### NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety Washington, D.C. 20594

### **UAS Aerial Imagery Factual Report**

### 4/27/2018

### A. <u>ACCIDENT</u> CEN18FA078

Location:	Raton, New Mexico
Date:	January 17, 2018
Time:	1800 Local Time (MST)
Event:	Bell UH-1H N658H CFIT

### B. <u>PERSONNEL</u>

UAS RPIC:	Bill English
	National Transportation Safety Board
	Washington, D.C.

UAS RPIC:	Jay Eller
	Honeywell
	Phoenix, AZ.

# C. <u>ACCIDENT SUMMARY</u>

On January 17, 2018, about 1800 mountain standard time, N658H, a Bell UH-1H helicopter, impacted terrain near Raton, New Mexico. A ground fire and explosion subsequently occurred. The commercial pilot, pilot rated passenger, and three other passengers were fatally injured. One passenger sustained serious injuries. The helicopter was destroyed during the impact and ground fire.

## D. <u>DETAILS OF IMAGERY</u>

### **1.0 Equipment and Procedures**

### **Equipment**

Initial scene photography and video was taken on January 19, 2018 by the Honeywell party representative using a DJI Phantom 3 Professional small unmanned aircraft system (sUAS, commonly known as a drone). The drone is equipped with a GPS/GLONASS receiver which provides georeference information on all still photos. The drone is equipped with an FC300 camera using the Sony Exmor 1/2.3" CMOS sensor, with a focal length of 20 mm. Still photo resolution was 12 megapixels in JPG or RAW format. One video was taken in MP4 format with UHD resolution at 30 frames per second.

Terrain mapping and viewpoint flights of the impact area were conducted on March 29 2018, using the NTSB DJI Phantom 4 Professional. The drone is equipped with a dual GPS/GLONASS receiver which provides georeference information on all still photos. The drone is equipped with an FC6310 camera using the Sony Exmor 1" CMOS sensor, with a focal length of 8.8 mm. Still photo resolution is 20 megapixels in JPG or RAW format. Videos were taken in MP4 format with 4K resolution at 60 frames per second.

Ground control points (GCP) were taken with a Trimble GEO7X differential GPS receiver in the impact area and corrected using the Wagon Mound, NM Continuously Operating Reference Station (CORS).

## **Procedures**

The accident site was in Class G airspace, no airspace authorization was required, and the flights were conducted under 14 CFR 107. The wreckage area was on unpopulated ranch land on a mesa with grass and sparse low brush. The mesa had a rise of about 100 feet in the area preceding the impact, as well as small hillocks. The initial site photography was taken during daylight hours to document the wreckage area. The goal of the March 29 flights was to document the view of the terrain in similar lighting conditions as the accident flight (corrected for date), and to make a detailed map of the terrain features.

The sUAS was flown in 3 overlapping grids over the approach to the main wreckage area capturing still images to create the terrain map. An additional panoramic set of stills was taken for orientation and visualization. Linear flights between the location and altitude of the last ADS-B target and the impact area were flown at various descent angles to capture viewpoint video surrounding the twilight timeframe of the accident. Total flight time was approximately 90 minutes.



Figure 1 – Flight Path of Helicopter, source: ADS-B

# Processing

Geo-referenced still imagery was processed using Pix4D photogrammetry software to provide a 3D model, orthomosaic map, and digital terrain model (DTM) with contours of the wreckage site. The orthomosaic was exported in Google Earth tiles kmz format. The output data, source radar, site documentation data was assembled in ArcMap GIS software to create a layered wreckage area map.

Video from the linear flights was overlaid with cockpit imagery from an exemplar helicopter as a visualization aid. The overlay is an approximation, as actual pilot position and eye height is not known

## 2.0 Imagery products

Approximately 700 high resolution photos and videos were gathered. Select source data, orthomosaic, DTM, and contour exports are included in the docket for this accident. Select photos and excerpts are included below.



Figure 2 – Wreckage looking back toward impact scar



Figure 3 – View along route of flight toward impact during daylight



Figure 4 – View along route of flight toward impact at sunset



Figure 5 – View along route of flight toward impact during twilight



Figure 6 – 3D model of terrain



Figure 7 – 3D model of terrain using topo chart color ramp



Figure 8 – Orthomosaic map overlaid on Google Earth



Figure 9 – Digital terrain map with contours at 1m intervals



Figure 10 – Video Overlay Snapshot

Attachment 1 – Google Earth kmz export

- Attachment 2 Digital Terrain Model geo-tiff
- Attachment 3 Contour shapefile
- Attachment 4 "Fly through" of 3D model
- Attachment 5 Video clips of viewpoint flights day/sunset/twilight
- Attachment 6 Video overlay of viewpoint flight with exemplar cockpit sunset/twilight
- Attachment 7 Aerial photo of wreckage (Fig 2)
- Attachment 8 Aerial photo of wreckage and scar