Florida Department of Transportation Research

Small Unmanned Aerial Vehicles (SUAV) for Structural Inspection

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Current Situation

Traffic structures in Florida must be inspected regularly, every 2 years for bridges and every 5 years for high mast light poles. Bridges that are difficult to access, such as the Dames Point Bridge in Jacksonville or the Sunshine Skyway over Tampa Bay, often require special bridge inspection vehicles that have extension arms to position the inspector under the bridge but also require lane closures. High mast light-poles are visually inspected with binoculars.

Research Objectives

University of Florida researchers demonstrated the use of small unmanned aerial vehicles, or drones, for structural inspection of bridges and high mast light poles.

A researcher launches a small unmanned aerial vehicle for inspection of high mast light-pole.

Project Activities

From a review of previous efforts in Florida and other states, the researchers learned about challenges in using small unmanned aerial vehicles (SUAVs) for bridge inspection, mainly the SUAV's inability to access GPS under bridges. A lack of GPS signal requires the operator to manually fly the SUAV, which requires extensive skill and training. The researchers then assembled equipment for use in the project, including still cameras, video cameras, and 4- and 6-propellor SUAVs, called quadcopters and hexacopters, respectively.

Inspections were conducted on six high mast light poles (HMLPs), three HMLPs at each of two interstate interchanges. Because the HMLP does not interfere with GPS reception, the SUAV could be flown in a programmed path. HMLP images were viewed remotely on the project team's computer and stored both on the computer and on the SUAV. Ground station setup, SUAV deployment, and pack-up took an average of 25 minutes. SUAV inspection results were reviewed by on-the-ground inspectors, who saw advantages to the SUAV inspection as it gets a closer look at the HMLP, but observed that it required more time, equipment, and personnel than binocular inspection.

Bridge inspections were conducted at ten locations on eight bridges, prestressed concrete alone or prestressed concrete and steel, with clearances above the water of 21 to 74 feet. Three bridges were examined by bridge inspectors at the same time. Both overall inspections and inspections of previously found defects were conducted. For bridges, complex flight paths, standoff distance, and communications issues presented special challenges; however, solutions were found. Generally, on-the-ground inspectors approved of SUAV inspections, mostly for specific situations rather than routine inspection. The team concluded that SUAVs might be most useful to monitor known defects or to avoid lane closures.

The research team made recommendations for an SUAV inspection system. They also reviewed the issues regarding post-processing of inspection images and automatic defect detection.

Project Benefits

The use of SUAVs adds a potential new approach to required inspections, one that is likely to offer more advantages with improvements in hardware and software.

For more information, please see www.fdot.gov/research/.