

# TECHNOLOGY ENTERPRISE AND MISSION PATHFINDER OFFICE

National Aeronautics and  
Space Administration



The Technology Enterprise and Mission Pathfinder Office (TEMPO) organizes, incubates, and infuses mission-enabling communications and navigation technologies. The TEMPO team takes on a wide variety of breakthrough efforts, leading concept studies, identifying capability gaps, overseeing technology infusion, performing experiments, and applying entrepreneurial methods to deliver results. The TEMPO technology development approach begins with the end result in mind, with the idea that we are part of a greater ecosystem of interconnected parts.

*TEMPO strives to be the innovation engine that turns the most promising communications and navigations concepts into the next generation of NASA technology and mission successes.*

## FOCUS AREAS

### INFORMS INTEROPERABILITY

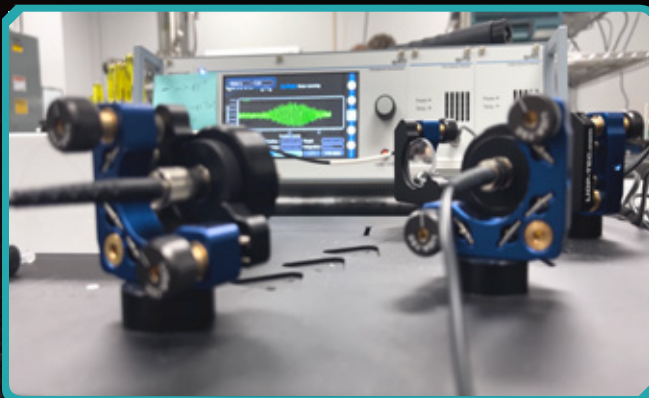
by contributing to the development of systems where satellites, rovers, and explorers from multiple agencies can operate side-by-side by using agreed-upon standards.



LunaNet will bring internet and cell phone-like capabilities to the lunar surface through innovative networking techniques, standards, and an extensible framework to provide missions and explorers at the Moon with communications and navigation services.

### ADVANCES CAPABILITIES

by taking promising early-stage technologies and bringing them to mission readiness.



Quantum Networking teams are studying and experimenting with how quantum physics can enable space-based quantum networks.

Delay / Disruption Tolerant Networking (DTN) and its Bundle Protocol will extend internet-like capabilities to space where end-to-end connectivity may be unavailable or limited.

## FOCUS AREAS

### INCUBATES PROJECTS

by providing guidance on formulation, funding, scheduling, and development until they have reached a maturation level to become independent.

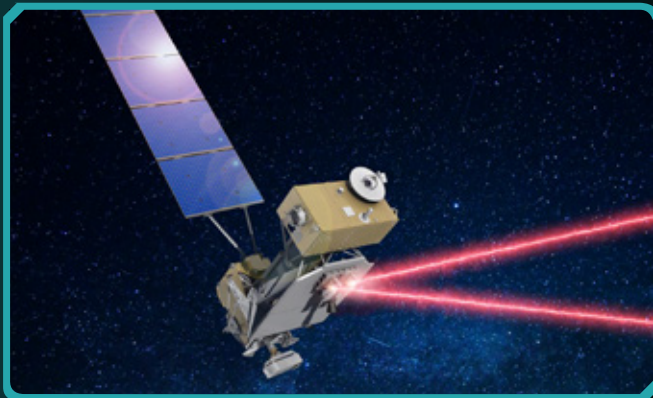


The Laser-Enhanced Mission Communications Navigation and Operational Services (LEMNOS) pipeline started in TEMPO and is now developing a laser communications system for the Artemis II mission.

The Lunar Communications Relay and Navigation Systems (LCRNS) project also started in TEMPO and now is managing the acquisition and implementation of lunar relay services to support the Artemis Moon missions.

### EXECUTES MISSIONS

to increase communications and navigation technology readiness levels. Often, these missions are further proving a capability or technology that has been studied but needs operational investigation.



Laser Communications Relay Demonstration (LCRD): Launched in 2021 to conduct experiments from industry, academia, and other government agencies to refine the laser communications technologies.

TeraByte InfraRed Delivery (TBIRD): Launched in 2022, TBIRD achieved NASA's highest ever laser communications data rate at 200 gigabits per second and sent 4.8 terabytes of data to Earth in a single laser communications link.

Lunar GNSS Receiver Experiment (LuGRE): Launching on a Commercial Lunar Payload Service to investigate if Earth-based navigation system signals - like GPS - can be used for timing and location data on the Moon.

## WORK WITH US

To work with TEMPO or learn more about the office, contact:

[GSFC-TEMPO-info@mail.nasa.gov](mailto:GSFC-TEMPO-info@mail.nasa.gov)

or visit:

[www.esa.gsfc.nasa.gov/projects/tempo](http://www.esa.gsfc.nasa.gov/projects/tempo)

If you are interested in proposing an experiment for LCRD, visit:

[go.nasa.gov/3qUtea7](http://go.nasa.gov/3qUtea7)