

# NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety  
Washington, D.C. 20594

## UAS Aerial Imagery Report

7/10/2018

### A. ACCIDENT ERA18FA120

Location: Daytona Beach, Florida

Date: April 4, 2018

### B. PERSONNEL

UAS RPIC<sup>1</sup>: Michael Bauer  
National Transportation Safety Board  
Washington, D.C.

UAS VO<sup>2</sup>: Catherine Gagne  
National Transportation Safety Board  
Atlanta, GA

### C. ACCIDENT SUMMARY

On April 4, 2018, at approximately 0953 eastern daylight time, a Piper PA-28R-201, N106ER, collided with terrain following an in-flight breakup shortly after takeoff from Daytona Beach International Airport (DAB), Daytona Beach, Florida. The airline transport pilot and private pilot were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by Embry-Riddle Aeronautical University and operated under the provisions of 14 Code of Federal Regulations Part 91 as an instructional flight. Day visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed for the local flight, which departed DAB at 0927.

### D. DETAILS OF IMAGERY

#### 1.0 Equipment and Procedures

##### Equipment

Mapping and still imagery capture of the accident site was performed on April 5, 2018, using the NTSB DJI Phantom 4 Professional (P4P) small unmanned aircraft system (sUAS, commonly known as a drone). The drone is equipped with a dual

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<sup>1</sup> RPIC – Remote Pilot In Command

<sup>2</sup> VO – Visual Observer

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, and significant wreckage locations were documented with a Trimble GEO7X differential GPS receiver.

### **Procedures**

The accident site within the Class C airspace controlled by the Daytona Beach air traffic control tower (ATCT). A Special Governmental Interest (SGI) waiver was granted by the FAA to conduct flights within the class C airspace at or below 100 ft above ground level (AGL). The flight was conducted under 14 CFR 107. The wreckage was located in two fields separated by a two-lane road. Traffic flow was not impacted during the mapping flights with none of the mapping flights were conducted directly over the road. Weather conditions were clear with less than 20 knot winds.

The sUAS was flown in two separate automated overlapping grids over the both wreckage areas at 100 ft AGL. Additional panoramic photos were taken to create images above the wreckage to provide situational awareness in the vicinity of the wreckage. Total mission time was approximately 40 minutes.

### **Processing**

Geo-referenced still imagery was processed using Pix4D photogrammetry software to produce a 3D point cloud and an orthomosaic map of the wreckage site. Relative accuracy (within the map) was calculated at 0.58 inches, twice the average ground sample distance of 0.29 in.

DGPS data was used to correct for any UAS elevation data errors and provide positional data for ground control points and checkpoints. DGPS data was corrected using the continuously operating reference station (CORS) at Ormond Beach, Florida (ORMD). Horizontal and vertical positional accuracy (when compared to features outside the 3D point cloud) was calculated at 3.9 inches in each direction.

## **2.0 Imagery products**

Approximately 380 high resolution photos and one videos was gathered. Select photos, snapshots from video, and excerpts from the 3D point cloud are included in this report in section 5.0. A list of images and select output products attached to this report and contained in the docket are listed in section 4.0.

Figure 1 is a still image showing a general overview of the accident scene. The left wing is in the foreground and the main wreckage is in the background past Tomoka Farms Road. The distance between the main wreckage and left wing was measured to be approximately

200 ft, using data from the point cloud. One tree is highlighted to show its location due to the multiple branches that were severed during the aircraft wreckage's descent.

Figure 2 is a still image showing the main wreckage at the accident scene. The fuselage, right wing and bottom surface of the stabilator is visible in the image.

Figure 3 is a still image showing the left wing at the accident scene. Left main landing gear can be seen in an extended position.

Figure 4 is a closeup, cropped, still image showing the tree that had branches separated during the aircraft's descent. Multiple severed branch locations are noted. Utilizing data from the point cloud, the aircraft's angle of descent was approximately 71 degrees relative to the horizon.

Figure 5 contains a screenshot of the orthomosaic map in Google Earth .kmz format.

Figure 6 is a sample of the panoramic view of the overall accident scene. The image was created using commercially available software which stitched together 34 individual images taken using a programmed sequence from the drone control software. The product is intended to be used with a 360 Panoramic viewer software and it is projected onto 2D for this report, creating various distortions. The original panoramic image is an attachment to this report and located in the accident docket.

#### **4.0 Attachments**

**Attachment 1** – Original Photograph without mark-ups used in Figure 1

**Attachment 2** – Original Photograph without mark-ups used in Figure 2

**Attachment 3** – Original Photograph without mark-ups used in Figure 3

**Attachment 4** – Original Photograph, uncropped, without mark-ups used in Figure 4

**Attachment 5** – Orthomosaic map in Google Earth kmz format (ref. Figure 5)

**Attachment 6** – Panoramic Image shown in Figure 6

5.0 Oversized Imagery



Figure 1 – Photo – Scene Overview (directional arrow approximated)

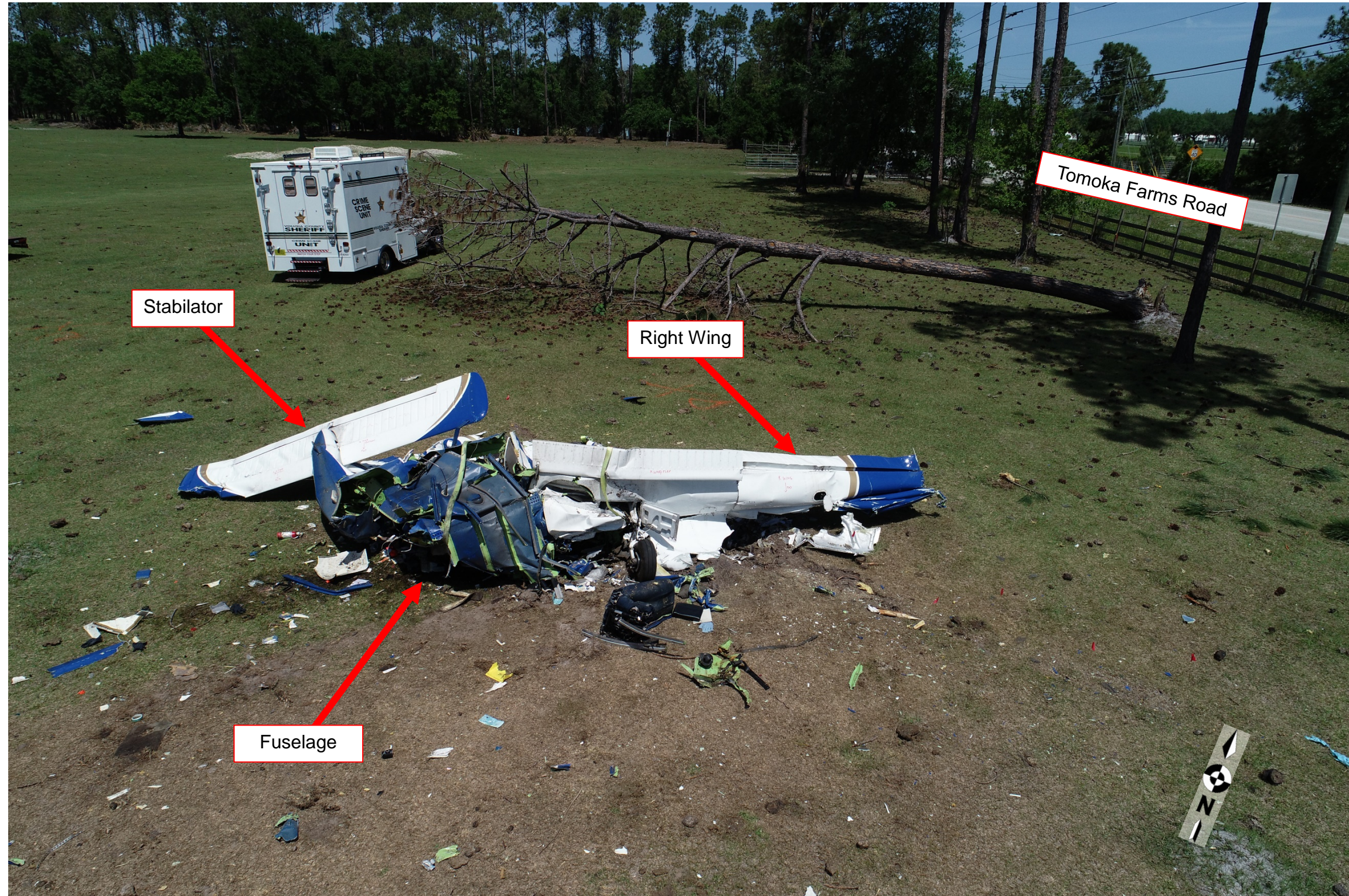


Figure 2 – Photo, Main Wreckage Site (directional arrow approximated)

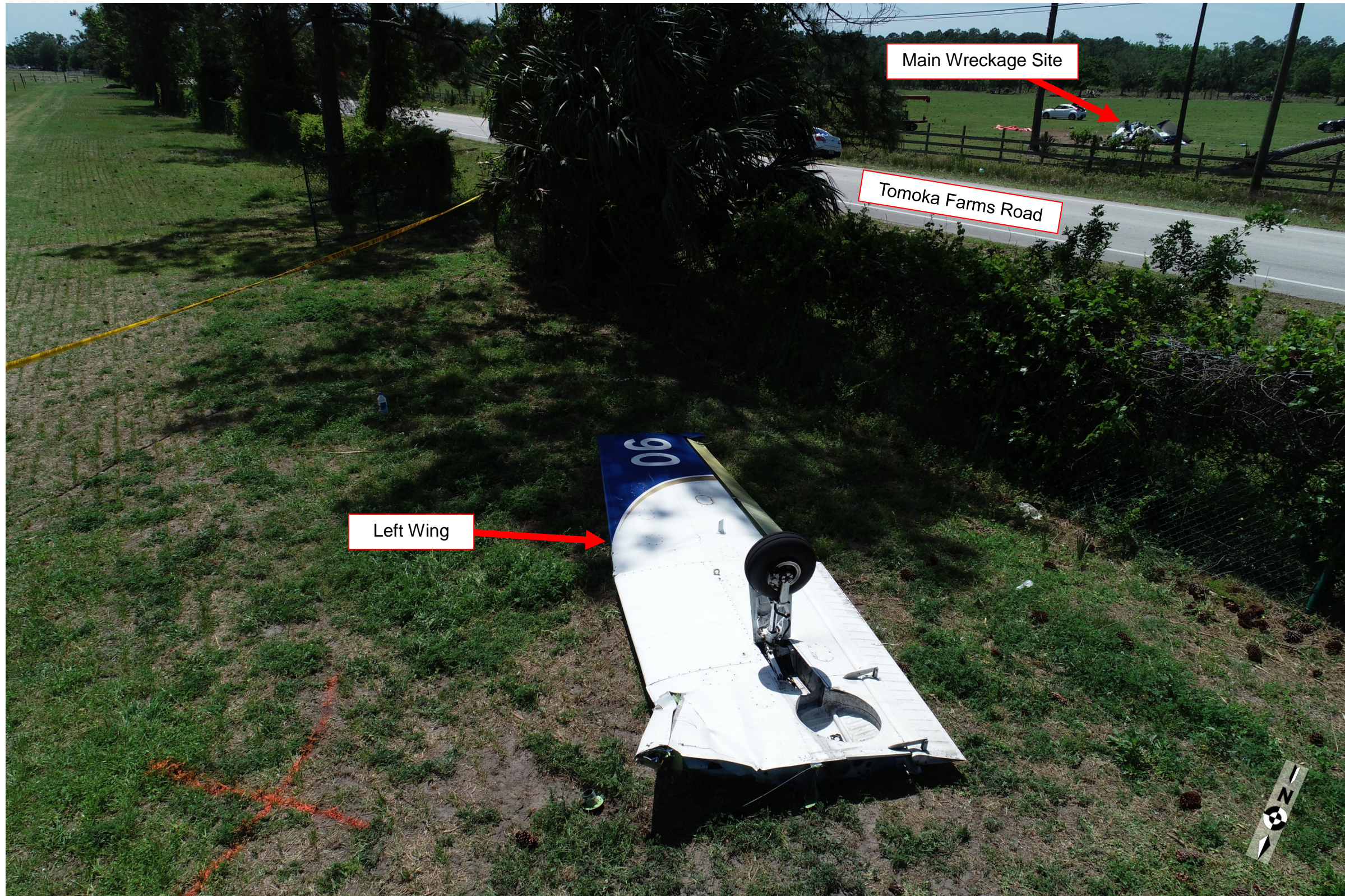


Figure 3 – Photo – Left Wing (directional arrow approximated)



Figure 4 – Photo (Cropped) showing a closeup of tree in flight path with broken branches (directional arrow approximated)



Figure 5 - Orthomosaic of accident site overlaid on Google Earth.





Figure 6 - Panoramic image of wreckage scene (Image contains distortions)<sup>3</sup>.

<sup>3</sup> The image is intended to be viewed with 360 Panoramic viewer software and it is projected onto 2D for this report, creating various distortions (i.e. roadway curvature).