

SMALL, UNMANNED AERIAL SYSTEM (UAS) APPLICATIONS FOR USE IN ENGINEERING GEOLOGIC INVESTIGATIONS

Michael Hennig

UAS Project Manager, San Diego State University Visualization Laboratory
Director RP Search Services, Southern California Region
San Diego State University, 5500 Campanile Dr. San Diego, CA. 92182 USA
Email: mhennig@projects.sdsu.edu

Gene Robinson

President, RP Flight Systems and Director RP Search Services
P.O. Box 470, Wimberly, Tx. 7867 USA
Email: gene@rpflightsystems.com

Robert Anderson

Senior Engineering Geologist, Alfred E. Alquist Seismic Safety Commission
1755 Creekside Oaks Drive Suite 100, Sacramento, CA. 95833 USA
Email: Anderson@state seismic.com

ABSTRACT

Aerial photography has been a key tool for engineering and geological investigations since the advent of the media. One of the first uses of a remotely operated airborne camera after a natural disaster was conducted after the 1906 San Francisco earthquake with a camera slung to a large kite. The camera was operated from the ground by a string connected to the camera. Over time, aerial imagery has generally been obtained using piloted, fixed- or rotary-wing aircraft. The use of a small, remote-control, aerial platform was very effectively demonstrated after the 1999 Chi-Chi Taiwan earthquake using a video camera and gimbaled, still camera mounted on an unmanned helicopter by Geo-Sinica.

Advancements in electronic devices, such as imaging and wireless communication systems, have allowed for advanced payloads to be integrated into low-cost, highly effective and rapidly deployable, small UAS platforms. This integration includes the use of high-resolution, electro-optic and micro-bolometer imaging systems, as well as wireless communication devices. To date small UAS assets based out of the San Diego State University Visualization Laboratory have been successfully used to provide fire observation support, law enforcement support, missing person searches, and general mapping. It is posited that the low cost of obtaining and operating small UAS vehicles can allow engineering geologists to quickly obtain visible-light or infra-red imagery for reconnoitering landslides, mapping fault traces, scouting for seeps in or near levees or dams, and searching for deformed ground after a large-scale earthquake or other event as the need arises on a project-specific basis. With the use of video streaming from the UAS to a laptop computer in the field, the UAS operator can control location and orientation and coverage of images, including obtaining ultra-high-resolution, stereoscopic coverage in minutes at nearly no cost of operation.

This presentation will focus on the use of small UAS in support of an engineering geologist in the field in Tijuana, Mexico near the US-built Rodriguez dam and reservoir, which may pose a significant threat to downtown Tijuana and the world's busiest border crossing at San Ysidro, California. A demonstration of the one of the UAS will follow.

