

Invited Talk

Title: Developing Distributed Autonomous Space Systems

Speaker: Caleb Adams, NASA Ames Research Center

Abstract:

The development of distributed autonomous space systems is crucial for advancing NASA's Small Spacecraft and Distributed Systems (SSDS) program. The Distributed Spacecraft Autonomy (DSA) project at NASA's Ames Research Center aims to enable autonomous multi-agent decision-making in multi-spacecraft operations, mitigating the effects of communication constraints like latency and bandwidth. This talk will discuss recent advancements in DSA technologies and applications, including distributed resource and task management, reactive operations, and ad hoc network communications. In addition to technical implementations, we will discuss software development strategies for rapid on-orbit testing. We will also highlight successes from the Starling 1.0 mission, The Starling 1.5 mission extension, and a space traffic coordination technology demonstration that showcased autonomous satellite operations without human intervention. Our work focuses on building flight heritage and experience for low-TRL software, raising confidence in new autonomy and distributed control capabilities for next-generation space missions.

Speaker Biography:

Caleb Ashmore Adams is a Project Manager and Principal Investigator at the National Aeronautics and Space Administration (NASA) Ames Research Center in Silicon Valley, California. He leads the Distributed Spacecraft Autonomy (DSA) group which demonstrates advanced swarm technologies on multi-spacecraft missions. He is also the Deputy Project Manager of the Starling mission, a 4-satellite swarm. On Starling, DSA demonstrated the first fully autonomous distributed space mission, and it continues to accomplish firsts-in-space while in operations today.

Due to the success of DSA, Caleb was selected by NASA's Space Technology Mission Directorate (STMD) to lead the preliminary design study of NASA's Next Generation Multi-Agent Swarm. He is also the Small Business Innovative Research (SBIR) Topic Manager for Autonomous Systems under NASA's Exploration Systems Development Mission Directorate (ESDMD) where he oversees investments into US industry that support NASA's mission to explore our solar system.

Caleb is the Project Manager and Principal Investigator for the Low-Light Universal Mapping for Extreme Environments (LUMEN) team where he works closely with researchers across industry and academia (Stanford, UC Berkeley, Nvidia, Google) to apply modern AI and computer vision techniques to the challenging environment of space.

Caleb won an Early Career Achievement award from NASA's STMD in 2024 and was awarded NASA's STMD's highly competitive Early Career Initiative (ECI) in 2025. Under his leadership, the DSA and Starling teams have won 3 separate group achievement awards. He holds bachelor's and master's degrees in computer science from the University of Georgia, was featured as one of the University of Georgia's 40 under 40 in 2025, and a recipient of the University of Georgia's Graduate School's 2025 Alumni of Distinction Award.