities and limitations in mind
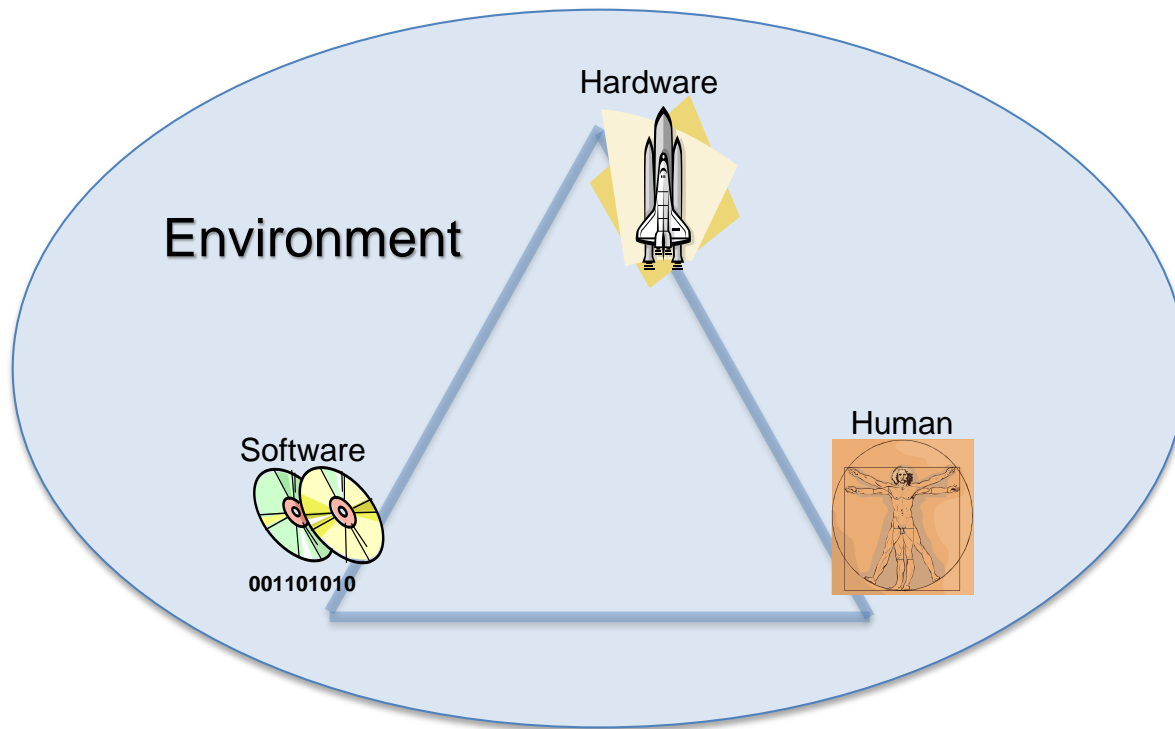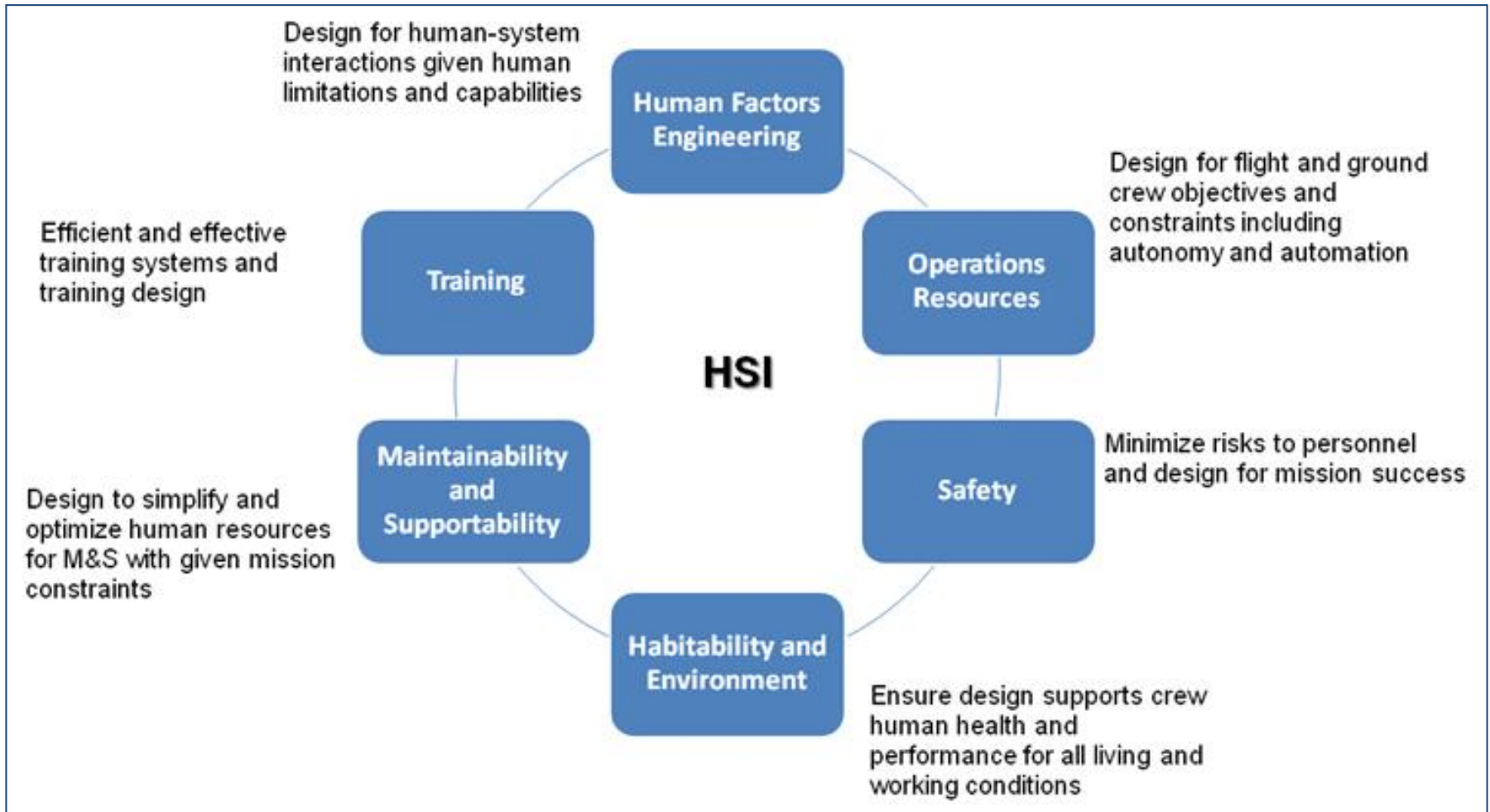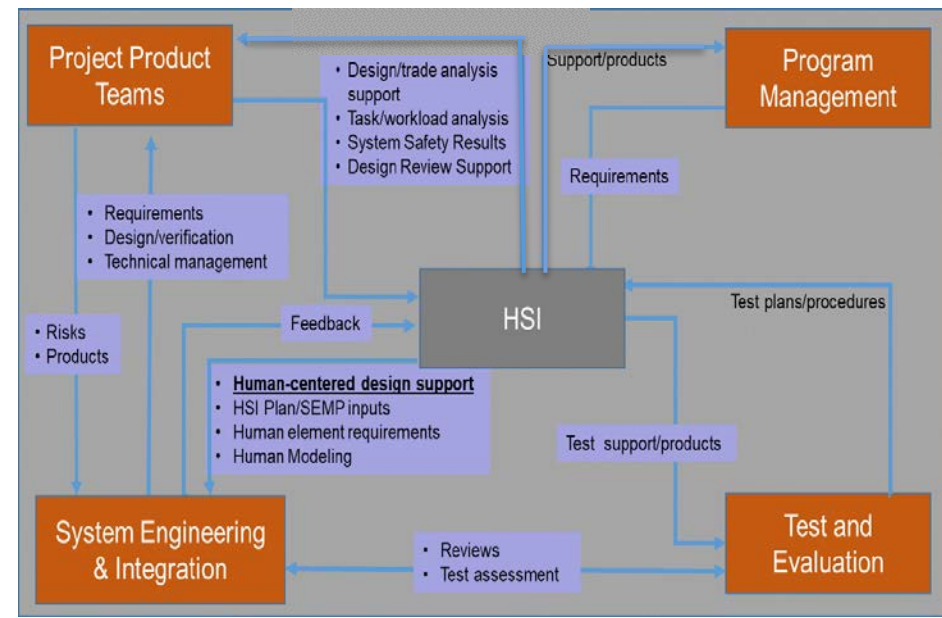
NASA/SP-2015-3709 Human Systems Integration (HSI) Practitioner's Guide
NASA Systems Engineering Handbook NASA/SP-2016-6105
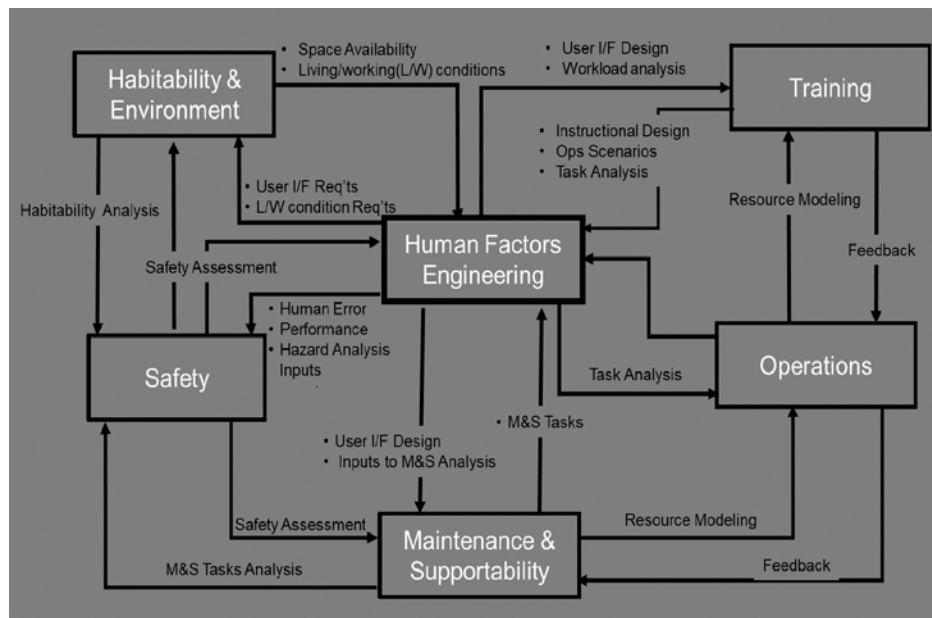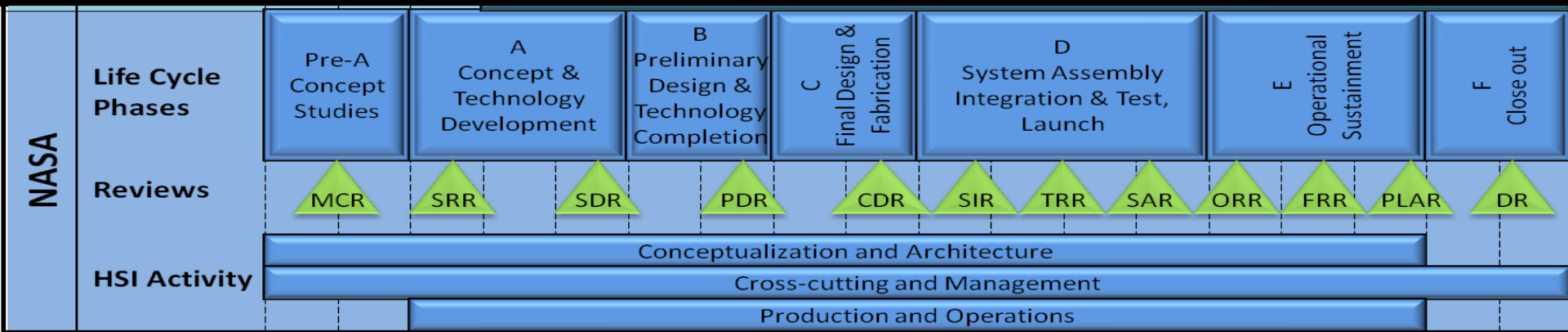
Notional HSI Domain Interaction

Notional HSI with Other Interfaces Interaction

Early Planning

- Ensure that the planning committees have access to all planning documents (logistics tracker, SharePoint)
- Weekly meetings with planning team
- Contact SMEs to serve as presenters, facilitators, and moderators

Procurement & Advertisement

- Earlier is always better!
- Top-down and bottom-up
- Contact multimedia, training photo/video support
- Anticipate future needs (giveaways, big posters, etc.
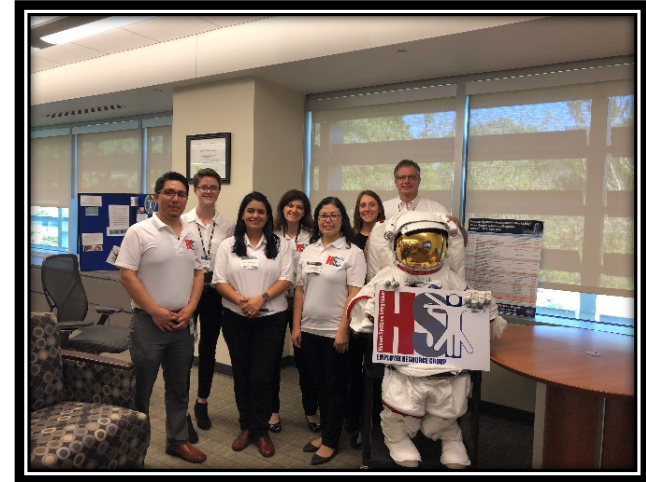
Closer to the Event

- Allocate specific time for all the last-minute details
  - Printing agendas, put together handouts, etc.

Goals

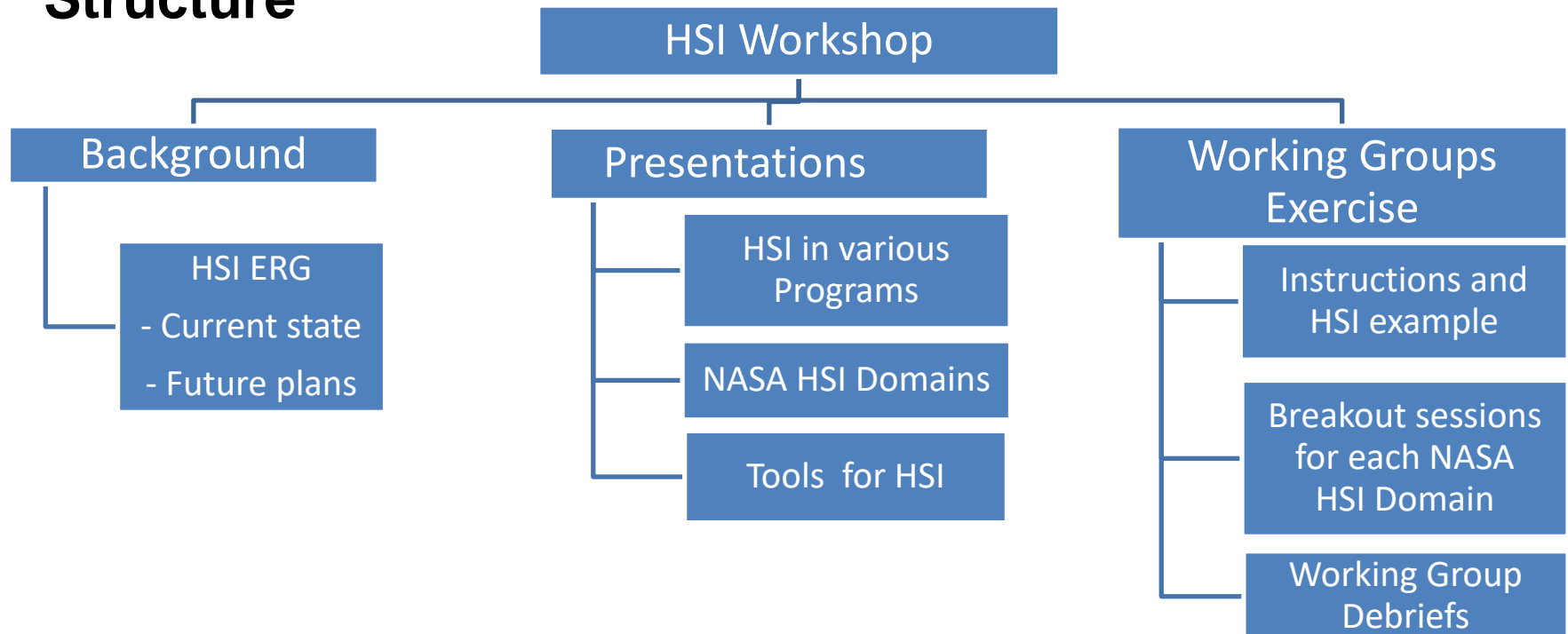- Address current status and forward plan of HSI implementation in NASA JSC's directorates at different phases of mission/project's lifecycle
- Use Gateway Program as case study to allow participants to go through the HSI Domains implementation for verification and validation methodologies
- Promote HSI ERG and provide information about HSI benefits to both the novice and expert

Structure

HSI Workshop

Background
- HSI ERG
  - Current state
  - Future plans

Presentations
- HSI in various Programs
- NASA HSI Domains
- Tools for HSI

Working Groups Exercise
- Instructions and HSI example
- Breakout sessions for each NASA HSI Domain
- Working Group Debriefs

- **State of HSI at NASA**
- **Origins of the HSI ERG**
- **HSI in Flight Operations Division**
- **Gateway Vehicle Integration and Test**
- **HSI in Aircraft Operations**
- **xEMU Suit and HSI**
- **HSI in Orion**
- **HSI on Gateway**
- **Crew Autonomous Scheduling Test on ISS**
- **Human Reliability Analysis for Gateway**
- **Significant Incidents in Human Space Flight**
- **HSI Practitioner's Guide**

1 Working Group per NASA HSI domain

Preparation

- Development of Working Groups
- Facilitator Training
- Preparation Exercise

Structure

- Requirements Brainstorm (20 min)
- Down Selection of requirements (10 min)
- Verification and Validation Discussion (20 min)
- Finalize Verification and Validation Inputs (10 min)
- Presentation Development (10 min)

Resources

- Trained Facilitators
- Presentation Template
- Gateway Assumptions
- Space and supplies to support group discussion

Exercise in HSI requirements development and verification/validation

Overall perception of the workshop

- – How likely are you to tell a friend about this event?
- – Are you likely to participate in one of our events in the future?

Likes and dislikes

- – Liked speakers and presentations
- – Disliked lack of preparation for writing requirements
- – Disliked lack of understanding HSI in their daily activities

+48.38

| < 30 poor | 30+ good | 50+ Great |
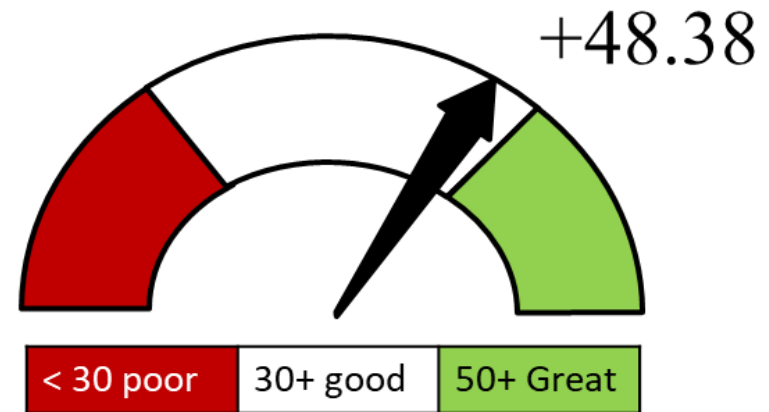
NPS Score: Promoters (51.61%) – Detractors (3.23%) = 48.38

Conclusion

- First NASA HSI Workshop was a success
- Provided opportunities to expand the knowledge of HSI Domains and their implementation within NASA missions
- Disseminated HSI information to both the expert and novice

Future Plans

- Disseminate recorded videos from workshop through the NASA Engineering and Safety Center Academy
- Development of online HSI course for JSC showcasing significant incidents and close calls in human spaceflight
- Continue offering events with professional development purpose within the Center
- Efforts of ERG have supported the development of a HSI Community of Practice at the Agency level and HSI will be institutionalized, ERG will support the transition

References
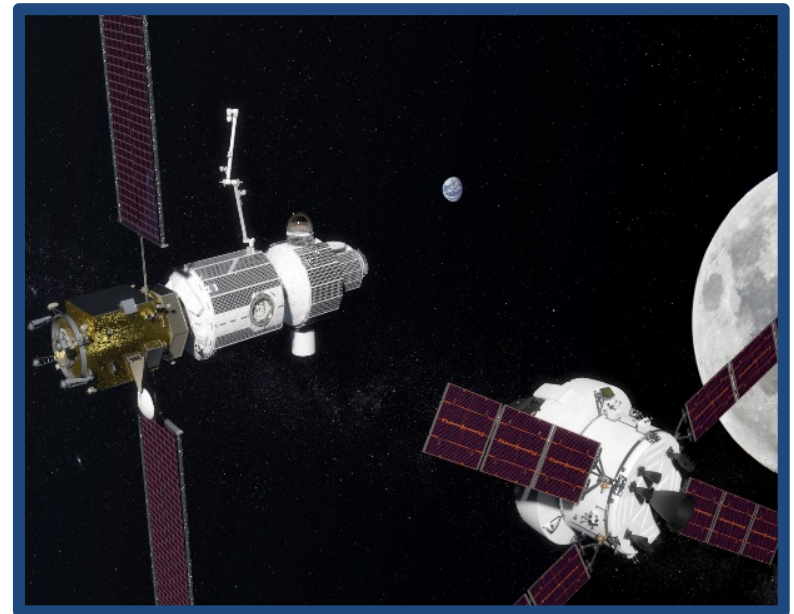
[1]   NASA/SP–2015-3709 (2015). Human System Integration Practitioner's Guide.

[2]   International Council on Systems Engineering (2016). Human Systems Integration Working Group.

[3]   Silva-Martinez, J. (2016). Human Systems Integration: Process to Help Minimize Human Errors, a Systems Engineering Perspective for Human Space Exploration Missions. Journal REACH - Reviews in Human Space Exploration, Volume 2, 8-23. Published by Elsevier.

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Questions

Acknowledgements

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