The objective of this subtopic is to create human-robot interfaces that improve the human exploration of space. Robots can perform tasks to assist and off-load work from astronauts. Robots may perform this work before, in support of, or after humans. Ground controllers and astronauts will remotely operate robots using a range of control modes, over multiple distances (shared-space, line-of-sight, in orbit, and interplanetary), and with a range of time-delay and communications bandwidth.

This subtopic seeks to develop new technologies that enable crew and ground controllers to better operate, monitor and supervise semi-autonomous robots. Of particular interest is software that improves robot operator productivity, situational awareness, and effectiveness.

Proposals are sought that address the following technology needs:

- **Crew telerobotic interfaces.** User interfaces that enable crew to remotely operate and monitor robots from inside a flight vehicle, habitat and/or during an extra-vehicular activity (EVA). User interfaces must be appropriate and relevant for use with near-term flight systems.


- **Robot tactical planning software.** Software tools that enable efficient, rapid handling of contingencies during robot tactical operations. This may involve a combination of embedded and user interface modules.

- **Robot ground data systems.** Systems and software for robot command planning and sequencing, telemetry processing, sensor/instrument data management, and automating ground control functions.

This subtopic does not solicit proposals for direct teloperation (e.g., joystick-based rate control), telepresence, or
immersive virtual reality subsystems or systems.