

Fixed-Wing Survey Drone

Functional Requirements List and Performance Specifications

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Introduction

The goal of the fixed-wing survey drone project is to develop an unmanned aerial vehicle, or UAV. The UAV will be autonomous by using microcontrollers, cameras and other sensors, while also having the option of manual controls. Obstacle avoidance will also be implemented on the UAV. It will pilot itself over a user-defined area and capture near infrared images, tagged with GPS information. Upon completion, the UAV will land at a designated location and notify the user (by email) that the survey of the area is complete, and also send a web link to a high resolution image of the entire area.

System Block Diagram

Figure 1 shows the overall block diagram of the UAV. The aircraft will house all of the components needed for the system to work. The components need include: two digital cameras, a microcontroller, a flight controller, a GPS receiver, an inertial measurement unit (IMU) containing a three-axis accelerometer, three gyroscopes, three magnetometers, and a barometric sensor, and a data link module used for networking.

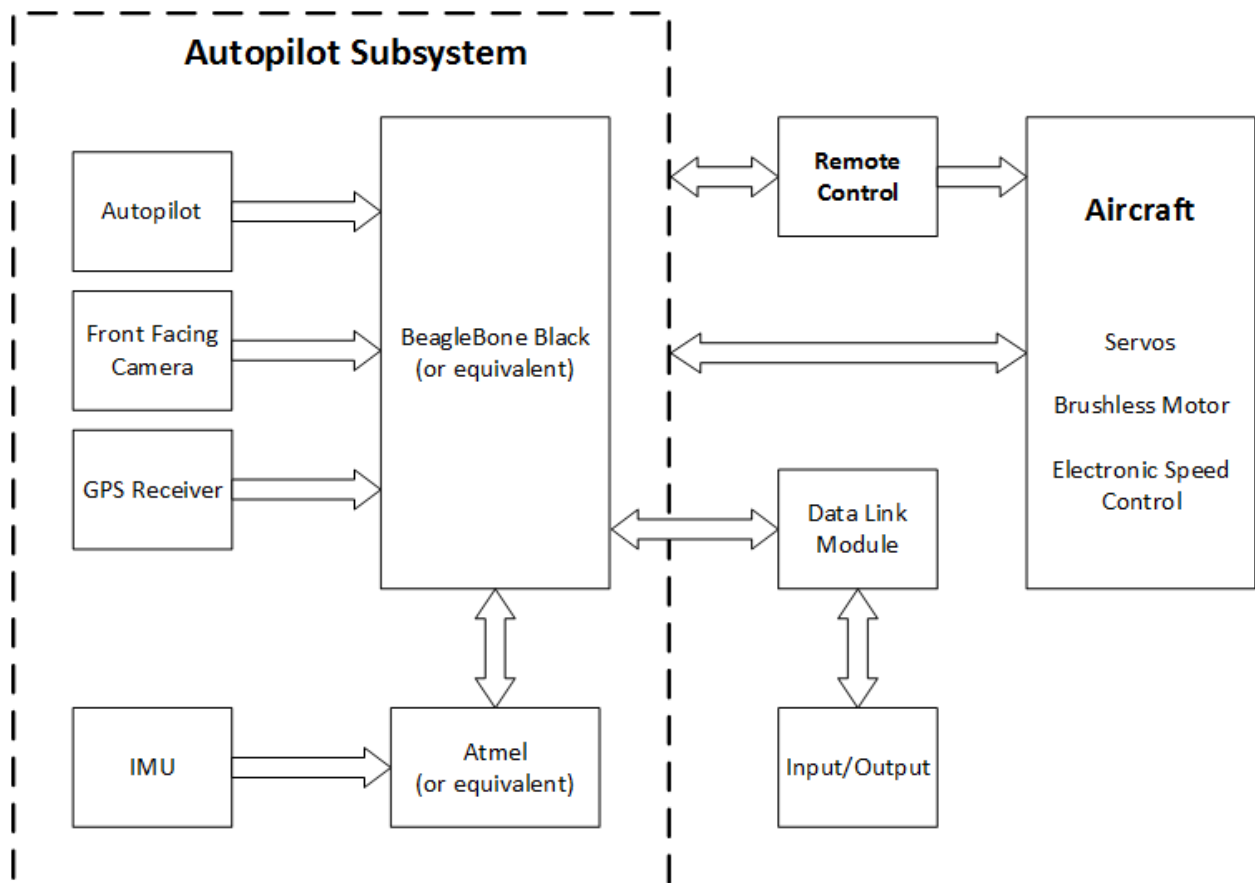


Figure 1 UAV Overall Block Diagram

Functional Requirements

Overall Requirements:

- The UAV must have an IMU, GPS receiver, flight controller, two digital cameras, microcontroller, and a data link module
- The UAV must be entirely autonomous
- Manual override must be available at all times during flight
- The UAV must be able to adjust its flight to avoid obstacles
- The UAV shall generate its own waypoints to capture images of the entire user defined area
- The UAV must be able to combine all of the images acquired into one high resolution image
- The UAV shall alert the user that the survey is complete via email, using the data link module
- The UAV shall complete the survey within 45 minutes

Airplane Requirements:

- The plane must be electrically powered
- The plane must be hand launched
- The battery must last long enough for the entire survey to be done in one charge (~20 minutes)
- The plane must be able to operate while holding all components

Camera Requirements:

- One front facing camera shall be of lower resolution to be used for obstacle detection
- Ground facing camera must be high resolution with the ability to capture near infrared pictures.
- Ground facing camera shall be a 16 megapixel camera used to capture high-resolution images.
- All images captured with the ground facing camera must be tagged with GPS information