



Multi-Purpose Crew Restraints for Long Duration Space Flights



M. Whitmore, Ph.D., J. Connolly, M. Arch. and S. Ramsey

Usability Testing and Analysis Facility

Habitability Design Center

Habitability & Human Factors Office

Other Key Personnel

Rosie Ortiz

Garrett Finney

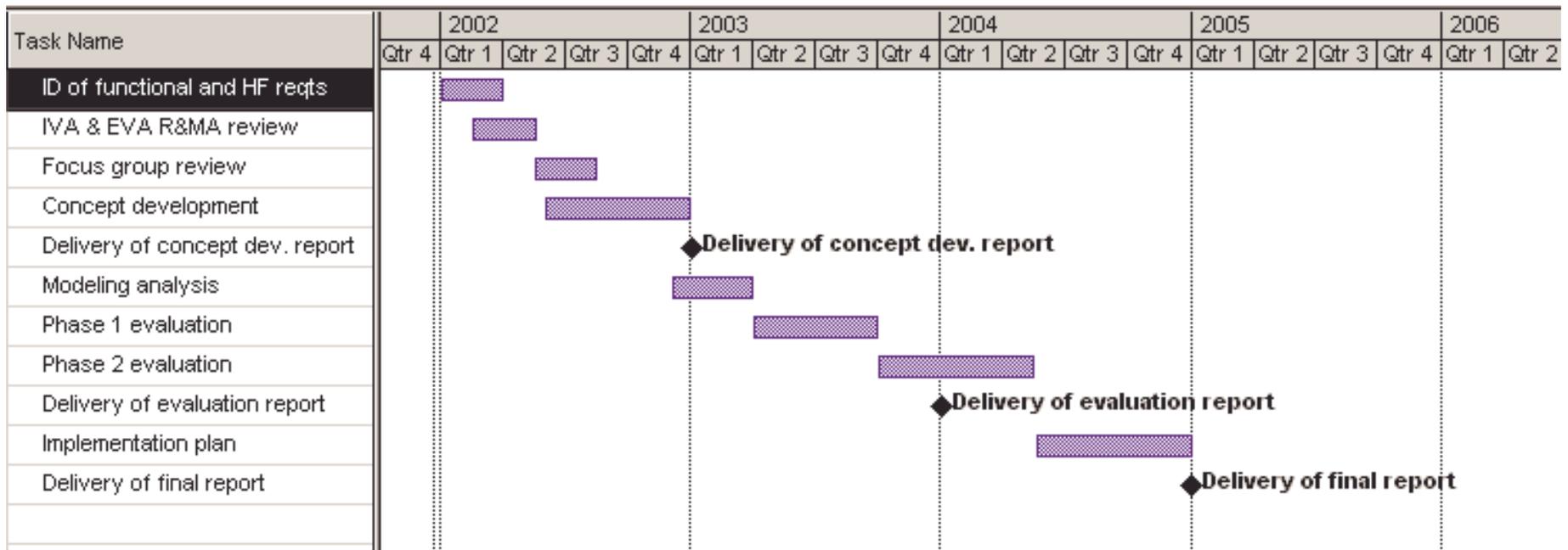
Michele Segal



National Aeronautics and Space Administration
Johnson Space Center



Project Schedule





Project Progress



Identification of Functional & Human Factor Requirements

- **On Track**
- Reviewed the SSP 41171 Rev B Preparation of Program-Unique Specifications and the Program Requirements Document for Johnson Space Center Non-Critical Government Furnished Equipment to help in the format of requirements.
- Reviewed Cupola Restraint Design Specifications.
- Developed a preliminary draft of specifications for concept crew restraints.
- **Next Step:** Planned to have external review by Crew, HEIT, Engineering, and Training.





Project Progress



IVA & EVA Restraint and Mobility Aid Review

- **On Track**
- Identifying an extensive list of IVA and EVA R&MA
 - Content (Description of equipment, equipment features, picture reference)
- Operational Habitability Evaluation: Restraint & Mobility Aids in Space Flight
 - Data from Skylab, Mir Phase I, Shuttle and ISS were reviewed.
 - Debrief data collection of restraints from the Increment 3 crew
- **Next Step:** Investigate the potential of an In-Flight evaluation of current restraint systems.





Project Progress



Focus Group Review

- **On Track**
- Developed Focus Group Discussion Questions
 - Developed to identify “unique” tasks and areas of need
 - Determine characteristics of “ideal” restraints
 - Solicit ideas for R&MA Concepts
- First Round of Focus Group Meetings
 - Four sessions held on Dec 13-14th
 - Representatives: Training, Engineering, Human Factors, and Payloads, Systems Integration
 - Summarized Preliminary Findings
- **Next Step:** Second Round of Focus Group Meeting that will include Crew Office, Scientists, and Analog Environment Representatives.





Project Progress



Concept Development

- **On Track**
- Presented preliminary concept schematics and models during First Round Focus Group Meetings.
- HDC had developed three restraint 'objects' to draw and model for an upcoming crew review. Easy Location Kit [ELK]:
 - 'Portable Floor' - a foot restraint that the crew can flip down with their foot or hand for use in front of a rack.
 - 'Tripod / Bipod' - a structural support to hold a body restraint in any location within the ISS corridors.
 - 'Body Restraint' - to attach to crew for long duration or fine motor tasks.
- Currently, the restraint 'objects' are being drawn up and physically modeled, some at full scale and others at a partial scale.
- **Next Step:** Present schematics at Second Round of Focus Group Meetings and complete preliminary HF evaluation of schematics.

