NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

Unmanned Aircraft System (UAS) Aerial Imagery Report

August 1, 2019

A. ACCIDENT WPR19FA109

Location: Fort McDowell, Arizona
Date: April 16, 2019

B. PERSONNEL

UAS RPIC:[1] Michael Bauer
National Transportation Safety Board
Washington, D.C.

C. ACCIDENT SUMMARY

On April 16, 2019, at 0706 mountain standard time, a Bell 206B experimental helicopter, N61PH, impacted an alfalfa field, about 1 mile south of Fort McDowell, Arizona. The commercial pilot and pilot-rated passenger were fatally injured. The helicopter was destroyed. The helicopter was registered to TRE Aviation Corporation and operated by Van Horn Aviation, LLC for research and development flight testing under the provisions of Title 14 *Code of Federal Regulations (CFR)* Part 91. Visual meteorological conditions prevailed, and no flight plan was filed. The accident occurred during the second leg of the test flight, which originated from Falcon Field (FFZ), Mesa, Arizona at 0632.

D. DETAILS OF IMAGERY

1.0

The UAS was deployed to assist in a search for a missing section of the main rotor blade from the helicopter. During preliminary discussions with the NTSB investigator-in-charge (IIC), information was provided regarding a witness video and initial an initial impact point and locations of wreckage found around the site. Using this information, seven areas were planned for conducting visual search patterns, see Figure 1. The search patterns were flown at an altitude of 260 ft above ground level (agl).

[1] RPIC – Remote pilot-in-command

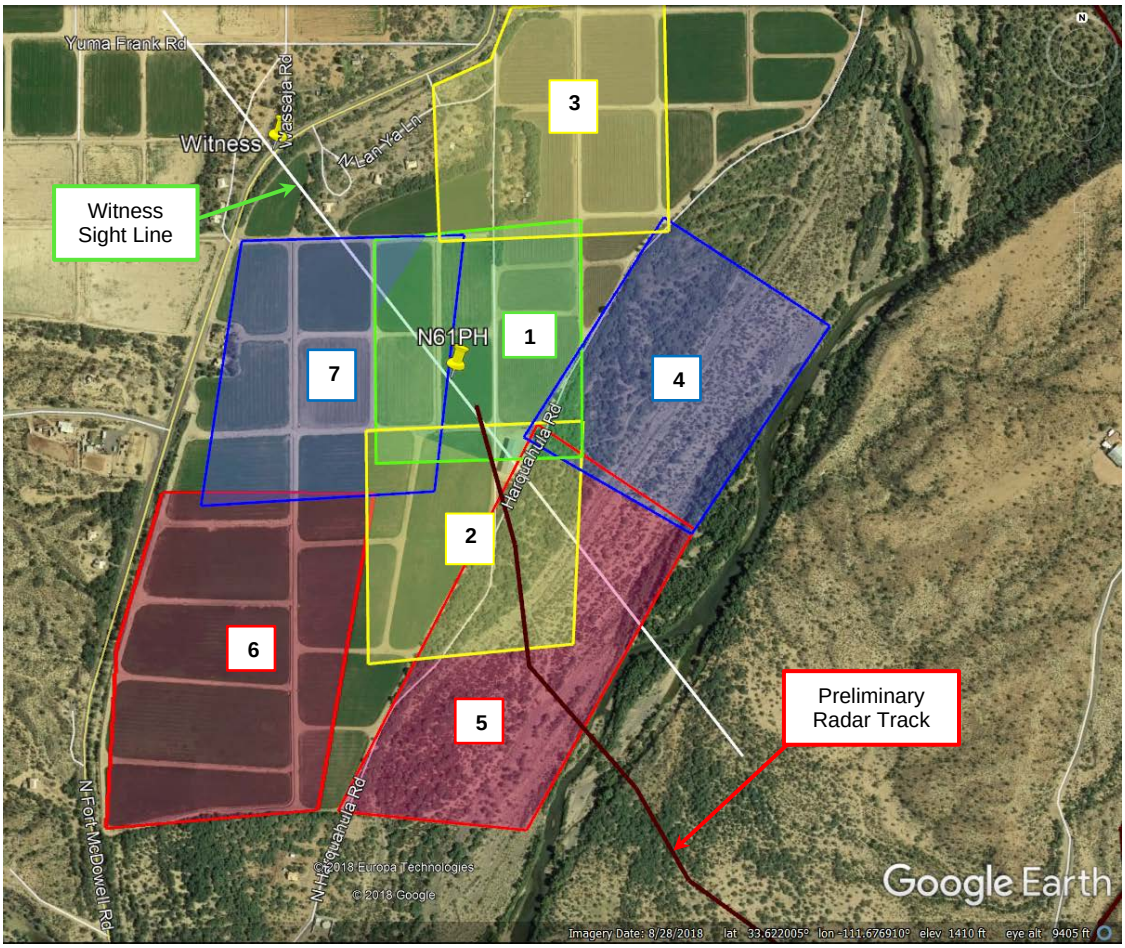

Figure 1 - Planned search areas

2.0 Equipment and Procedures

Equipment

Mapping and search flights of and around the accident site were conducted on April 16th, 2019, using the DJI Phantom 4 Professional V2 (P4PV2) small UAS (sUAS, commonly known as a drone). The drone was equipped with a dual GPS/GLONASS receiver which provides georeferenced information on all still photos. The drone was also equipped with an FC6310 camera using the Sony Exmor 1-inch 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.

No ground control points were measured for these flights.

Procedures

The accident site was located in an area of alfalfa fields approximately 10.1 nm from FFZ. The accident site was in class G airspace. Flights were conducted under the provisions of 14 CFR Part 107.

The sUAS was flown in a series of grids over each search area at an altitudes of 260 ft agl from the launch point. Sample photos were taken of exemplar wreckage (placed both in the alfalfa fields and on the road) to aid in the search process.

The search procedure consisted of the search grid mission being flown, and upon completion the photos were reviewed by the IIC and additional search team members. While the photo review was being conducted the next search grid would be flown. As the team reviewed the photos, any photos which contains points of interest were noted, and the EXIF data[2] of the noted photos were used to plan additional flights for closer inspection or search by the ground team.

During the review of search grid 2, an object of interest was spotted, and a ground searcher was dispatched to check the object. While enroute to the object, and during the flight of search area 3, the missing rotor blade was found. The missing main rotor blade was located about 1,670 ft south-southeast (160°) from the main wreckage site. Additional sets of still images were taken for additional viewpoints around the accident scene. The remaining search areas were not flown after the rotor blade was identified and recovered. Total flight time was about 1 hour 20 minutes.

Accident Site Processing

Geo-referenced still imagery was processed using Pix4D photogrammetry software to produce a three-dimensional (3D) point cloud and an orthomosaic map of the accident site and the search areas. Relative accuracy (within the map) was calculated at 1.82 inches, twice the average ground sample distance.

3.0 Accident Site Imagery products

About 850 high resolution photos, one panoramic image and one video were gathered. Select photos (compressed to a lower resolution) and excerpts from the 3D modelling products are included in this report and detailed in the following paragraphs. The original high-resolution images and select output products for the figures included this report are contained in the docket for this accident and listed in section 4.0.

Figure 2 contains a still image taken from north of the hay barn looking toward the accident site in the alfalfa field.

[2] EXIF is an EXchangeable Image File format standard that places data within the image that possibly includes but is not limited to, camera position, camera orientation, camera altitude, date, and time.

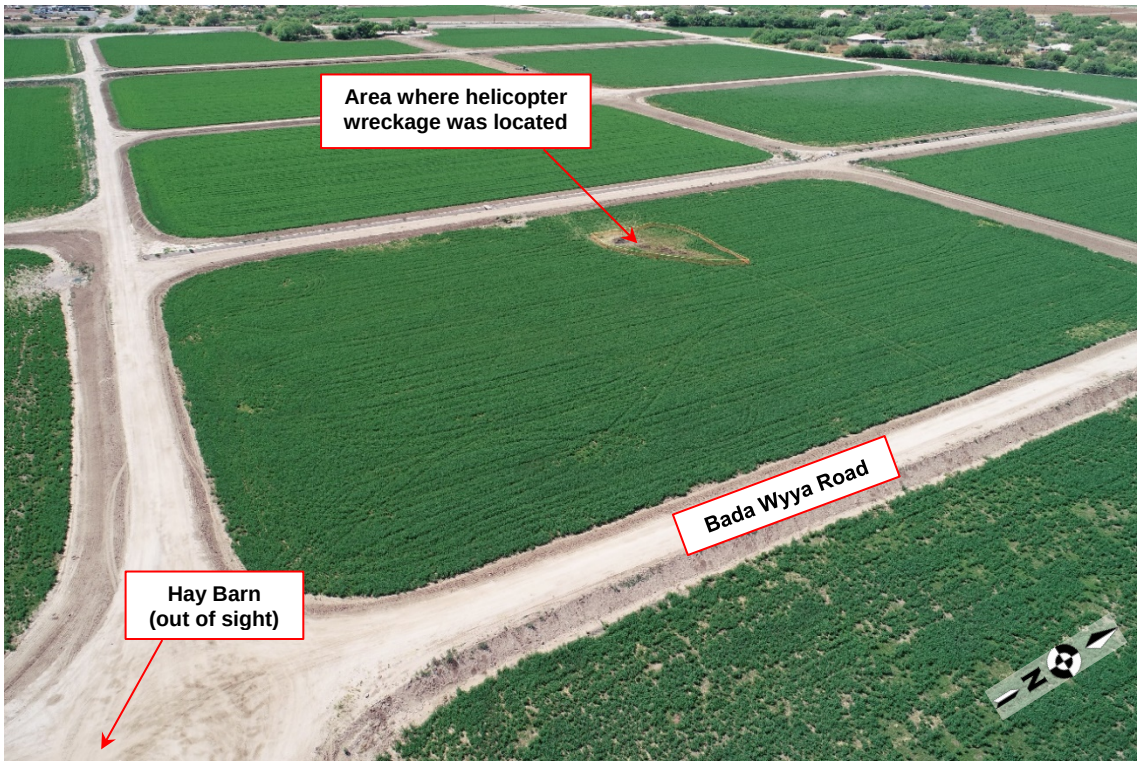

Figure 2 - Accident site (positional arrow approximate)

Figure 3 contains a still image taken from south looking toward the accident site and including the main rotor blade location.

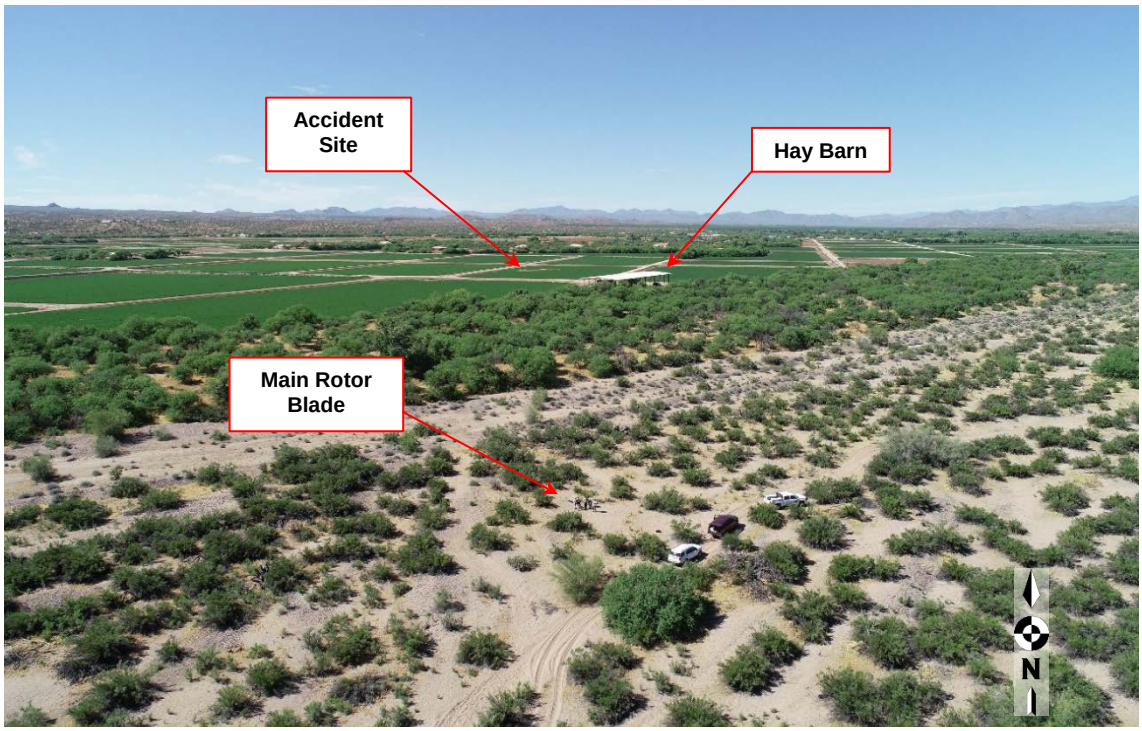

Figure 3 – View looking at the main rotor blade toward accident site (positional arrow approximate)

Figure 4 contains a still image taken from overhead of the main rotor blade that was missing. Small pieces of the rotor blade can be seen around the main piece of blade.

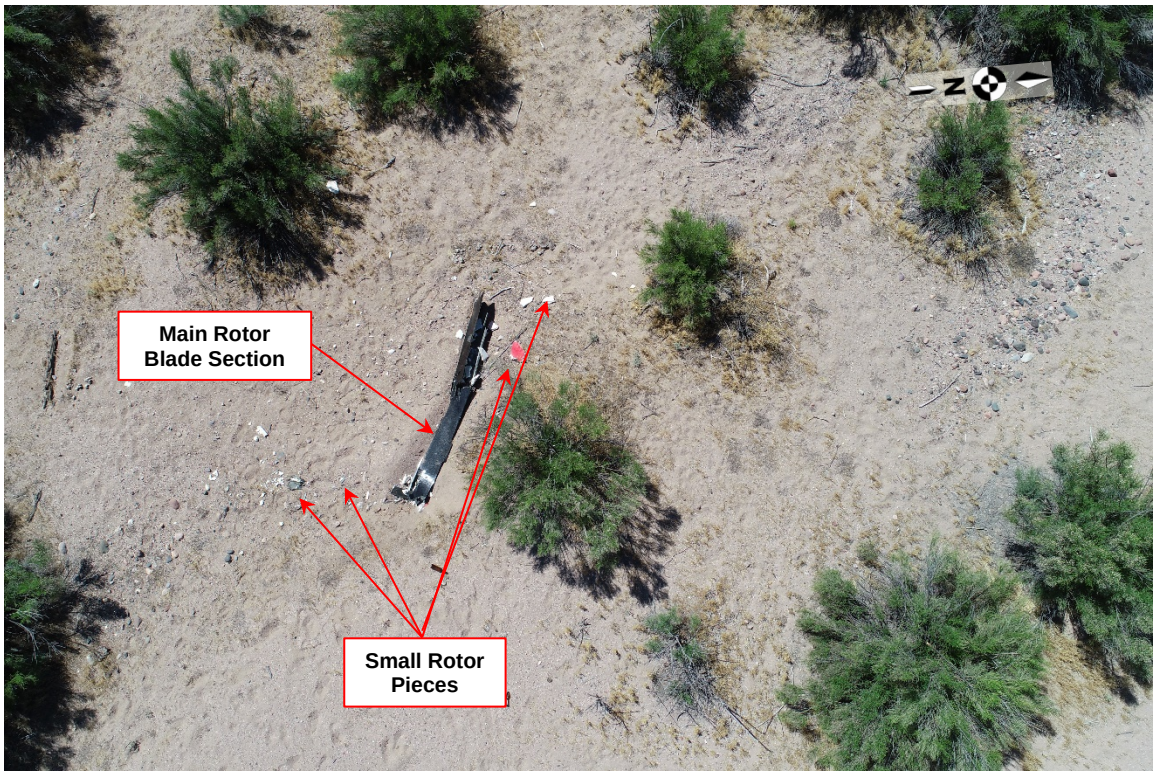

Figure 4 – Section of main rotor blade as found (positional arrow approximate)

Figure 5 contains multiple orthomosaics generated by Pix4D overlaid on a Google Earth image. A green pushpin indicates the location of the missing main rotor blade, while yellow pushpins indicate the accident site, the witness location, and other recovered main rotor blade sections. Figure 6 contains the search areas extents overlaid on the Google Earth image along with the processed orthomosaics.

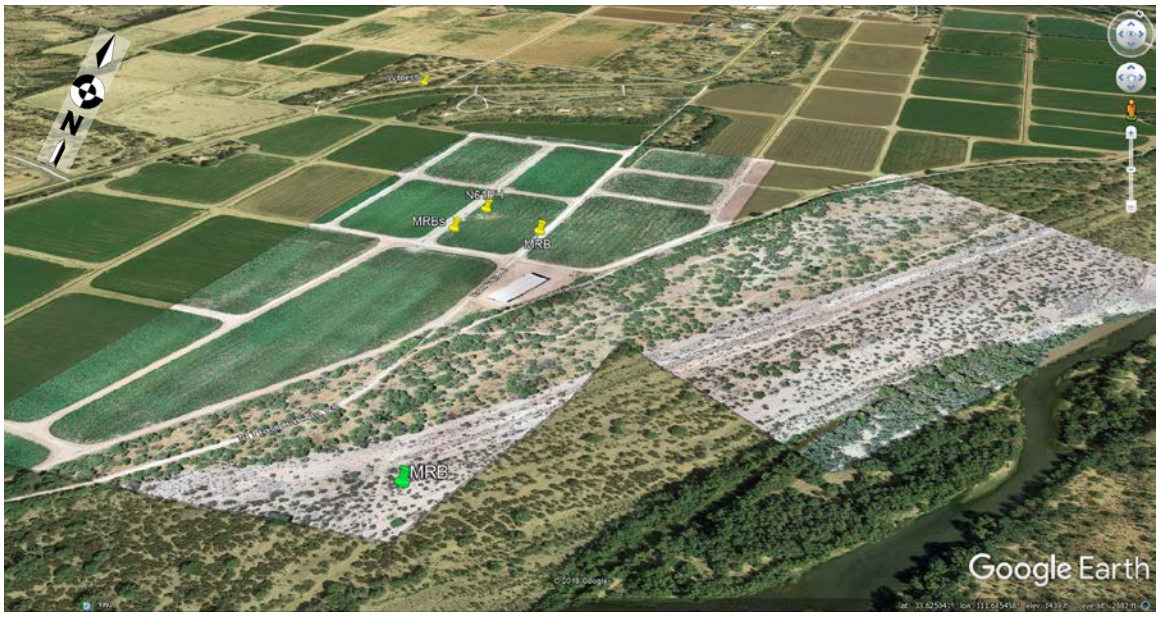

Figure 5 - Orthomosaic of searched areas overlaid on Google Earth (green pin indicates location of main rotor blade

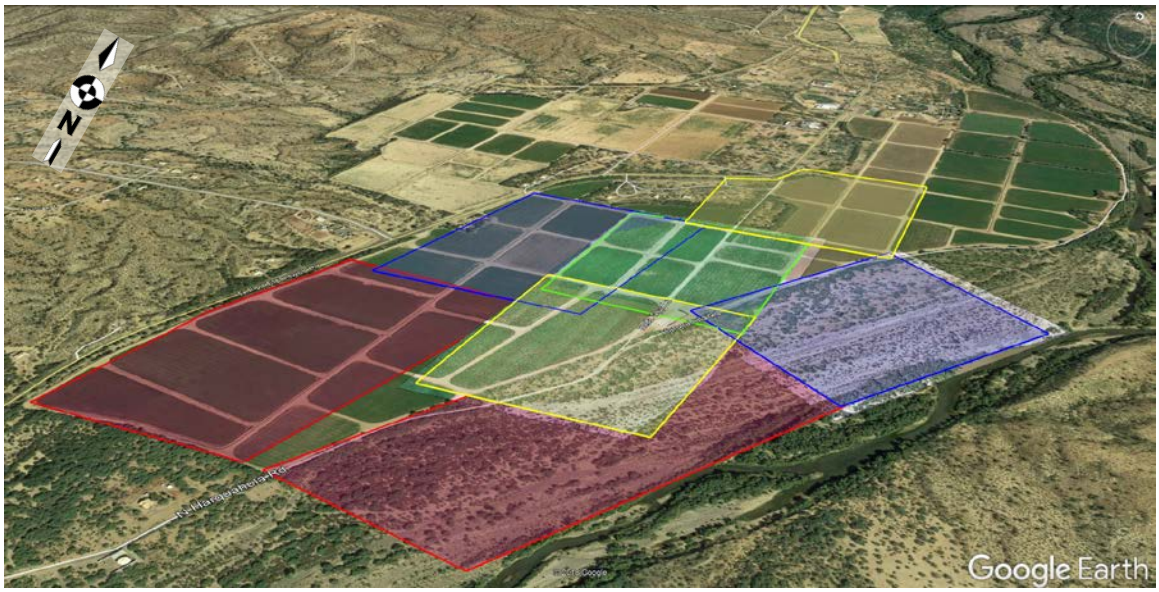

Figure 6 - Orthomosaic with search areas overlaid

Figure 7 and Figure 8 contain still images with exemplar wreckage pieces placed on the gravel road adjacent to the hay barn taken from overhead at an altitude of about 260 ft above ground level and at a lower altitude.

Figure 7 – Exemplar wreckage (highlighted) on road from about 260 ft agl

Figure 8 - Exemplar wreckage (highlighted) on road from low altitiude

Figure 9 and Figure 10 contain still images with exemplar wreckage pieces placed in the alfalfa field adjacent to the hay barn taken from overhead at an altitude of about 260 ft agl and at a lower altitude.

Figure 9 - Exemplar wreckage (highlighted) in alfalfa field from about 260 ft agl

Figure 10 - Exemplar wreckage (highlighted) in alfalfa field from low altitude

4.0 Attachments

Attachment 1 – Original Photograph used in Figure 2
Attachment 2 – Original Photograph used in Figure 3
Attachment 3 – Original Photograph used in Figure 4
Attachment 4 – Orthomosaic map in Google Earth .kmz format (ref. Figure 5)
Attachment 5 – Original Photograph used in Figure 7
Attachment 6 – Original Photograph used in Figure 8
Attachment 7 – Original Photograph used in Figure 9
Attachment 8 – Original Photograph used in Figure 10