Advanced Exploration Systems (AES)

Artemis Graphical User Interface (GUI) Standard
(Proposal for Discussion)

Chad Thrasher / MSFC / HP10

Interoperability Lead / Systems Integration & Analysis (SIA)

AES SE&I

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Presentation Outline

- The problem
- Terms and reference documents
- Recent history with updated GUI standards
- Proposed course of action with rationale
- Discussion Points
- Final Thoughts

The Problem

Artemis crews must interact with multiple systems to successfully perform the mission. As additional programs deliver assets to the lunar surface and orbit, if the display and control interfaces are inconsistent, crews will require increased training time, more time to perform tasks, and an increase in the likelihood of operational errors.

What can be done to reduce training time, reduce errors, and make crew interactions with multiple systems more intuitive?

Develop and levy an Artemis GUI Standard.

3

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Terms and Reference Documents

- MPCV 72242 Orion Multi-Purpose Crew Vehicle Program Display Format Standards
- Orion Multi-Purpose Crew Vehicle Program Display Framework User Guide (Flight Software-RPL-2003, reference document)
- GP 10056 Gateway Program Graphical User Interface Standard (Baseline, July 2, 2020)
- Gateway Vehicle Insight and Control (VIC) GUI As-Built Display Framework (January 12, 2022, reference document)
- Artemis Icon & Symbol Library (draft, has not gone out on review)

- HLS-STD-0XX, HLS Graphical User Interface Standard (in CR)

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Recent History with GUI Standards

- How was the Orion GUI standard developed?
  - Groups Involved: Human Factors, Rapid Prototyping Lab, and Cockpit Working Group community
  - Included industry best practices and NASA specifics based upon past vehicles
  - Some specifics based upon Orion hardware
  - First version – too detailed, too many requirements
  - Second version – not detailed enough, too much open to interpretation by the prime contractor
  - Eventually, a middle ground was found
  - Final displays were captured in "as-built" documentation for verification

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Recent History with GUI Standards (continued)

- Gateway GUI standard started with the Orion GUI standard
  - Deleted Orion hardware specific limitations
  - Deleted information related to dynamic flight requirements
  - Added additional functionality due to laptop capabilities vs. avionics display hardware
  - Gateway program directed that the document be flexible and allow innovation
  - Similar groups involved in the standard development

- HLS GUI standard started with Gateway GUI standard
  - Intent is to allow the same level of innovation/flexibility as Gateway
  - Involved similar groups as the Orion and Gateway standard development effort
  - (Details deleted due to pending procurements)

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Suggestions with Rationale

Develop an Artemis GUI Standard as a Type II document with a living database for the Artemis Icon & Symbol Library.

- Document should not conflict or impact Gateway, HLS and Orion programs – current designs and GUI Standards are grandfathered.

- New AES Programs use as much as applicable to their system but have the flexibility to modify/add based on system functionality and requirements.

- Crew interaction with all systems is reasonably similar
  - Reduces risk (reduces training time, response time, operational errors)
  - Promotes consistency in displays and operations
  - Helps future Artemis programs
  - May support the consolidation of various program documents

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Discussion Points

- How would academia react to an Artemis GUI standard? Is it desired/wanted or not?

- How do we achieve the right balance between functional interoperability and allowing innovation?

- We do want non-proprietary hardware interfaces. We do not want a proprietary interface that limits the design and/or limits everyone to using a single supplier. How does one engineer an open architecture?

- What Artemis standards are needed now and in the near future?

- What is the best means of collecting inputs from non-NASA future Artemis campaign participants to assist in development and adoption of standards.

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Final Thoughts

- Best case results – consistency for the crew operators
- Owned by ACD, Artemis campaign – not the programs
- The standard keeps everyone in sync, would like to be consistent but history teaches us to not rely on people or programs but rather controlling processes.
- Improve the safety of the crew, reduces training for multiple systems
- Future programs – we don't know what everything will look like in the future