

NASA SBIR/STTR Technologies

A2.02-7634 - Safety Analysis For Evaluating (SAFE) sUAS



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Identification and Significance of Innovation

At present, there are no exhaustive safety analysis models for sUAS. Part of the reason is the lack of real world operations data for sUAS flights since they are not yet legal without a Certificate of Authorization (COA) from Federal Aviation Administration. As a fallback, there is a requirement to use synthetic operations data obtained from simulations. This proposal aims to adapt an existing UAS safety model called UAS Safety Analysis Model (USAM) to analyze sUAS missions. However, the current version of USAM is limited to analyzing large fixed wing UASs. SAFE sUAS will extend this architecture to include small UASs by first developing high fidelity sUAS trajectory models and then performing NAS-wide safety analyses of sUAS missions.

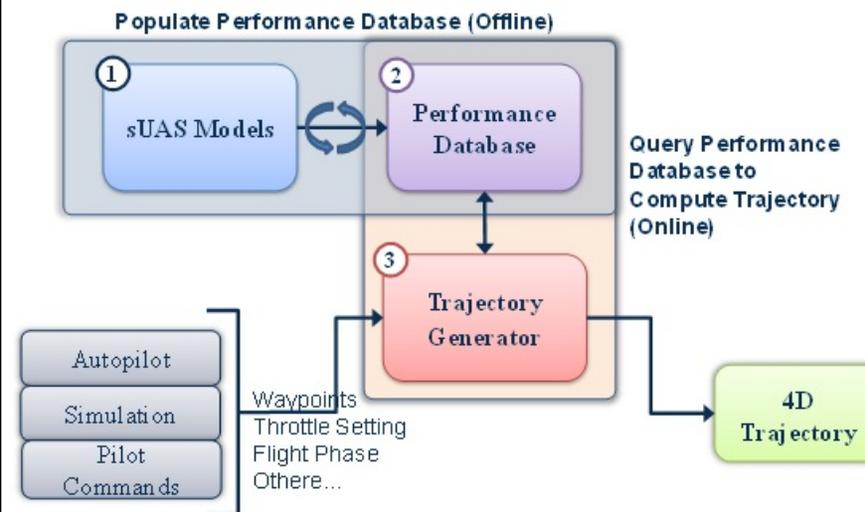
Estimated TRL at beginning and end of contract: (Begin: 2 End: 3)

Technical Objectives and Work Plan

- **Objective 1:** Development of high fidelity sUAS performance models
- **Objective 2:** Adapt high fidelity models to run within standard modeling and simulation platforms
- **Objective 3:** Perform safety analyses of sUAS flights in the NAS.

Outline of Phase I Tasks

- **Task 1:** Hold kickoff meeting and establish program requirements
- **Task 2:** Setup 6-DOF flight dynamics and control simulation
- **Task 3:** Use 6-DOF closed-loop flight simulation for generation of sUAS performance files
- **Task 4:** Modify KTG for sUAS trajectory generation using performance files from Task 3
- **Task 5:** Validate KTG trajectories against 6-DOF simulation
- **Task 6:** Demonstrate prototype simulation analysis results for sUAS
- **Task 7:** Develop concepts for Phase II and transition



NASA Applications

NASA researchers will find SAFE sUAS architecture useful to analyze the impact of integrating sUAS to the NAS. They can identify minimum operational performance for sUAS safety assurance tools. NASA can integrate the sUAS performance models developed here to any modeling and simulation platform of choice to simulate sUAS trajectories rather than develop a new platform altogether. The tool will allow them to experiment with different concepts of operations for sUAS safety, mission planning, route planning, conflict avoidance and mitigation.

Non-NASA Applications

We envision SAFE sUAS tool to be used by FAA to study impacts of aviation policy regarding sUAS operations. FAA can integrate the sUAS performance models into existing simulation platform and analyze the impacts of sUAS operations. SAFE sUAS can be used by commercial UAS operators to plan the best routes in presence of congestion and to simulate what-if scenarios.

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NON-PROPRIETARY DATA