Name(s)

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Project Number

S1426

Project Title

Low-Cost Autonomous Civilian Unmanned Aerial Systems

Abstract

Objectives/Goals

Unmanned Aerial Systems pose a wide variety of civilian applications. However, the majority of current systems were developed for military applications and are expensive to build, operate, and maintain. The objective of the project was to design and develop a low-cost Autonomous Unmanned Aerial System (AUAS) capable of meeting the needs of civilian applications.

Methods/Materials

A list of requirements for the UAS was made. A design was created, and a prototype built to follow the design. Commercial costs of each component were recorded, and the total cost of the system calculated. Software was developed to offer user-friendly point-and-click control of the system. An experiment to verify the system's capability to execute a sample application, Aerial Imaging for Survey, was devised. Interest areas were selected by an operator with the custom Mission Control software, and the system was deployed under full autonomous control. Data measuring every aspect of the plane's flight, primarily locational, airspeed, and altitude was electronically recorded. This test procedure was repeated with five differing interest areas. Custom software was developed and used to determine the area imaged by the on-board camera, and was subsequently compared with the initial interest area of each flight. The resulting percent interest area imaged was recorded.

Results

The system imaged over 100% of the interest area for every test. The system, if manufactured for commercial use, costs $594.36 per unit, $24,405 less than a comparable drone currently in use, which costs $25,000.

Conclusions/Discussion

It was concluded that the final design was capable of meeting the needs of a common civilian application at a significantly reduced cost to a comparable drone currently in use.

Summary Statement

I designed, developed, and built a prototype Autonomous Unmanned Aerial System capable of fulfilling the needs of a common civilian application, and wrote software to provide simple point and click control of the system.

Help Received

Mother helped procure board elements; Jim Hall donated airborne computer; Father helped with transport; Advise from Damon Russell, Doc. Student at Caltech