

National Transportation Safety Board

Office of Research and Engineering

Washington, D.C. 20594

Airplane Performance Study with Air Traffic Control Communications

**Specialist Report
Marie Moler**

A. ACCIDENT

Location:	Minden, Nevada
Date:	February 19, 2018
Time:	1130 PST
Airplane:	PIPER PA34, N14GQ
NTSB Number:	WPR18FA091

B. GROUP

No vehicle performance group was formed.

C. SUMMARY

On February 19, 2018, about 11:30 Pacific standard time, a Piper PA-34-200T airplane, N14GQ, collided with the ground northwest of the Minden-Tahoe Airport (MEV), Minden, Nevada. The commercial pilot was fatally injured. The airplane was destroyed. The airplane was registered to the Stunad, LLC, and operated by the pilot under the provisions of Title 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed and a flight plan was not filed. The flight originated from Meadows Field Airport (BFL), Bakersfield, California, about 09:35 with an intended destination of MEV.

D. PERFORMANCE STUDY

The airplane was equipped with an Appareo Stratus PRX V2. The device recorded the date, universal time, latitude, longitude, altitude (height above mean sea level), groundspeed, ground track, vertical speed, pitch, roll, and accelerations in the x, y, and z axes. The device's sample rate was 5 Hz. Data used in the study are from the Appareo device.

Also included are air traffic control (ATC) communications between the accident aircraft and the Northern California Terminal Radar Approach Control prior to the accident.

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Weather Observations

The nearest weather reporting station was MEV, about four miles south of the accident site. According to recorded information at 11:15, the winds were 350° at 15 knots, gusting to 29 knots, visibility 10 statute miles or greater, sky clear, temperature -2° C, dew point -13° C, and an altimeter setting of 29.82 inches of mercury. Satellite imagery 30 minutes prior to the accident revealed extensive cloud coverage over the region but also significant breaks in the cloud cover where the ground can be seen. A pilot reported about 30 minutes after the accident, about 10 miles east of the accident site, clouds between 9,500 and 13,000 ft msl.

A wind simulation for the accident site and time was run and the winds aloft results are shown in Table 1.

Table 1. Winds aloft.

Height, mean sea level (ft)	Wind Direction	Wind Speed (kts)
16220	340	27
14612	341	24
13176	338	19
11906	332	16
10749	322	13
9758	314	13
8853	311	13
8059	312	12

Airplane Ground Track, Altitudes, and Speeds

The aircraft took off from Meadows Field Airport in Bakersfield, California at about 09:35 (Figure 1). The airplane flew up the Central Valley of California at an altitude of about 4,300 ft and a groundspeed between 130 and 150 kts (Figure 2). Just after 10:30 the airplane began turning right and climbing. By 10:50 the airplane was above 13,000 ft and on a track of 23° over the Sierra Nevada Mountains. Its groundspeed was between 140 and 150 kts. By 11:15 the airplane's altitude was above 14,000 ft and it was near the California-Nevada border.

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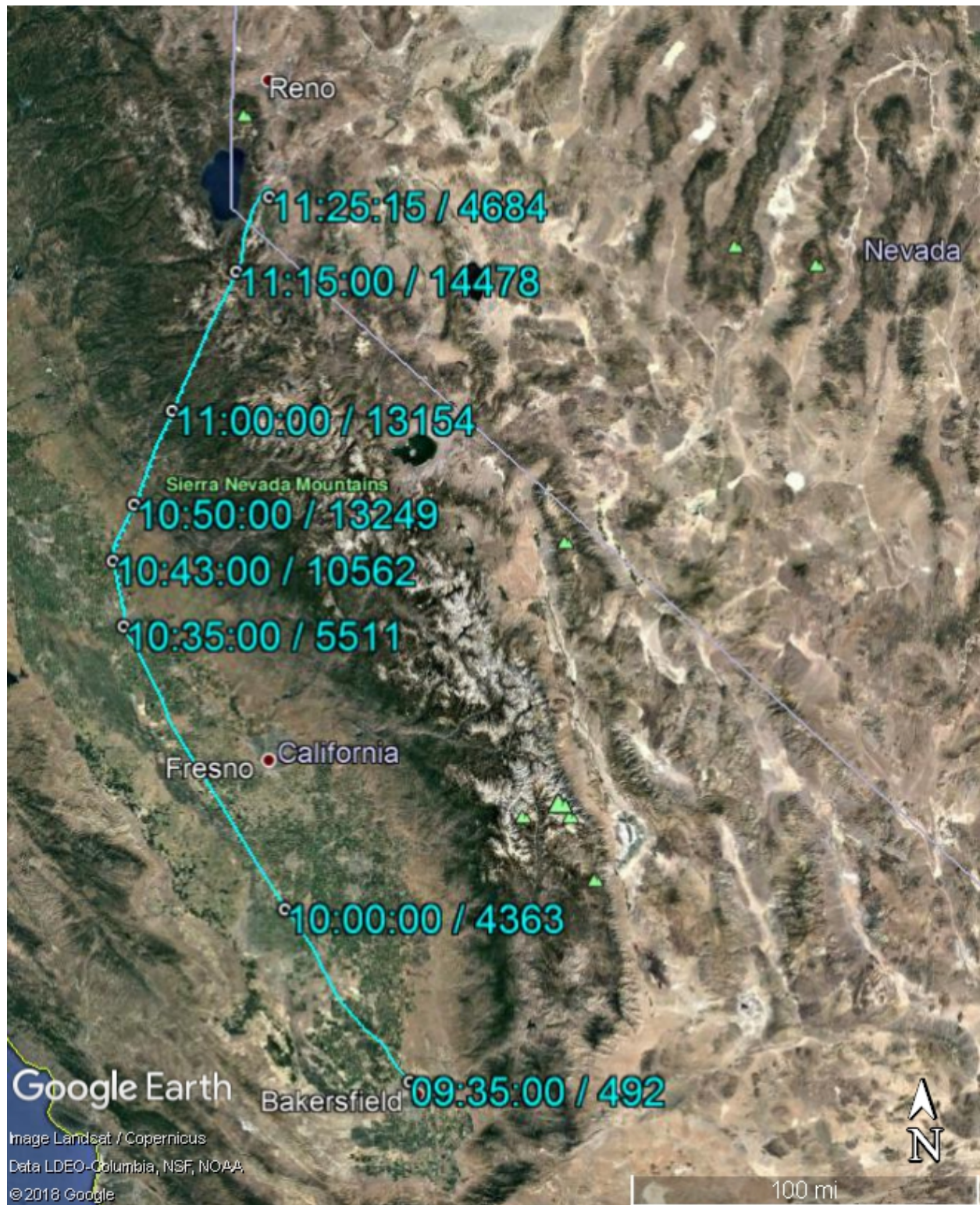


Figure 1. Airplane flight path with time and altitude annotated.

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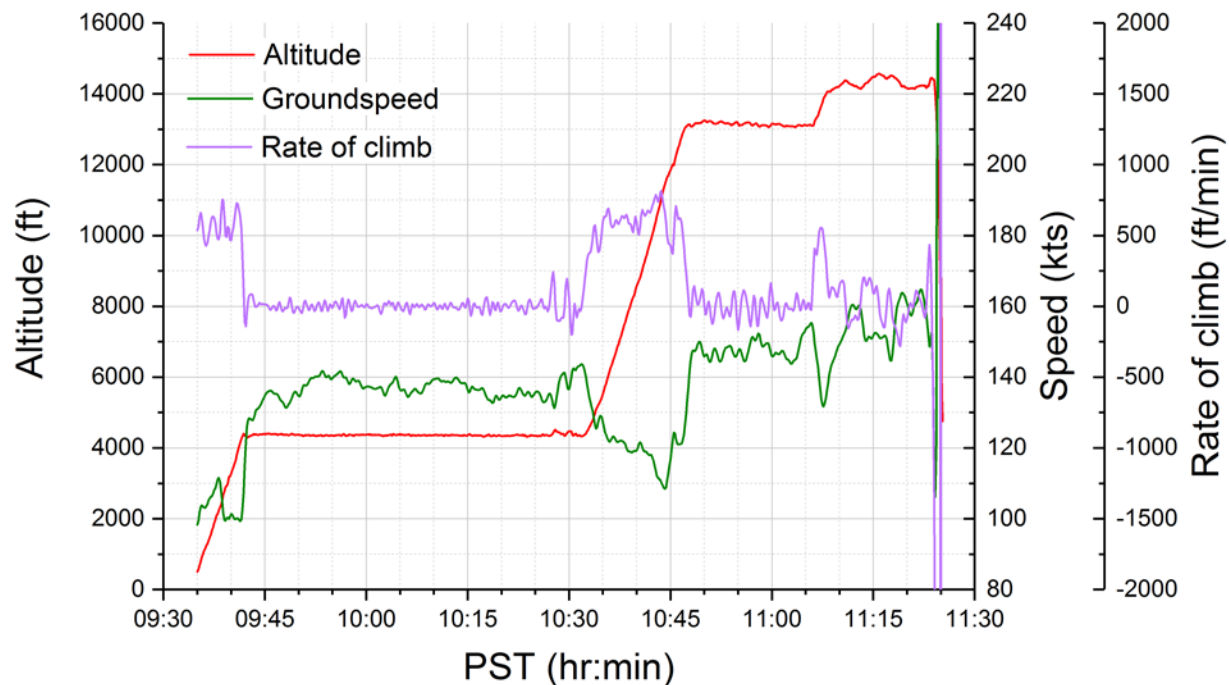


Figure 2. Altitude, groundspeed, and rate of climb for whole flight.

The airplane's calibrated airspeed was calculated using the weather and winds aloft from the area and time of the accident. At about 11:23:00 the airplane began a right turn from a track of 30° to 140° while above 14,000 ft (Figure 3). At about 11:23:51 the right turn began to tighten, but the airplane maintained its altitude until 11:24:00 (Figure 4) when it began to descend. As the altitude passed below 13,500 ft, the airspeed began to increase rapidly (Figure 4 and Figure 5) and the right turn continued to tighten into a spiral. After 11:24:49, the data from the Appareo became unreliable.

The airplane's maximum structural cruising speed (V_{NO}) is listed in the Pilots Operating Manual [1] as 190 mph or 165 kts of calibrated airspeed. The never exceed speed (V_{NE}) is 224 mph or 195 kts of calibrated airspeed. These limitations are shown on Figure 4. The airplane exceeded V_{NO} at 11:24:24 and V_{NE} at 11:24:29.

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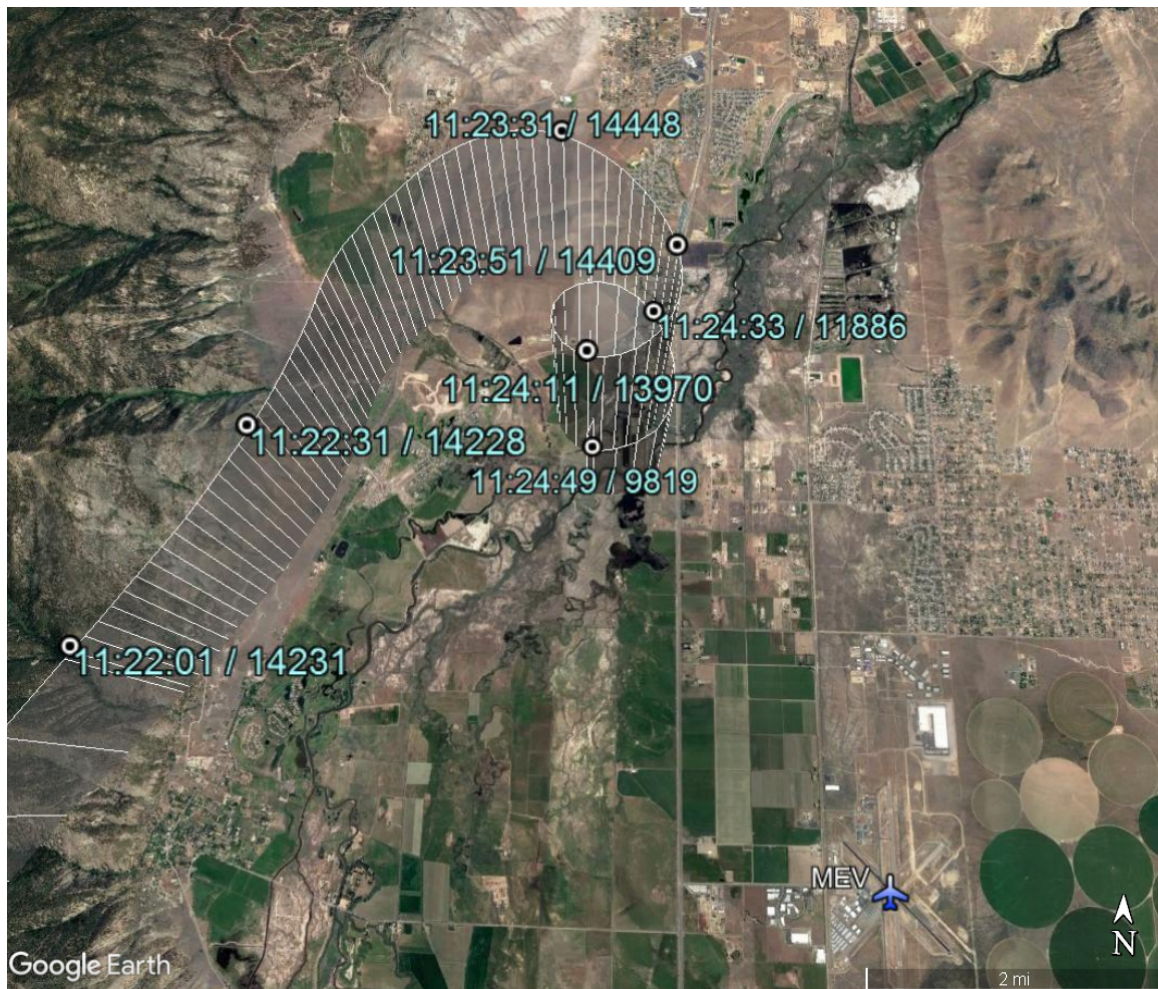


Figure 3. End of airplane flight path

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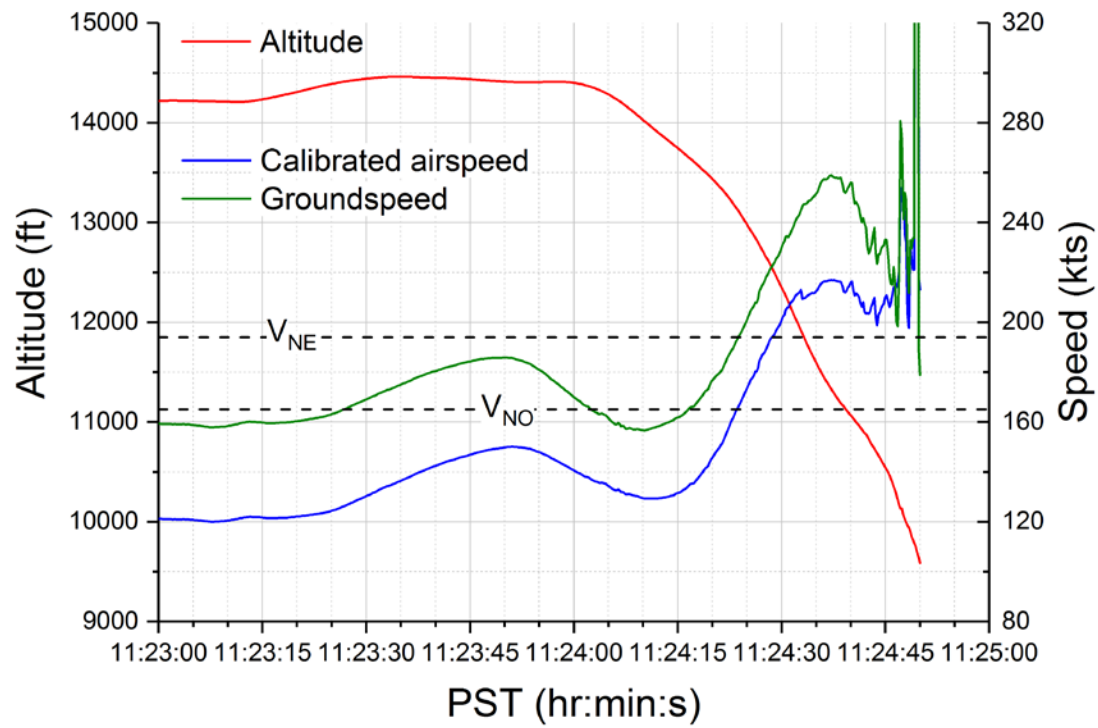


Figure 4. Altitude, groundspeed, and calibrated airspeed.

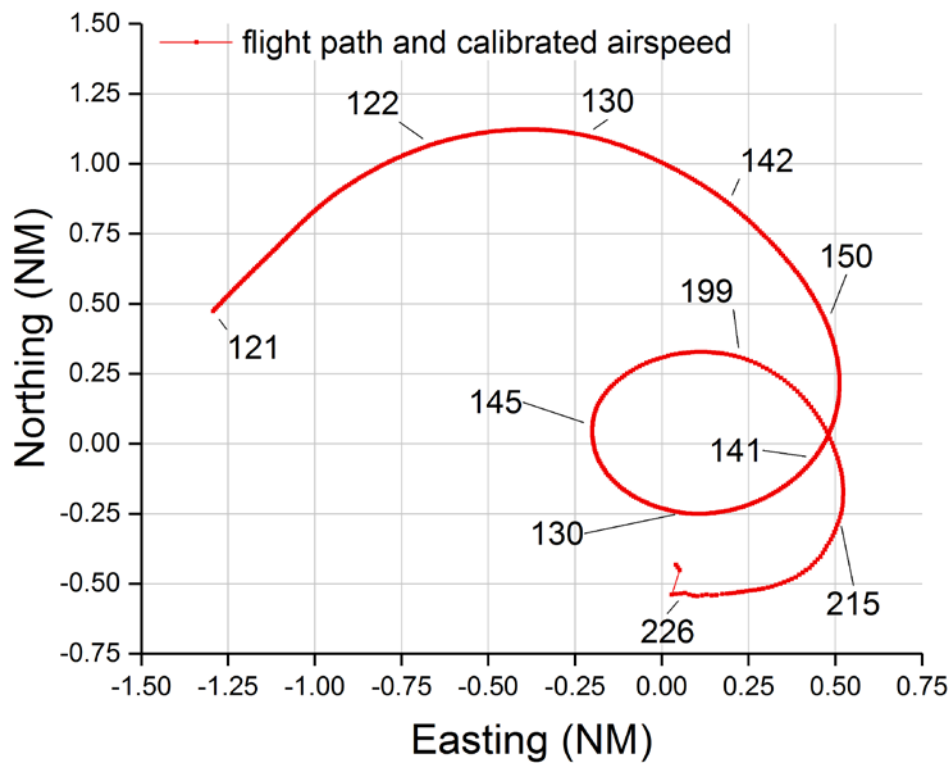


Figure 5. Airplane flight path with airspeeds.

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Airplane Breakup

The airplane's maximum positive flight load factor (flaps up) is listed as 3.8 g's. The airplane's recorded flight load in the z-axis steadily increased starting at 11:23:00 when the right turn began (Figure 6). The airplane's flight load as recorded by the Appareo reached a maximum value of 3.95 at 11:24:50 at which point the Appareo data became unreliable (see also the sudden positive change in altitude) and the load factor drops significantly.

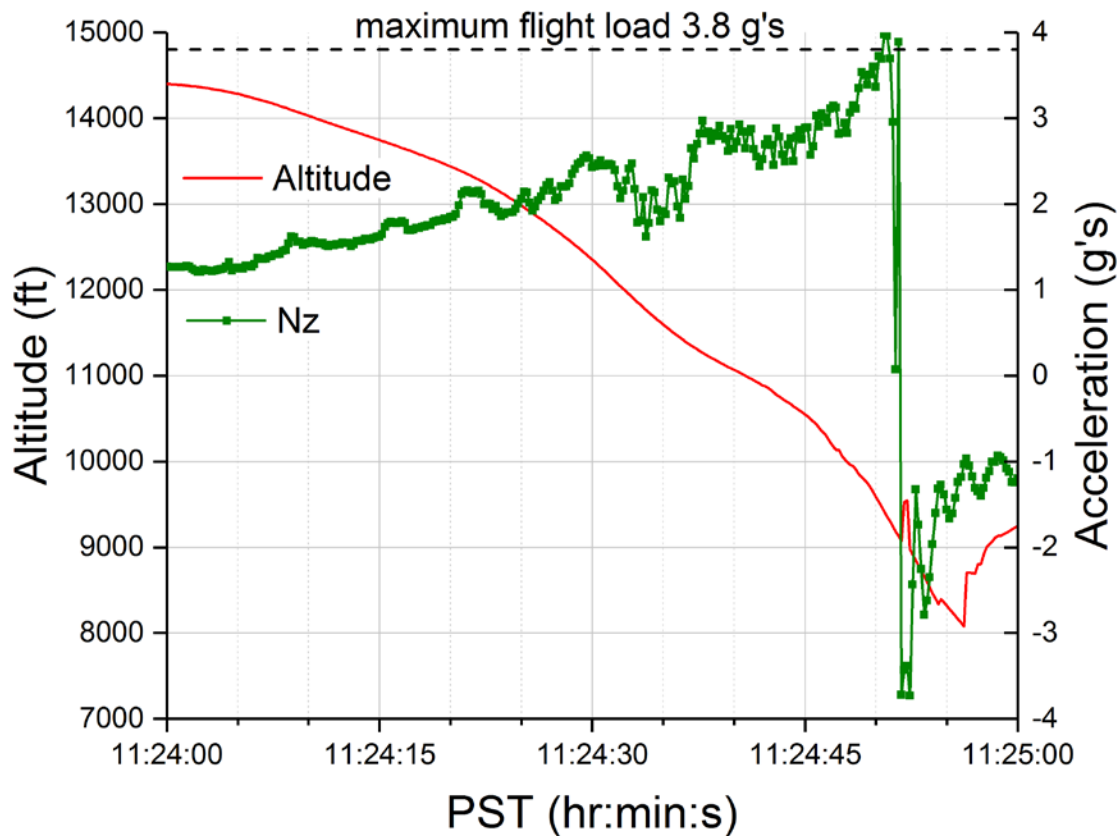


Figure 6. Altitude and vertical acceleration.

Figure 7 shows the recorded flight path with data points between 11:24:50 and 11:25:08 removed. The final six seconds of data from 11:25:08 until 11:25:15 did show a flight path and altitude consistent with the airplane fuselage's final resting point (Figure 8). The elevation of the debris field was about 4,600 ft above sea level. The wreckage lay along a heading of 345° from the southern-most stabilator trim tab to the fuselage, which was a mile away.

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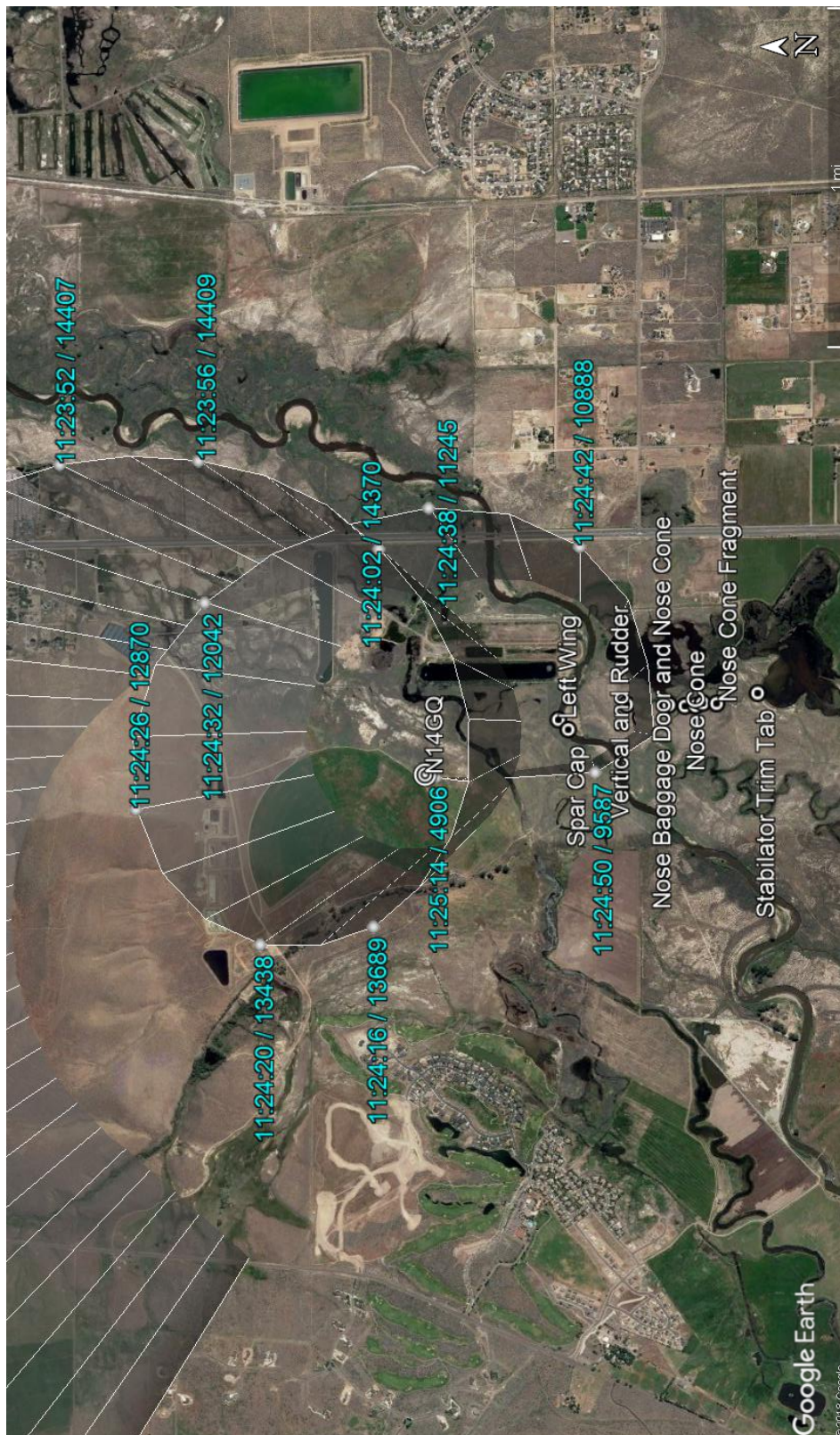


Figure 7. Airplane flight path and debris field.

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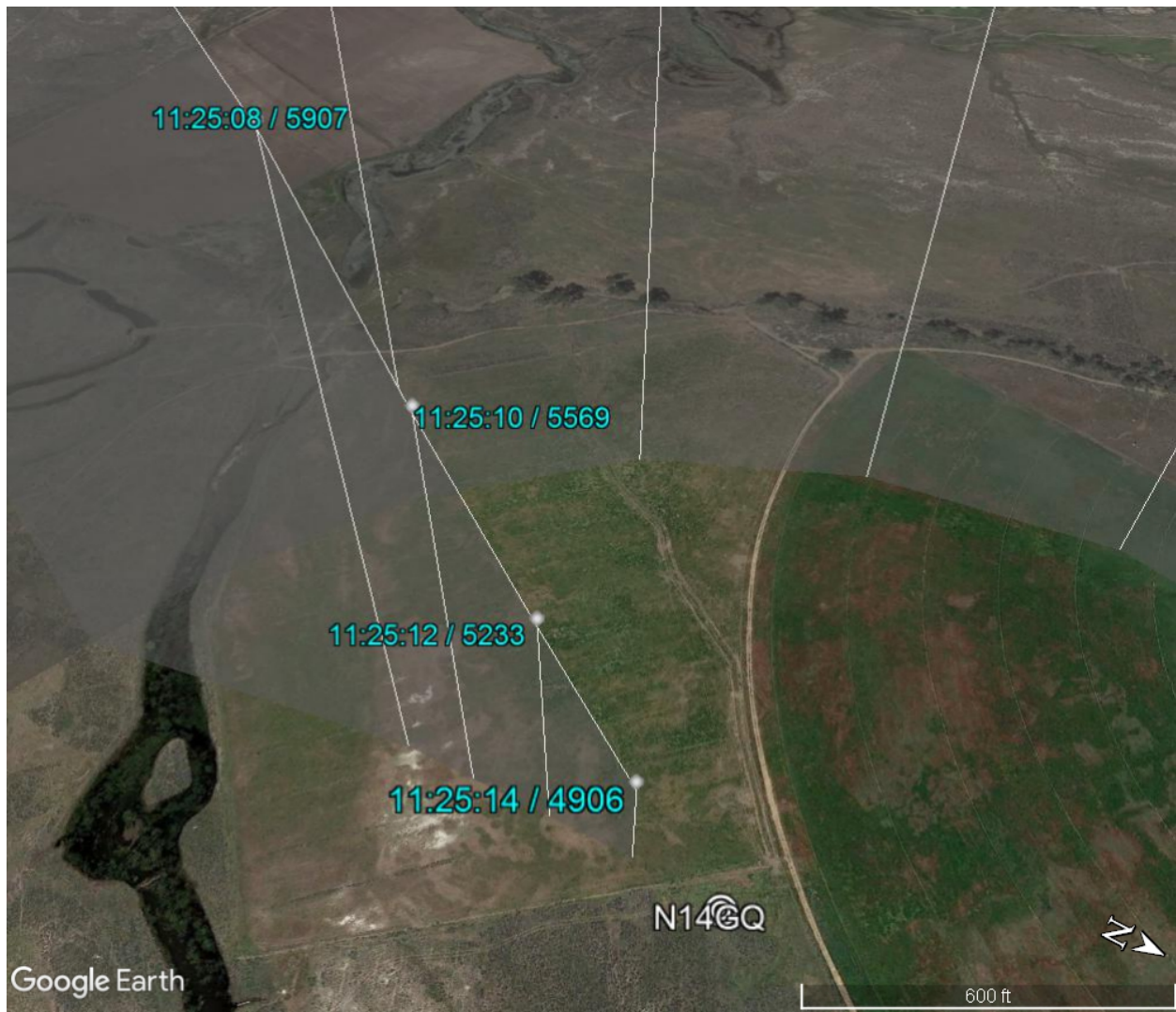


Figure 8. Airplane flight path and fuselage, marked as N14GQ.

The unreliability of the data after exceeding the maximum load suggests that the airplane broke up about 11:24:49 at an altitude of 9,500 ft MSL, 4,900 ft above the terrain below. Figure 9 shows the flight path projected onto the ground and the debris field. Also noted are the wind directions from Table 1. Winds below 10,000 ft are noted on the figure. The debris field is consistent with a break up at 9,500 ft. While the high momentum fuselage continued north, lighter pieces were carried southward and somewhat east by the wind.

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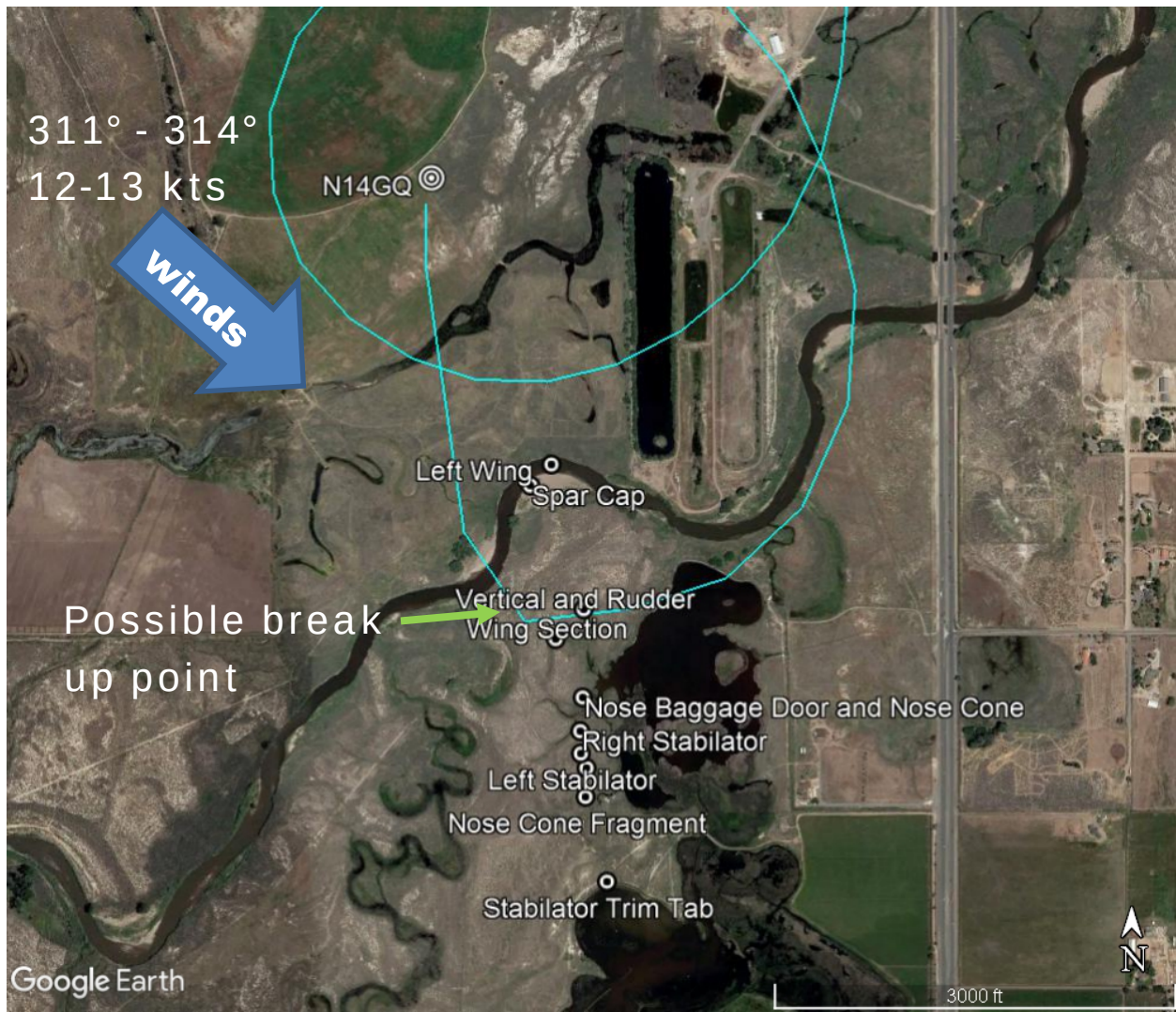


Figure 9. Airplane flight path and debris field.

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ATC Communications

The Northern California Terminal Radar Approach Control provided a recording of the air traffic control communications in the area from 1049 to 1156 PST on the day of the accident. The time was correlated for this Performance Study and the communications are shown in Table 2.

Table 2. Paraphrased ATC comments.

Time	Speaker	Comment
11:19:41	N14GQ	fourteen five to Minden
11:21:16	ATC	how much further north are you going to go or is it for clouds?
11:22:33	ATC	seneca one four golf quebec approach
11:22:39	ATC	seneca one four golf quebec NORCAL approach
11:22:43	N14GQ	ah, one four golf quebec
11:22:46	ATC	how much further north you want to go?
11:22:50	N14GQ	can you please speak up, I can't hear you
11:22:55	ATC	how much further north are you going to go? [carefully enunciated]
11:23:07	N14GQ	I'm gonna orbit here to the south south over the airport I can see it, maneuvering through a hole
11:23:13	ATC	roger

At 11:21:16, ATC asked “how much further north are you going to go or is it for clouds?” and Figure 10 shows that the airplane was near the latitude of MEV. The accident pilot did not respond and the frequency was not busy. At 11:22:33 ATC called for N14GQ and again at 11:22:39. At 11:24:43 the pilot responded “ah, one four golf quebec” (Figure 11).

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Figure 10. Airplane flight path and ATC communications.

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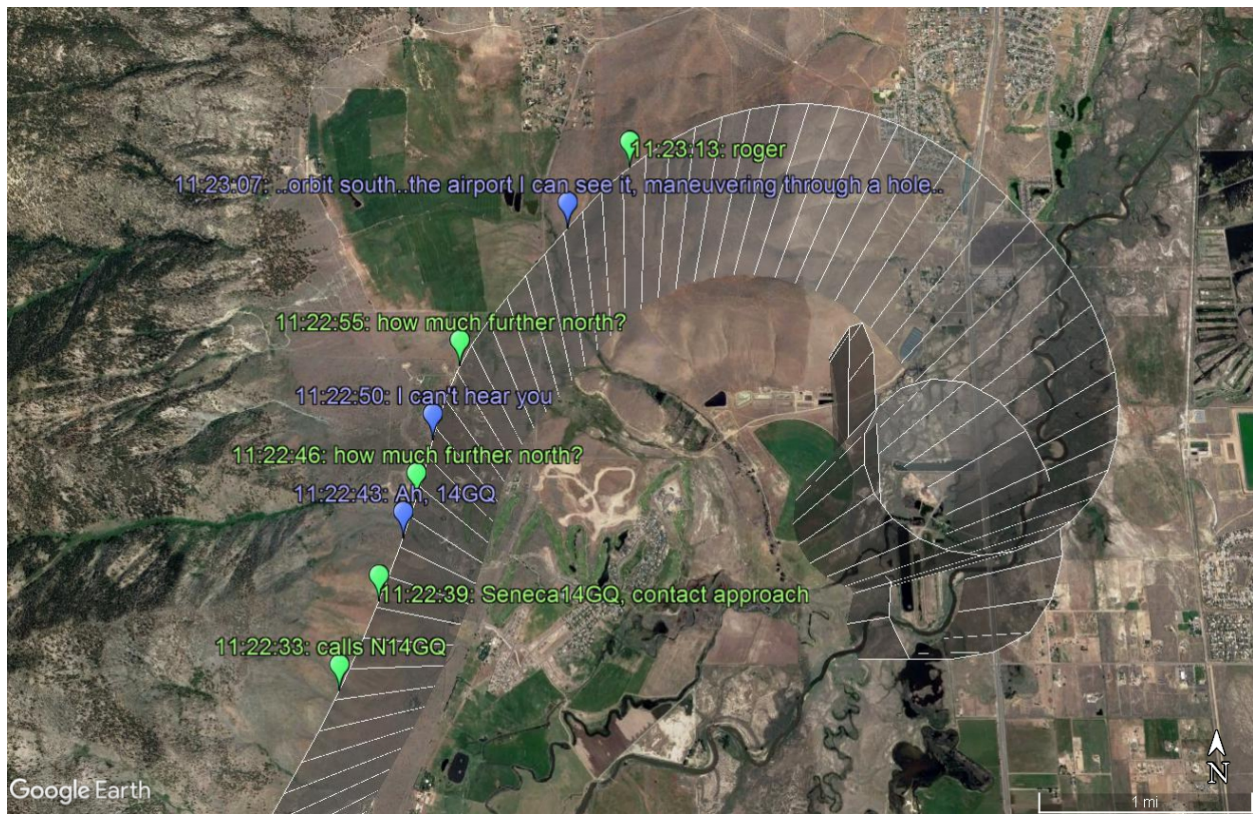


Figure 11. Airplane flight path and ATC communications.

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E. CONCLUSIONS

The aircraft took off from Meadows Field Airport in Bakersfield, California at about 09:35, flew up the Central Valley of California at an altitude of about 4,300 ft, and turned right onto a track of 23° at 10:30 to climb over the Sierra Nevada Mountains, which required a flight altitude over 14,000 ft. Throughout the flight the airplane's speed and rate of climb were normal.

At 11:21:16, ATC asked how much farther north the airplane was going to continue. ATC called again at 11:22:33 and 11:22:39 before N14GQ responded. After ATC repeated the question twice, N14GQ responded at 11:23:07 that he could see the airport and was maneuvering through a hole, assumedly in the clouds. The airplane had begun a right-hand turn towards the airport at 11:23:00 from an altitude of about 14,000 ft. At about 11:23:51 the right turn tightened, but the airplane maintained altitude until 11:24:00 when it began to descend. As the altitude passed below 13,500 ft, the airspeed began to increase rapidly and the right turn continued to tighten into a spiral. The airplane exceeded its maximum structural cruising speed (V_{NO}) at 11:24:24 and its never exceed speed (V_{NE}) at 11:24:29. The Appareo data indicated that the airplane exceeded its maximum positive flight load about 11:24:49 after which time the data became unreliable. The altitude and location of the data becoming unreliable, winds, and debris field were consistent with an in-flight breakup at 9,500 ft.

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F. REFERENCES

1. Pilots Operating Manual, The Seneca II. Piper Aircraft Corporation, July 1974.