

Opportunity Title: Federated Communications Relays for Deep Space Exploration

Opportunity Reference Code: 0328-NPP-MAR26-JPL-TechDev

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0328-NPP-MAR26-JPL-TechDev

How to Apply All applications must be submitted in [Zintellect](#)

Please visit the NASA Postdoctoral Program website for application instructions and requirements: [How to Apply | NASA Postdoctoral Program \(oua.org\)](#).

A complete application to the NASA Postdoctoral Program includes:

1. Research proposal
2. Three letters of recommendation
3. Official doctoral transcript documents

Application Deadline 4/2/2026 6:00:59 PM Eastern Time Zone

Description About the [NASA Postdoctoral Program](#)

The [NASA Postdoctoral Program \(NPP\)](#) offers unique research opportunities to highly-talented scientists to engage in ongoing NASA research projects at a NASA Center, NASA Headquarters, or at a NASA-affiliated research institute. These one- to three-year fellowships are competitive and are designed to advance NASA's missions in space science, Earth science, aeronautics, space operations, exploration systems, and astrobiology.

Description:

Swarms of cooperative small satellites can serve as a relay for critical flight operations, as was proven with the MarCO technology demonstration. By routing planetary communications traffic (e.g. around Mars) through a set of cooperating communications relays, the burden on DSN scheduling can be significantly reduced. The use of frequency division (OMSPA) enables all probes communicating through the relay to be received by one DSN antenna, enabling DSN resources to be extended across a greater number of missions. In contrast to a monolithic relay, swarms enable a greater degree of granularity in supporting multiple probes simultaneously. Swarms also provide the usual benefits of multi-element array reception, namely robustness to single point failures and transmit/receive diversity.

The downside of swarms are the additional complexity in coordinating the multiple elements. Recent advancements in swarm and constellation optimization have made the concept more tractable, and ripe for exploration as a future architecture for the human exploration of Mars. Long round-trip light times make centralized coordination of swarms difficult, so distributed coordination becomes more critical. Study of these architectures through simulation (e.g. ns-3) and hardware test platforms (e.g. Software Defined Radio) will enable critical information for architecture selection of future



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planetary missions.

Field of Science: Technology Development

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Applications with citizens from Designated Countries will not be accepted at this time, unless they are Legal Permanent Residents of the United States. A complete list of Designated Countries can be found

at: <https://www.nasa.gov/oiir/export-control>.

Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,
- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

Questions about this opportunity? Please email npp@orau.org

Qualifications Candidates should have demonstrated experience with:

- Developing space-based swarm/constellation optimization algorithms
- Extensive communications protocol design
- Solid understanding of physical/link layer communications, including synchronization, beamforming, and autonomous rate adaptation

Point of Contact [Mikeala](#)

Eligibility Requirements • **Degree:** Doctoral Degree.