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| UAS Integration at SAV – Phase 2 |
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### Abstract

Woolpert will provide UAS consulting services as directed by the Savannah-Hilton Head International Airport Authority (SAV). Woolpert will work with SAV and the FAA to support the integration of UAS technology and capability into regular SAV airport operations. Woolpert’s initial support included the integration of UAS technologies at SAV for daytime perimeter surveillance and wildlife management operations (Phase 1). Phase 2 of the implementation program will include additional operations of UAS for situations such as irregular operations, disaster response/recovery operations, nighttime surveillance, airfield asset management, airfield safety inspections, construction observation operations, traffic monitoring and other tasks that are not traditionally supported by aerial operations (manned or unmanned). Phase 2 will also include tasks to establish procedures and systems and train personnel at SAV allowing them to ultimately implement a full self-service UAS program.

Priorities for SAV during Phase 2 of the program are broken out into tasks below. Throughout Phase 2, Woolpert will be incorporating additional areas of flight from Phase 1, additional mission types and a deeper level of coordination with the local FAA Air Traffic Control Tower (ATCT) and other interested stakeholders, as appropriate, with the goal of advancing the UAS program at SAV, while supporting FAA’s interests in capturing data and feedback on the integration process.

Prior to beginning the tasks identified in the following outline, Woolpert and SAV will establish a project plan in collaboration with SAV to ensure the project objectives are met. The plan will incorporate the UAS program stakeholder considerations, planned meeting and deliverable dates, technical details on the UAS and sensors to be utilized, design of efficient UAS flight missions, and data processing/analysis expectations.

1. Develop Flight Management and Data Management Routines, Data Security and Integration
	* The use of UAS results in large amounts of data being collected thus requiring advanced data processing, storage capacity, accessibility considerations, analysis and visualization, and IT security controls. Management of the acquired imagery or sensor data, data standards and quality, taxonomy, flight logs, service records and resulting reports (pre/post flight reports and/or any investigations flagged from flight anomalies) is paramount to consider prior to implementing a fully mature UAS program. Woolpert will review SAV’s existing IT systems and applications, identifying the key requirements, performance, and controls needed to achieve mission needs of SAV.
	* Woolpert will coordinate with the SAV security operations team to review current security systems coverage (CCTV, motion sensors, etc.), security management tools, and IT systems associated with the airports security operations.
	* **(Phase 3)** Integration of UAS data, either live-feed or post-flight processing and inspection, into the security teams process will be studied, demonstrated (if permissible and technically possible) and recommendations for improvements for successful integration will be provided. *Woolpert will leverage subcontractor support from Faith Group as necessary to complete this task.*
	* Woolpert intends to utilize SAV’s existing Cityworks ™ license to develop applications, interface and workflows to assist SAV in planning, managing and reporting on their UAS operations. As the analysis of the current IT infrastructure at SAV is being completed, the impacts of including UAS mission data and visualization capabilities will be defined and recommendations to consider and work with SAV on scripting an IT implementation plan to support the UAS program.

*Deliverables:*

* + 1. Beta-version of the Cityworks ™ forms and reporting capability, will apply fixes and recommendations from field testing in final product.
		2. **(Phase 3)** Systems analysis report documenting Woolpert findings and analysis of existing IT systems, software investment and system upgrade recommendations, and data security protocols.
1. Support Human Factor’s Research of SAV Operations Workload Impacts
* Woolpert will conduct observation, analysis and reporting on the human factors impacts of UAS flight operations to the SAV airport operations staff. Introducing alternative (UAS) solutions to an existing airfield inspection routine can be disruptive and challenging. With that in mind, Woolpert will conduct interviews with airport operations staff to establish a baseline understanding of tasks, responsibilities and intended outcomes of those duties and tasks (such as identifying encroachments, breaches, etc.). Additionally, Woolpert will research and observe any proposed UAS operations to understand the technology, potential limitations/constraints and benefits/risks of implementing UAS technology for certain functions.
* **(Phase 3)** Woolpert will be evaluating and providing recommendations for proposed UAS functionalities, as well as the associated recommendations for training updates and safety updates (for operator, other personnel, equipment, etc.) required for a UAS operator conducting flight operations within the AOA.
* Woolpert anticipates that the FAA will conduct similar human factors studies for impacts on ATCT staff during the Woolpert-led UAS operations. SAV and Woolpert will not be responsible for FAA research in this area.

*Deliverables:* Final reports for the human factors task analysis.

* + 1. **(Phase 3)** Human factors impact statement in cost-benefit analysis of airfield operations tasks
		2. **(Phase 3)** Recommendation for training and safety updates
1. Conduct On-site Flight Demonstrations
	* Woolpert will utilize the lessons learned from Phase 1 of the program, incorporating the original flight objectives while adding mission types and challenges in cooperation with SAV. The goal is to fly missions to conduct both day-time and night-time operations in support of the following with the estimated number of UAS missions specific to each:
* Pavement and Asset Inspections/Inventory
	+ Runway, Taxiway, Apron and Ramp Asset Inspections
* Structural and Facility Inspections/Inventory
	+ Parking, Rental Car and Operations Facility Inspections
* Replication of Part-139 Inspections
* Wildlife Hazard Management Applications
	+ Invasive species identification, animal habitat locations, environmental impact identification, animal tracking and deterrence applications
* Traffic Monitoring
* Airport property security surveillance and response
* Construction Monitoring
* Emergency Response and Event Management

Flight mission parameters (limits, altitudes, etc.) will be determined in collaboration with SAV. Woolpert will define necessary parameters to address key goals per each mission. Once the missions have been more fully defined through collaboration with SAV staff, Woolpert will include these details in the MOA with ATCT. The potential for obtaining a waiver to FAA Part 107 performance-based standards to complete each mission type, is dependent on the final flight plans established during the project planning task. Additional Part 107 performance-based standards needing to be addressed will be incorporated into flight planning and approval requests from the FAA. Woolpert will take the data collected and deliver multiple processed tools, to be determined in collaboration with SAV, for evaluation.

*Deliverable:* Test flight missions and data.

1. Support SAV Staff on Obtaining Part-107 Licensed Pilot(s), UAS Flight Planning, and Data Acquisition
	* Leading up to formal training on-site, Woolpert will prepare the supporting documentation to conduct the training and will be a deliverable for SAV internal use for guidance. Standard Operating Procedures (SOPs) and guidance workshop material will be created, as well as the on-site training sessions organized and designed.
	* **(Phase 3)** Utilizing the Woolpert-prepared MOA, mission planning, flight logs and data storage techniques, Woolpert will provide classroom-style instruction for skill enhancement in completing successful UAS flights from plan-to-completion. The sessions provided by Woolpert will not be designed to prepare pilots for acquiring a Part-107 license, rather will focus on the SAV specific missions from planning to data management. The key components will include:
		1. Fundamentals on UAS platform and sensor technology
		2. Pre-mission planning and communications
		3. Flight operations (communications, safety, roles and responsibilities, lessons learned)
		4. Post-mission tasks (communication, equipment and data storage, minor maintenance)
		5. Data management, processing and dissemination
	* **(Phase 3)** The safe operation of UAS is critical, however the objective of utilizing UAS is not to simply fly but to harness the value of the data and insight collected using UAS. Thus, during classroom instruction, Woolpert will introduce the data processing, manipulation and output production of the imagery data collected for dissemination to appropriate SAV departments and/or other necessary organizations. Woolpert will develop materials, presentations and other supporting documents to cover during the classroom training, these materials will be delivered to SAV to share with employees not in attendance during the on-site training session.
	* **(Phase 3)** The sessions will be conducted at SAV for airport selected employees, the sessions will not be a substitute for officially certified FAA Part 107 certification training program. It is recommended that as many SAV staff as practical actually have achieved their Part 107 license prior to these training sessions in order to aid in the understanding of the concepts being taught.

*Deliverables:*

1. **(Phase 3)** 1-day classroom-style session (with 2 presenters), field training will be conducted during demonstration flights (see task 6 below).
2. Training materials discussed during classroom session
3. Program Closeout and Recommendations
	* Upon completion of Phase 2 flights, Woolpert will conduct detailed interviews with key staff to determine the business case for each mission in terms of the amount of labor saved, risks reduced, or enhanced delivery of services achieved over traditional methods (see task 2). Woolpert understands the importance of this step to assisting SAV make sound business decisions moving forward and will work closely with SAV to ensure we are able to identify tangible benefits to present to SAV leadership in the form of a written report and PowerPoint presentation. A final check-in meeting with FAA HQ to present the results of the project will also be completed at the end of the project.
	* **(Phase 3)** After conducting the task and workload analysis, Woolpert will conduct a cost-benefit analysis (CBA) incorporating effects on manhours, risks and technology investments with the goal of demonstrating an overall cost and liability savings to the airport. The factors analyzed and reported upon will include cost savings, cost avoidance, operational efficiency, safety, multi-functional use of the data, and airfield operations enhancements.

A critical component to support the CBA is the conclusion of the different mission types attempted as part of the project and their viability to support exiting operations. Beyond the workload analysis, technical review of the data by Woolpert professionals will provide conclusions on the practicality and efficiency of incorporating UAS applications to the prescribe mission types listed in task 3. Civil, structural, water and transportation engineering experts will be consulted to complete the analysis of each mission type.

* + **(Phase 3)** Woolpert will develop a UAS Technology Investment and Performance recommendation matrix to illustrate system features including aerial platform, sensors, payload, and support requirements by mission and include technology benefits, performance data and cost to assist in future acquisition and operations and maintenance decisions.
	+ **(Phase 3)** Upon completion of this phase of work, SAV will determine as to whether they will indeed acquire UAS technology and self-perform future UAS operations. In the event SAV does want to proceed with purchase and self-performance, Woolpert could anticipate that a third phase be added to assist with the technology acquisition, additional training and integration support.

*Deliverable:*

1. Interim report on findings from data and observations made during Phase 2 will be delivered, providing insight into the final deliverable findings and recommendations.
2. **(Phase 3)** Project close-out presentation and report with recommendations on investments, next steps for implementation, lessons learned and resulting cost-benefit analysis.
3. **(Phase 3)** Cost-Benefit Analysis report.

### Level of Effort Estimate

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|  | ROM Level of Effort Estimate |
| Task | **Labor** | **Travel/Expenses** | **Task Total** |
| 1. IT Analysis/Develop Flight Management
 | $28,700.00  | $2,100  | $30,800  |
| 1. Support Human Factor’s Research
 | $18,300  | $2,000  | $20,300  |
| 1. Conduct On-site Flight Demonstrations
 | $55,250  | $9,750  | $65,000  |
| 1. SAV Staff Training
 | $12,200  | $0  | $12,200  |
| 1. Program Closeout and Recommendations
 | $18,150  | $3,450  | $21,600  |
|  | $132,600  | $17,300  | $149,900  |

### Project Schedule Summary (Phases 2 and 3 Combined)

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| MONTH | **Sep** |  | **Oct** |  | **Nov** |  | **Dec** |  | **Jan** |  | **Feb** | **Mar** |  | **Apr** |  |
| **Project Planning and Coordination** |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |
| **IT Systems and Flight Management Tools Analysis** |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |
| **Human Factors Tasks and Reporting** |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |
| **Flight Missions, Scenario Testing, and Data Processing** |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |
| **Project Data Analysis, Final Project Report and Deliverable Development, Training** |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |
| **Final Project Report and CBA** |   |   |   |   |   |   |   |   |   |  |   |   |   |   |   |

### Scope and Estimate Acknowledgement

*By signing and accepting this Phase 2 approach, the scope provided herein will be made part of “Attachment A” to the Contractor/Operator Agreement between the Savannah Airport Commission and Woolpert, Inc. dated and signed the 4th day of May, 2016.*

**SAVANNAH-HILTON HEAD INTERNATIONAL AIRPORT:**

Signed:

Name:

Title:

Date:

**WOOLPERT, INC.:**

Signed:

Name: Thomas E. Mackie, PS

Title: Vice President

Date: