Human Reliability Assessments: Using the Past to Predict the Future

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THE PAST – SHUTTLE PROGRAM (1981-2011)

NASA has experience with manned spaceflight since its' first manned mission in 1961.

Unique position of having over 50 years of experience with getting humans to space and exploring, providing analysts with a proven track record of:

- Developed training programs (crew, console, operations and ground support)
- Implementation of consistent process and program reviews and technical assessments
- Developed assessment criteria and methods to analyze and assess capabilities and safety
- Process to provide information and support before, during and after a Mission

Shuttle HRA Program

- HRA Program Development
  - Shuttle had years of flight experience and detailed information available
  - Screening Methodology
  - Detailed Methodology
- Why This Worked for Shuttle

The Present: ORION Vehicle (2016)

- Current Situation – Preliminary Design Phase
- Using NASA Program and Organizational Experience
- Performing the Assessment
  - Screening
  - Detailed

Past versus Present

Differences	Screening	Detailed
Past (Shuttle)	Time, Environment & Stress Conditions Known	Design, Cabin Layouts, Processes & Procedures Available and Verified with Years of Experience
Present (Orion)	• Analyses, Preliminary Designs & Model Simulations Available for Current Program. • Generic History & Experience to Draw From.	• Analyses, Preliminary Designs & Model Simulations Available for Current Program. • Generic History & Experience to Draw From.

The Future – Challenges and Solutions

Problem	Why This a Problem	Solution	Acceptability
Available Information	Concept and requirement documents allow multiple paths for success and limits available specifics.	Using past experience	For the areas identified, it is unlikely that NAS operations will change what years of development and experience have shown as effective.
Identify potential failure significant HE	Multiple ways to cause failure based on many different permutations of events (too many "what ifs").	Using past experience identify single action that would cause failure.	At this point in program the Risk values are high level estimates, so using the human action that must occur for success or failure provides a reasonable estimate.
Manpower/ Resources	Always limited.	Screening vs. detailed	Concentrating on high risk contributors is more effective use.
Assumptions	• Consistency between programs • Reasonableness • Most probable development of events	Using past experience	Provides basis for rationale and results
How conservative	Major risk contributors need to be defensible to ensure resources versus reward	Screening vs. detailed	Each method is conservative
Using the Results	Interpretation.	Integrate into program reviews.	Inform management and reviewers of potential risk concerns.

Summary

- A human reliability assessments performed early in a program is a starting point
- Assumptions and surrogate data can only be proven correct or appropriate as assumptions become reality
- Any changes or modifications in design, process or procedure can affect results
- Rationales based on NASA's unique history and experience may not be applicable to other industries