The long-term goal for this subtopic is to enable planning, designing, training, and carrying out human space missions of up to 5 years with crew independence, without re-supply and without real-time communications to Earth. Specifically, this subtopic’s focus is the development of innovations in crew equipment; and the development of technologies for assessment, modeling, and enhancement of human performance; and the development of design tools for engineers to incorporate human factors engineering requirements into hardware and software. Proposals are solicited that seek to develop technologies that address these specific needs:

- Monitoring and maintaining human performance non-intrusively. Specifically, minimally invasive and unobtrusive devices and techniques to monitor the behavior and performance (physical, cognitive, perceptual, etc.) of individuals and teams during long-duration space flights or analog missions. Embedded measures to detect significant changes in crew readiness to perform physical or cognitive tasks;

- Predicting human performance: methods and models for predicting effects on physical performance of encumbrances of clothing, space suits, etc. Models for predicting effects of physical environment (e.g., lighting, noise, temperature, contaminants) on human performance. Models to simulate and optimize interactions between humans and equipment/vehicle. Capability to implement time-delay algorithm and functionality into simulation for higher fidelity and effectiveness. Models for predicting effects of cognitive changes on performance;

- Tools to aid in design and evaluation of human-system interfaces for speed, accuracy, and acceptability in a cost-effective and reliable manner: automated analysis of computer-user interfaces for complex display systems to conduct objective review of displays and controls, and to determine compliance with guidelines and standards. Quantitative measures of the effectiveness of user interfaces to be used for task-sensitive evaluations;

- Tools that facilitate the user interface design for human computer interfaces, and for facilitators such as procedures, labels, and instructions. Tools should assist the designer in incorporating contextual information such as the user's task, the user's knowledge, and the system limitations; and

- Tools to build just-in-time system and operational information software to aid human users conducting routine and emergency operations and activities. Such tools might include effective and efficient job aids (e.g., “intelligent” manuals, checklists, and warnings) and support for designing flexible interfaces between users and large information systems. Methods for development of “facilitators” (procedures, labels, etc.)
adapted for the development of space vehicle and payload applications.