

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

February 2, 2021

Video Study

Specialist's Study Report
By Sean Payne

1. EVENT

Location:	West Palm Beach, Florida
Date:	October 8, 2020
Aircraft:	Cessna 414, N8132Q
Operator:	Private
NTSB Number:	ERA21LA011

2. GROUP

A group was not convened.

3. SUMMARY

On October 8, 2020, about 1115 eastern daylight time, a Cessna 414, N8132Q, was substantially damaged when it was involved in an accident at North Palm Beach County General Aviation Airport (F45), West Palm Beach, Florida. The private pilot and six passengers sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

4. DETAILS OF INVESTIGATION

On November 23, 2020, the National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following electronic files:

File:	IMG_3210.mov & IMG_1405.mov
Location:	Ramp Area – SunQuest Aviation
Source:	Personal Electronic Device (PED)

File:	North Ramp PTZ - .2.24 - Camera - 7-2020-10-08 _09h50min36s000ms.mp4
Location:	Ramp Area – SunQuest Aviation
Source:	Security Camera System

1.1. Recorder Description

The videos “IMG_1405.mov” and “IMG_3210.mov” were recorded on a personal electronic device (PED). The exact type of PED was not documented, however, the file had characteristics of being recorded with an Apple device.

The security camera system that captured the video file named “0 - 2020-10-29 09-38-08-990.mp4” was not documented.

1.2. Video Files

IMG_3210.mov

A video file, IMG_3210.mov, was supplied to the NTSB by a witness. The video was supplied to the NTSB with a resolution of 1280 x 720 pixels and a frame rate of 30 frames per second (fps).

Attachment 1 is the video in its native format as supplied to the NTSB.

Figure 1 is a screenshot of this recording showing the perspective of the camera as it relates to the accident aircraft during part of the recording.



Figure 1. A screenshot from video file IMG_3210.mov. This shows the accident aircraft prior to the attempted flight.

IMG_1405.mov

A video file, IMG_1405.mov, was supplied to the NTSB by a witness. The video was supplied to the NTSB with a resolution of 1280 x 720 pixels and a frame rate of 30 frames per second (fps).

Attachment 2 is the video in its native format as supplied to the NTSB.

Figure 2 is a screenshot of this recording showing the perspective of the camera as it relates to the accident aircraft during part of the recording.



Figure 2. A screenshot from video file IMG_1405.mov. The accident aircraft is circled in red.

North Ramp PTZ - .2.24 - Camera - 7-2020-10-08_09h50min36s000ms.mp4

This electronic video file was received as a .mp4 file. The video was supplied to the NTSB with a resolution of 1280 x 720 pixels and a frame rate of 29 fps.

Attachment 3 is the video in its native format as supplied to the NTSB.

Figure 3 is a screenshot of this recording showing the perspective of the camera as it relates to the accident aircraft during part of the recording.



Figure 3. A screenshot from the North Ramp PTZ camera recording. The accident aircraft is circled in red. Text indicates the witness's position who recorded IMG_1405.mov.

Determination of the Elevator's Pitch Condition Prior to and During Takeoff Roll

Extracted frames from videos IMG_3210.mov and IMG_1405.mov were captured, enhanced and compared to an exemplar image of a Cessna 414 with an elevator control lock installed. The condition of the exemplar Cessna 414 with the elevator control lock installed is shown in figure 4. Figure 4 shows the elevator in a trailing edge down position. Elevator "horns" which are visible on the outer edges of the elevator are shown being above the horizontal stabilizer surface. This is annotated in figure 4.



Figure 4. A exemplar photo of a Cessna 414 with an elevator control lock installed. The elevator is fixed in a trailing edge down position. Elevator horns are seen on the edge of the horizontal stab and above the horizontal stab.

Figures 5, 6, 7 and 8 are extracted frames from IMG_3210.mov. The frames were zoomed, cropped, and filtered with a series of sharpness and blur effects in an attempt to clarify the image. The elevator is in a trailing edge down position shown on the figures. The exact position of the elevator in relation to the horizontal stab was not quantified.



Figure 5. Frame 79 from IMG_3210.mov.



Figure 6. Frame 100 from IMG_3210.mov.



Figure 7. Frame 221 from IMG_3210.mov.



Figure 8. Frame 250 from IMG_3210.mov.

Figure 9 is an extracted frame from IMG_1405.mov. The figure shows the accident aircraft was on a takeoff roll approximately 1,900 feet from the runway 14 threshold. The frame has been zoomed, cropped, and filtered with a series of sharpness and blur effects in an attempt to clarify the image. The elevator position was unable to be determined from this image. As the aircraft passed the observer and traveled down the runway, the tail of the aircraft was visible, however, at the resolution provided, a determination of elevator position was unable to be made.



Figure 9. An extracted frame from IMG_1405.mov.

Determination of the Aircraft's Average Groundspeed on Takeoff Roll

An attempt was made to determine the aircraft's average groundspeed during portions of takeoff roll. After review of all three video recordings, it was determined that IMG_1405.mov recorded from the witness's position shown in figure 3 would be the best candidate for performing a calculation of the average groundspeed. Furthermore, the exact witness's position at the airport is indicated in figure 10.

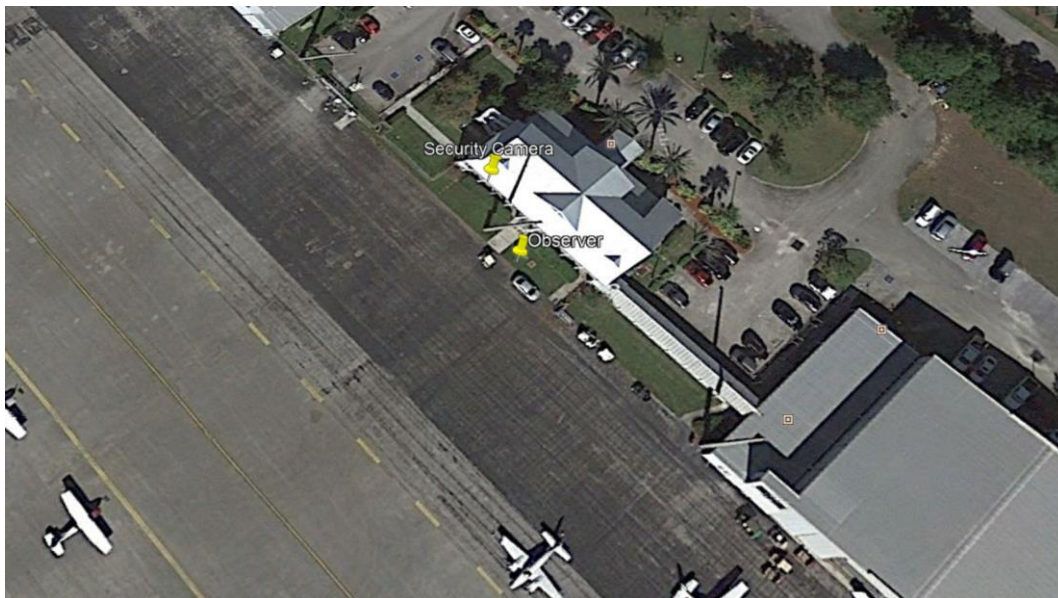


Figure 10. Pins indicating the observer's position as well as the position of the East Ramp PTZ security camera.

Using the information from IMG_1405.mov, three lines of sight were identified from the observer's perspective, and they were translated to a geographical map (Google Earth). Figure 11 shows these three lines of sight, path 1, path 2 and path 3. Path 1 translates from the observer's position, across the runway and to the leading edge of a bank of trees. Path 2 translates from the observer's position, across the runway and to the airport's windsock. Path 3 translates from the

observer's position, across the runway and to an antenna structure adjacent to runway 9R. Three virtual points were created on the runway where path 1, path 2 and path 3 cross the runway's centerline. These points are now referred to as point 1, point 2 and point 3. When measured on Google Earth, the distance between these points 1 and 2 is approximately 231 feet, and between points 2 and 3 is 113 feet. The red line indicates the distance between points 1 and 2 and the green line indicates the distance between points 2 and 3.

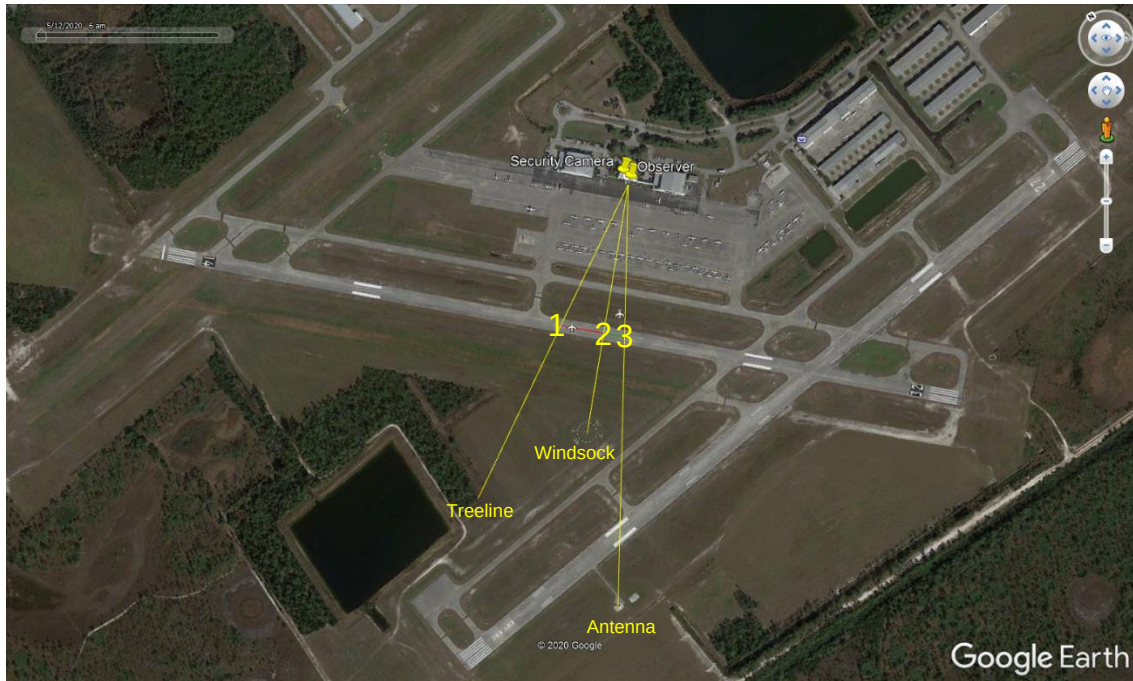


Figure 11. Lines of sight identified on airport property that translate to the observer's position in IMG_1405.mov.

Next, three frames were extracted from IMG_1405.mov that show the aircraft's nose intersecting these two positions. Figure 12 shows the aircraft at point 1. Figure 13 shows the aircraft at point 2. Figure 14 shows the aircraft at point 3. For the aircraft to travel between points 1 and 2, 44 frames had elapsed, or approximately 1.467 seconds had passed based on the camera's frame rate of 30 frames per second. For the aircraft to travel between points 2 and 3, 20 frames had elapsed, or approximately 0.667 seconds had passed based on the camera's frame rate of 30 frames per second.



Figure 12. The aircraft at point 1 on the runway.



Figure 13. The aircraft at point 2 on the runway.



Figure 14. The aircraft at point 3 on the runway.

Assuming the aircraft was on the runway's centerline, the distance (D) traveled between points 1 and 2 was 231 feet. The aircraft accomplished this in 44 frames, or 1.467 seconds (t). Using the formula of calculating average speed ($v = \frac{\text{distance } (D)}{\text{time } (t)}$), yields the average ground speed of the accident aircraft between point 1 and point 2 was 157 feet per second, or 93 knots.

Using the same equation, a distance of 113 feet and 20 frames (0.667 seconds) between points 2 and 3 yields the average ground speed of the accident aircraft between point 2 and point 3 was 169 feet per second, or 100 knots.

The aircraft's average groundspeed between points 1 and 2 equated to 93 knots. This was an average groundspeed between the two points.

The aircraft's average groundspeed between points 2 and 3 equated to 100 knots. This was an average groundspeed between the two points.

The aircraft's average groundspeed between segments 1 and 2 suggested the aircraft was accelerating at this time.

The distance of point 1 to the threshold of runway 14 is approximately 2,140 feet along the runway's centerline.

At point 3 there was approximately 1,800 feet of paved surface remaining.

Errors in the calculation could include, but are not limited to the following:

- The aircraft not actually being on runway centerline the whole time.
- The frame chosen of the aircraft at key frames (points) being off by 1 frame. A one frame error would equate to approximately 2 knots in the calculations.
- The distance between points 1, 2 and 3 measured on Google Earth may have an offset compared to the real distance. This could be a result of the software or a user selection error.