



NASA STTR 2015 Phase I Solicitation

T5 Communication and Navigation

Lead Center: HQ

Communications and Navigation Systems, consists of six technology subareas: optical communication and navigation; radio frequency communication; internetworking; position, navigation and timing; integrated technologies; and revolutionary concepts. Communication links are the lifelines to spacecraft, providing commanding, telemetry, and science data transfers as well as navigation support. Therefore, the Communications and Navigation Systems Technology Area supports all NASA space missions. Advancement in communication and navigation technology will allow future missions to implement new and more capable science instruments, greatly enhance human missions beyond Earth orbit, and enable entirely new mission concepts.

Subtopics

T5.01 Autonomous Communications Systems

Lead Center: GRC

Participating Center(s): GSFC

Future missions require networked comms systems that can support greater levels of autonomy and possess cognizance of the local environmental conditions and awareness of the state of other assets in the comms network for enhanced reach back and data delivery. ACS offer potential to improve overall system performance through automated sensing of local and system level conditions, rapid analysis and responsive configuration control.

Innovations are sought to enable an ACS to:

- Learn through experience to enhance adaptability to nominal and anomalous operations.
- Establish self-configurable network connections.
- Exchange information autonomously.
- Sense local conditions and dynamically maximize performance.
- Mitigate system-level effect of outages, delays, disruptions and interference.
- Leverage capabilities of flexible receivers, software-defined radios (SDRs), cognitive radios, network routers and storage, and ground assets to increase system-level autonomy, capacity and efficiency.

Potential deliverables may include a demo of ACS concept(s), enhanced comms component(s) through a clever innovation, or prototype of an element that enables a higher level of automation, performance, or efficiency at the system level.

State of the Art

Current spaceflight transceivers perform comms and some navigation functions. SDRs are reconfigurable. Use of GPS for location determination is becoming common. However, most transceivers, SDRs and ground assets operate independently under closely coordinated control. They are not yet cognitive of their local environmental conditions or the overall comms network capabilities and status, and unable to learn and improve.

Compelling need for this Subtopic

NASA SMD and HEOMD conduct robotic and human missions from low Earth orbit to deep space, in spacecraft as varied as constellations of CubeSats to human-rated orbiters and landers. The Space Communications and Navigation (SCaN) Program provides infrastructure, technologies and standards enable these missions. ACS offers the potential to sense and exploit knowledge of local and system-wide capabilities and conditions for efficient use of available comms network assets and maximum performance.

STMD/NASA/NARP/National Goals

SCaN Goals include: To implement a networked communication and navigation infrastructure across space; and to evolve its infrastructure to provide the highest data rates feasible for both robotic and human exploration missions.