

Division of Research, Innovation & System Information
Research Initial Scope of Work
SUBMITTAL FORM – FY 19/20

I. Project Number:

Project Title: Caltrans UAS Safety Management System

II. Task Number: 3694

Task Title: Caltrans UAS Safety Management System

III. Project Problem Statement: The Division of Aeronautics, lead on Unmanned Aircraft System (UAS) implementation at Caltrans, seeks to establish a UAS Safety Management System (USMS). The Caltrans UAS Program (Program) thus far consists of a Caltrans UAS Operations Handbook, FAA Part 107 Pilot Registration requirement, and tracking of Remote Pilots, UAS, and UAS Operations. The Program lacks development of best practices, standardized training, and a comprehensive UAS safety management system for the operating for State business and on the State Highway System.

IV. Objective: The research project will produce recommendations, best practices, guidelines, and training materials for the establishment of the USMS. The goal of the research is to ensure all Caltrans UAS operations are performed in accordance with the USMS. The program may include curriculum development, classroom instruction, hands-on training, train-the-trainer, crew and public safety, flight training, a proficiency check for Remote Pilots including flight maneuvers, first aid and fire safety training, best practices for equipment and battery maintenance, transportation, handling, and record keeping; mission planning, safety checklists, hazard analysis, roles and responsibilities for flight crews, hazard/ fire risk assessment, emergency procedures and protocols. The program will also include best practices for the training of Visual Observers, and/or support personnel. Additional components may include UAS safety around restricted airspace, airports, heliports, and aircraft.

The project will require the review and update of the Caltrans UAS Operations Handbook. The USMS and updated UAS Operations Handbook could serve as a standard or benchmark for local agencies and others to use.

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V. Task Description of Work and Expected Deliverables:

Focus areas for research for the development of the proposed USMS program include, but are *not limited* to the following:

1. Public and crew safety when operating adjacent to a highway, structure, or other facility
 - a. Minimum offset distances
 - b. Minimum hovering altitude
 - c. Launch/no launch locations (gore/inside shoulder)
 - d. Traffic conditions/distractions/visibility
2. Training and proficiency check best practices
 - a. Flight maneuvers
 - b. Proficiency check requirements
 - c. Pass/Fail criteria
 - d. Recurrent training
3. UAS equipment and batteries best practices
 - a. Maintenance
 - b. Inspection
 - c. Transportation and handling
 - d. Recordkeeping
4. Operational best practices
 - a. Pre-flight Procedures
 - i. Mission planning
 - ii. Hazard analysis
 - iii. Safety checklists
 - iv. Identifying roles and responsibilities
 - v. Communication/emergency protocols
 - vi. First responder contacts and procedures
 - b. Flight Procedures
 - i. Detect and avoid
 - ii. Loss of signal or other malfunction
 - iii. Emergency landing/abort

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- c. Post Flight
 - i. Debriefing
 - ii. Reporting/logging
 - iii. Incident/Accident Reporting
 - 5. Visual Observers and support crew training
 - 6. Training and best practices for UAS operations in or near:
 - a. Airports/Heliports
 - b. Restricted Airspace
 - c. Heavily trafficked airspace
(Radio communications/ aviation language)
 - 7. Risk of fire due to UAS: assessment, mitigation, readiness, and response
 - 8. Research optimal sites for UAS training facilities for use in:
 - a. Test flights of UAS (new or existing with new software, hardware, etc.)
 - b. Practice flights prior to UAS operations to ensure drones are in optimal operating condition, safe to fly

Preference for publicly owned sites statewide that could be established or considered for longer-term training facilities in collaboration with public entities.
 - VI. Background: Caltrans in partnership with the University of California, and hosted by the UC Center of Excellence on Unmanned Aircraft Systems, launched a pilot training program held in Summer 2019. The training course consisted of a hands-on, 3-day session that covered a wide range of topics from regulatory requirements for the operation of UAS, best practices for safety and risk mitigation, flight performance standards, and equipment management.
- Building on the experience gained from the pilot program, as well as feedback provided from the 40 students who completed the training, research and development will now continue to encompass the more comprehensive scope and development of the Caltrans UAS Safety Management System.

VII. Estimate of Duration

Researcher to provide timeline for task completion.

Task 1 – 3 months to complete

- Literature Review
- Nationwide review of current best practices with emphasis on state/local departments of transportation or public agencies

Task 2

- Develop standards

Task 3

- Develop curriculum

Task 4

- Pilot Test Course / Training

Delivery

- Standards
- Curriculum
- Course
- Lessons Learned
- Evaluation

Outcome

The program will provide for the development of the USMS that includes standardized training to allow a Caltrans employee with no prior knowledge or experience with UAS to meet qualifications and requirements and become a fully trained UAS Remote Pilot.

The program will ensure Caltrans will have all the tools it needs to deliver UAS safety and flight training throughout the State and will provide for a process and method for maintenance, as well as timely updates of the training and materials.

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VIII. Related Research

The following references and resources were found online:

[University of California, Safety and Loss Prevention, UC Unmanned Aircraft System Safety](#)

[City of Los Angeles, Department of Public Works, Bureau of Engineering, Unmanned Aerial Systems \(UAS\) Flight Operations Manual – March 2017](#)

[North Carolina Department of Transportation, UAS Program Office, UAS Operational Procedures Guide, Best Practices Series – February 2017](#)

[Channel Islands, Standard Operating Procedures for UAS at CSU Channel Islands – Undated \(contains proprietary materials\)](#)

[Skyswoop Unmanned Aircraft System Operations Manual for Skyswoop, Inc. – June 2017](#)

[Visual Line of Sight Standard Operating Procedures, Unmanned Safety Institute – August 2016](#)

[2019 Mid-Year Public Safety UAS Report, DroneResponders](#)

Caltrans Safety Manual

IX. Deployment Potential: The primary deployable product will be a comprehensive and sustainable Caltrans UAS Safety Management System that furthers Caltrans' Mission, Vision, and Goals.

The outcome of the research will result in Caltrans' having all the tools it needs to deliver its USMS statewide.

Date: August 30, 2019