

INTERFACE CONSISTENCY PHASE I: CHARACTERIZATION AND MEASUREMENT

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Future exploration missions will rely on the design and development of vehicles and complex systems from within NASA and through multiple external commercial partners to meet mission goals. Even with existing consistency-related agency requirements, NASA's current approach to commercial spaceflight development is to allow providers flexibility and opportunities to innovate. This approach is resulting in significant design diversity across Artemis vehicles. Design best practices and guidelines champion interface consistency to facilitate mental model development and knowledge transfer. However, research investigating consistency-related benefits is mixed and little is known about consistency in complex systems. Determining the level of risk that system diversity presents is difficult, as there is no established method for quantifying the degree of consistency within and across interfaces, nor is there information about the differential impacts of different types of inconsistency.

Phase I of this project serves as a starting point to better understand the construct of consistency, its application, and the range of studies and methods used to measure it. This includes gaining awareness of the agency's current practices to assess consistency and examples of consistency-related challenges faced within the agency. This information provided the groundwork to create the taxonomy used to develop a suite of proposed methods for assessing intersystem consistency. Checklist and cognitive walkthrough methods were developed for use by human factors (HF) and human-computer interaction (HCI) experts. The Intersystem Consistency Scale (ICS) was developed for interface evaluations with crew.

The project team will present results from a pilot study with a prototype exhibiting aesthetics and interaction styles representative of interfaces that may be used by Artemis crews. The level of consistency (e.g., high, low) will be manipulated between the prototype interfaces. HF/HCI experts will evaluate the prototype and provide output using the checklist and the cognitive walkthrough methods. Participants from the Johnson Space Center Human Test Subjects pool will perform tasks with the prototype using the think-aloud protocol and will provide consistency ratings on the ICS. Consistency scores for this group will be compared to human performance data. This limited pilot study will allow the project team to assess performance of the consistency methods and establish a protocol to be extended toward the second project phase that would include a more comprehensive risk assessment research study intended to identify the types of inconsistency that pose the greatest risk to performance.