



5-6944-01: Implementation of Unmanned Aerial Systems Using Close-Range Photogrammetry Techniques (UAS-CRP) for Quantitative (Metric) and Qualitative (Inspection) Tasks Related to Roadway Assets and Infrastructure

Background

One of the main objectives of this implementation project was to validate the TxDOT Unmanned Aircraft Systems (UAS) Flight Operations and User's Manual (FOM) that was developed as part of the research project 0-6944. After the research project was successfully completed, TxDOT granted this implementation project that included nine training sessions, at different locations all over the state of Texas, and five tasks. These five tasks included multiple missions to conduct mapping and inspection at different locations. Of the five tasks, three were performed by the University of Texas at Arlington (UTA), and two were contracted to different vendors. UTA performed the tower inspections, intersection mapping, and building mapping tasks. Planimetric and topographic mapping was contracted to Vendor 1, and bridge inspection was contracted to Vendor 2; however, the bridge inspection could not be conducted due to unforeseen events..

What the Researchers Did

As part of the implementation project, UTA participated in nine training sessions at El Paso, Houston, Dallas, Fort Worth, Austin, Corpus Christi, Lubbock, and San Antonio offices. A comprehensive training on the UAS Flight Operations Manual and a brief introduction of the completed research project 0-6944 was provided to TxDOT personnel who attended the training sessions from different parts of the state. UTA provided additional detail of the research conducted as part of 0-6944.

UTA conducted the tower inspections at Lubbock, Kaufman, Corsicana, Fairview, and Calallen. First three are communication towers, fourth is a water

tower, and the last one is a high mast lighting tower. The first and the last towers are located in Lubbock and Corpus Christi Districts, respectively, whereas the rest of the towers are located in Dallas District. UTA mapped the intersection in Seguin within the San Antonio District, where TxDOT is planning to upgrade the four-leg intersection to a roundabout. UTA also conducted building mapping of the Seguin area maintenance office. Vendor 1 conducted the planimetric and topographic mapping of an intersection in Tyler to obtain the 3D mapping data of the intersection. UTA coordinated with Vendor 2 for conducting the UAS inspection of Fred Hartman Bridge in Houston, however, the inspection was canceled when a barge hit the column of a nearby bridge, resulting in traffic diversions onto the bridge scheduled for UAS inspection.

What They Found

During the question and answer session of

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the training, it became apparent that TxDOT personnel's perception of using UASs was positive, and that the training sessions were successful in creating awareness of the guidelines for using UASs. During the tower inspections, the researchers identified some disconnected cables and rusted areas within less time and in a safer manner than traditional inspection methods. The high mast tower inspection provided information about the damaged condition of the pulley system holding the lighting assembly. The use of UAS for visual inspection and data collection can aid in the repair or replacement of tower elements. During the intersection mapping, the researchers collected and processed image data to develop 3-dimensional dense point cloud models, orthomosaics, digital elevation models, and contour maps. These deliverables were helpful to the area engineers in obtaining the metrics of the intersection in a safe and quick manner. UAS image data was collected at a building site to be

used for 3D building modeling.

Vendor 1's data collection task of planimetric and topographic mapping provided the vector map data of the area that can be directly used by TxDOT for further planning/modifying the designs for future construction activities.

What This Means

The present implementation study, conducted as a part of TxDOT project 05-6944-01, showed that the UAS-CRP technology can provide valuable data for TxDOT's asset management. The study validated the use of TxDOT's Unmanned Aircraft Systems (UAS) Flight Operations and User's Manual (FOM) for real field data collection tasks. The time and cost comparisons for each task, as well as other information collected as part of this project, will be helpful to TxDOT in their development of a business model for the use of UAS technology.

For More Information

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