

HASP 2007:  
Scientific Report for GeoCam and Hyper-GeoCam  
payloads

Texas A&M University

Report written by: John Yezak, Texas A&M University  
Igor Carron, Spaccraft Technology Center, Texas A&M University

## 1. Introduction

This report summarizes the goals and results of two payloads that flew on HASP 2007: GeoCam and Hyper-GeoCam, two small class experiments. Both payloads stories were reported in one blog [3].

## 2. GeoCam

For HASP 2007, it was decided to re-fly the successful GeoCam payload that flew in 2006 and yielded the longest panoramic view ever taken from a single camera [1] [2]. Because of this successful run, we decided to re-fly the same hardware as-is in the HASP 2007 campaign with some larger memory SD card and a shorter time interval than in 2006 (it was 23 seconds then).

On landing with HASP, GeoCam fell from the main payload. This hard impact damaged the camera. The camera was flooded [Figure 1] but the SD card was recoverable and could be read.



Figure 1: Recovered GeoCam box.

A screenshot of the SD card directory can be seen in Figure 3. In there one can see that various trials performed on July 27<sup>th</sup> at integration worked well. One can also see that a month later, two photographs were taken one day apart. Each photographs (Figure 2) represent the start-up of the HASP whole payload. They also show that GeoCam was unable to take any photographs after the very first one of the series. The shock sustained by GeoCam made it impossible to figure out the failure mechanism sustained by the payload.



Figure 2: Image taken from GeoCam.

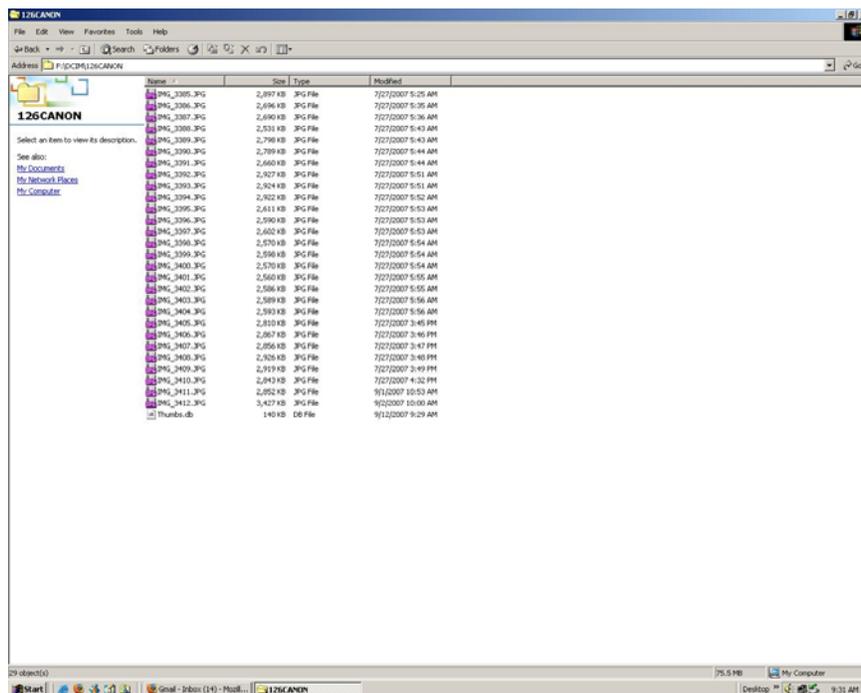


Figure 3: Screenshot of the GeoCam SD card

### 3. Hyper-GeoCam

Hyper-GeoCam was a payload destined to produce imagery that had both a natural image and an altered version of that image through the use of a random mirror set-up. The camera is using the mechanism detailed in the random lens imager [4] that uses the new paradigm of Compressed Sensing. The goal of this experiment was first to produce a transfer function between random image and natural images. The second goal of this experiment was also designed to evaluate this transfer function on a series of wavelength thereby showing the possibility of producing a low cost hyper-spectral imager. In order to be successful, the deconvolution of the “random” image requires a large series of natural images, i.e. more than 1000 images needed to be taken in order to evaluate the sparse transfer function.

For reasons unknown to the group, Hyper-GeoCam stopped working after 20 minutes with fewer than 20 images stored on the camera.



Figure 4: Recovered Hyper-GeoCam payload.



Figure 5: Last image taken from Hyper-GeoCam at 1 km altitude. The natural image is on the right side, the “random” image is on the left side.

Most of the work that was to be expanded on this payload was to be performed after the data had been collected by the payload. Since the payload failed in recovering more than a certain number of image data, the undergraduate group in charge of this payload did not pursue this project further.

We were not able to reproduce the failure mechanism for this system.

#### 4. Conclusion

Both experiments did not perform as expected and did not yield useful information. The failure mechanism is most probably linked to the snapshot or finger mechanism. However we were not able to reproduce the failure mechanism.

Reference:

[1] A 150-km panoramic image of New Mexico,  
<http://blogs.zdnet.com/emergingtech/?p=446>

[2] Poster/Presentation “GeoCam - An off-the-shelf Imager for Rapid Response Remote Sensing Monitoring”. workshop on Unmanned Airborne Vehicle Imagery for Domestic Emergency Response & Natural Resource Survey organized by the NASA/UL Lafayette Regional Application Center, the U.S. Geological Survey of the Department of the Interior and the National Wetland Research Center. December 13-14th, 2006

[3] GeoCam / Hyper-GeoCam blog: <http://hasp-geocam.blogspot.com/>

[4] Random Lens Imaging, Fergus Rob, Torralba Antonio, Freeman William T., 2-Sep-2006, Massachusetts Institute of Technology Computer Science and Artificial Intelligence Laboratory, <http://dspace.mit.edu/handle/1721.1/33962>