FY23 SUAS Autonomous Navigation

TFA Number: SR-FY23-01
TFA Category: Autonomous Navigation for Small Unmanned Aerial Systems (SUAS)
PM: RC

Problem Statement: SOF wishes to use SUAS to navigate to points of interest without relying upon Global Positioning Systems (GPS) or continuous operator control.

Operational Use Scenario: SOF Operators will use currently available SUAS to navigate to a point of interest, with minimal operator interaction. The system should identify a landing zone and autonomously land to maintain observation of the point of interest. The system should then navigate to an alternative location or return to initial launch point for recovery.

General Conditions: The demonstration will take place in a variety of outdoor environments to include forest, desert, marsh, fields, or urban terrain. The system must operate in both day and night ambient light conditions.

- The demonstrator will be provided a satellite image of a point of interest as much as 5 kilometers away from the launch location.
- The SUAS will launch with an approximate range and bearing, navigate around obstacles, identify the point of interest, identify a suitable landing zone, and land. The SUAS will then launch, navigate to the initial launch location, and land again.
- Performance will be measured: Round trip navigation error, point of interest identification, landing zone selection, and landing precision.

Unique Conditions: Initial launch position will be provided in advance of testing, but the point of interest location will be provided on the day of testing and may be fixed or transient. System may not utilize GPS signals for navigating, only for flight safety fail-safe mechanisms during testing. Navigation may non-cooperatively use RF signals of opportunity from space based or terrestrial emitters for alternative position fixing. Navigation may include georeferencing or preloaded maps of an appropriately sized area.

Standards/Desirements:
- Navigation algorithms should integrate onto the SUAS without modifying the existing autopilot.
- Navigation algorithms should integrate onto the SUAS utilizing PX4 or derivative autopilot.
- Navigation algorithms should not disrupt the ability to utilize GPS signals when desired.
- Navigation algorithms should accommodate high level behavioral inputs from the operator into route planning and obstacle avoidance prior to launch, e.g. minimum or maximum altitude.