Beyond Visual Line-of-Sight Drone-Aided Search and Locate

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Background

Unoccupied Aerial Vehicles (UAVs) provide a cost-effective means of accelerating **search and rescue operations in remote wilderness locations** and reducing the burden on ground search teams performing this critical life-saving service. **However, UAV operations in this context are currently restricted to remain within the line of sight** of operators, which limits the effective search radius of the UAV. Therefore, developing Beyond Visual Line of Sight (BVLOS) capabilities and procedures to support regulatory changes is of utmost importance.

Innovation

To enable BLVOS operations, we have designed an autonomous system consisting of a search UAV for conducting the BVLOS mission, and a relay UAV which automatically and safely positions itself to enable a continuous, high-quality video and telemetry datalink for the duration of the mission.

Project Description

The aim of this project is to increase the effective search radius of a search & rescue UAV by designing a novel Beyond Visual Line-of-Sight (BVLOS) UAV system utilizing an intermediate "relay UAV" to provide an uninterrupted communications link between the ground station and the search UAV. The use of a relay UAV to maintain the link avoids the need for additional infrastructure (e.g., 5G towers which are not ubiquitous in the remote wilderness locations).
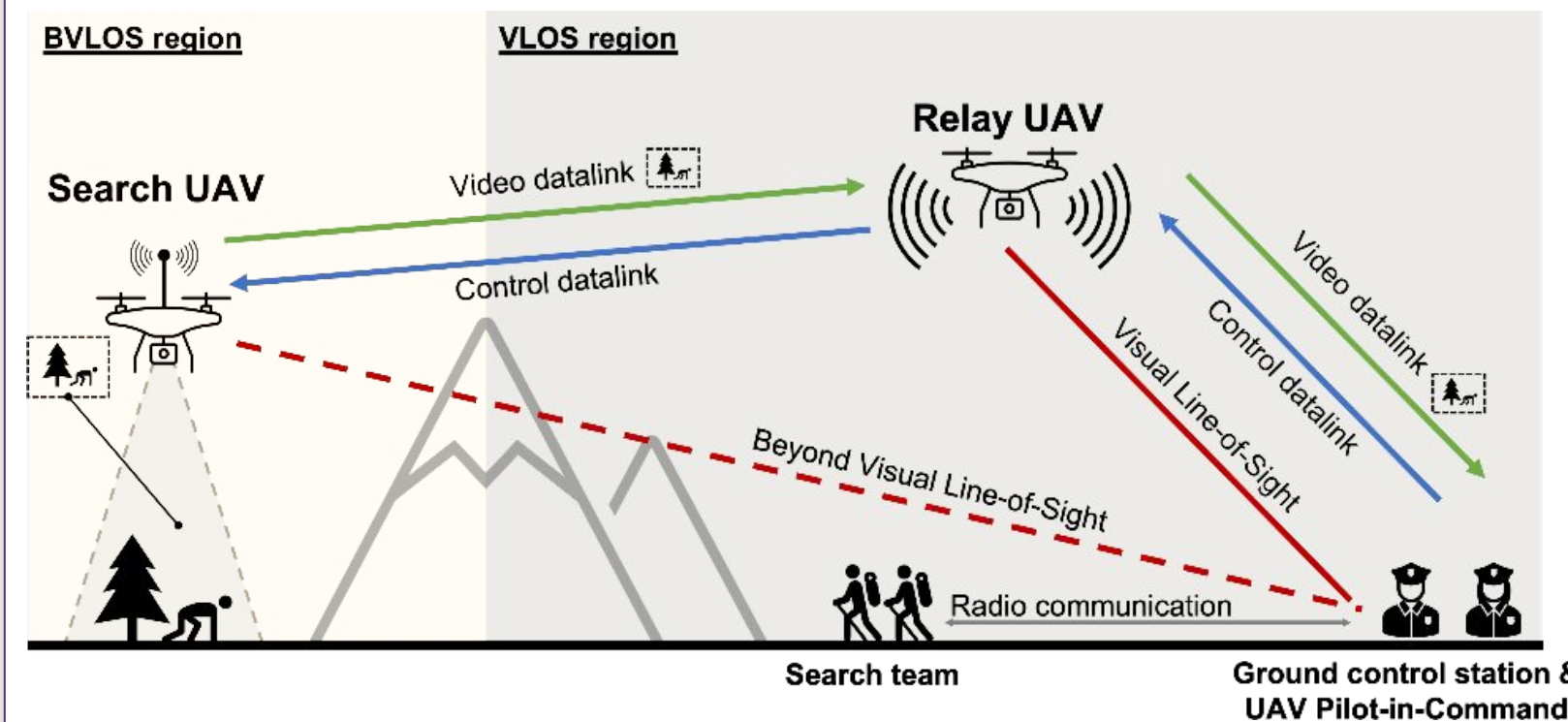
Project Aims

- Design and assembly of UAV and payload hardware
- Communications payload architecture & network configuration
- Search and relay UAV hardware and flight stack
- Algorithms for autonomous path-planning (relay UAV)
- Procedures and best practices for BVLOS operations
- Characterization of performance & limitations of the system

Impact

BVLOS UAV systems can:
- Minimize search time/effort
- Extend effective search radius
- Decrease overall mission cost
- Reduce ground team safety risk

These benefits could be extended to other first-responder applications.

Path Forward

- Implementation of autonomous relay UAV positioning algorithm
- Datalink quality characterization and BVLOS procedure flight test planned for Apr '23
- **Final demonstration** flight of fully autonomous BVLOS search mission planned for late May '23
- **Delivery of prototype** system design to industry partners: Chelan County Sheriff's Office and Freefly Systems