

**Title:** Rapid Response Low Cost Airborne Digital Imaging System

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**Abstract:** The acquisition of aerial photography, and conversion to a digital format, has traditionally been a slow and costly process. With the advent of relatively inexpensive digital cameras and computer systems, along with GPS positional information, an opportunity has arisen to reduce the cost and time involved in digital image acquisition. Because of a need to monitor short lived events we designed and built a rapid response, low cost, digital aerial imaging system, and have been flying it for two years. This system, based around a Duncantech MS3100 CIR Multi-Spectral camera, can be deployed in a matter of hours, and enhanced digital photos can be reviewed in real time as they are collected or within minutes after landing. The Duncantech camera used in our system is a 3CCD system with independent gain controls for each CCD. This allows the use of different gains for different bands. For example, high gain can be used for one of the bands to optimize clear water penetration, while leaving the other two bands at a normal gain settings. The camera has a resolution of 1392x1040 pixels per band, and has a 10 bits per band dynamic brightness range. Four images can be captured per second, allowing for flight speeds of 40 to 70 knots. Our typical flight altitude is from 150 to 600 meters yielding image resolutions ranging from 0.05 to 0.25 meter/pixels. The system was assembled for under \$20,000 and cost approximately \$2,000 to \$5,000 per flight for helicopter time and travel, depending on the size of the area and distance from the helicopters duty station. The current system is not a direct replacement for traditional aerial photography because at this price range the footprint is smaller than traditional film photography. Currently, the system does not have an IMU or other spatial reference systems so our post processing geometry is not ideal. However, it is possible to georectify the images using image-to-image correlation technologies, making this system useful for small survey areas and short-term change detection applications. With higher resolution camera systems on the horizon and the cost of IMU equipment dropping the future of low cost, rapid response digital aerial imaging is promising.