

# National Transportation Safety Board

Office of Research and Engineering

Washington, D.C. 20594

## Performance Study

### Specialist Report

Marie Moler

#### A. ACCIDENT

Location: Plain City, Ohio  
Date: March 17, 2019  
Time: 17:45 EDT  
Airplane: Cessna 421B, N424TW  
NTSB Number: CEN19FA100

#### B. SUMMARY

On March 17, 2019, about 17:45 eastern daylight time, a Cessna 421B airplane, N424TW, impacted terrain near Plain City, Ohio. The commercial rated pilot, sole occupant, was fatally injured and the airplane was destroyed. The airplane was registered to Classic Solutions, Inc. and operated by Phoenix Test Flight, LLC, as a 14 Code of Federal Regulations Part 91 flight. The flight departed Dayton (KDAY), Dayton, Ohio about 17:20, en route to (KDLZ) Delaware, Ohio.

#### C. PERFORMANCE STUDY

The aircraft was equipped with an integrated flight display (IFD) from Avidyne. The Avidyne recorded navigation information, fuel flow and quantity, latitude, longitude, and altitude. The Avidyne also recorded the airplane's measured airspeed and system annunciations and displayed warnings. Data started about 17:00 in the ramp area. Take-off was about 17:15.

#### Weather Observations

An Automated Weather Observing System (AWOS) is located at Delaware Municipal Airport/Jim Moore Field (DLZ) in Delaware, Ohio, about 6 miles northeast of the accident site. The airport elevation is 945 feet. At 17:16 EDT, about the take-off time, DLZ reported no wind, visibility of 1 1/2 statute miles, light snow, scattered clouds at 700 feet above ground level (agl), ceiling overcast at 1,600 feet agl, temperature of 34°F (1°C) and a dew point temperature of 32°F (0°C), altimeter setting of 30.20 inHg. At 17:35 EDT, DLZ reported wind from 080° at 3 knots, visibility of 3 statute miles, light snow, scattered clouds at 400 feet above ground level (agl). At 17:55 EDT, DLZ reported wind from 110° at 5 knots, visibility of 3 statute miles, light snow, ceiling broken at 600 feet agl, ceiling overcast at 1,100 feet agl, temperature of 32°F (0°C) and a dew point temperature of 32°F (0°C), altimeter setting of 30.19 inHg.

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The weather study [1] stated that there were no Center Weather Advisories or Meteorological Impact Statements issued by the Center Weather Service Unit (CWSU) at the Indianapolis Air Route Traffic Control Center that were active for the accident location at the accident time. However, there was the possibility of moderate icing and supercooled large droplets between 3,000 and 5,000 ft from 1700 through 1800 EDT.

### Flight Path and Air Traffic Control Communications

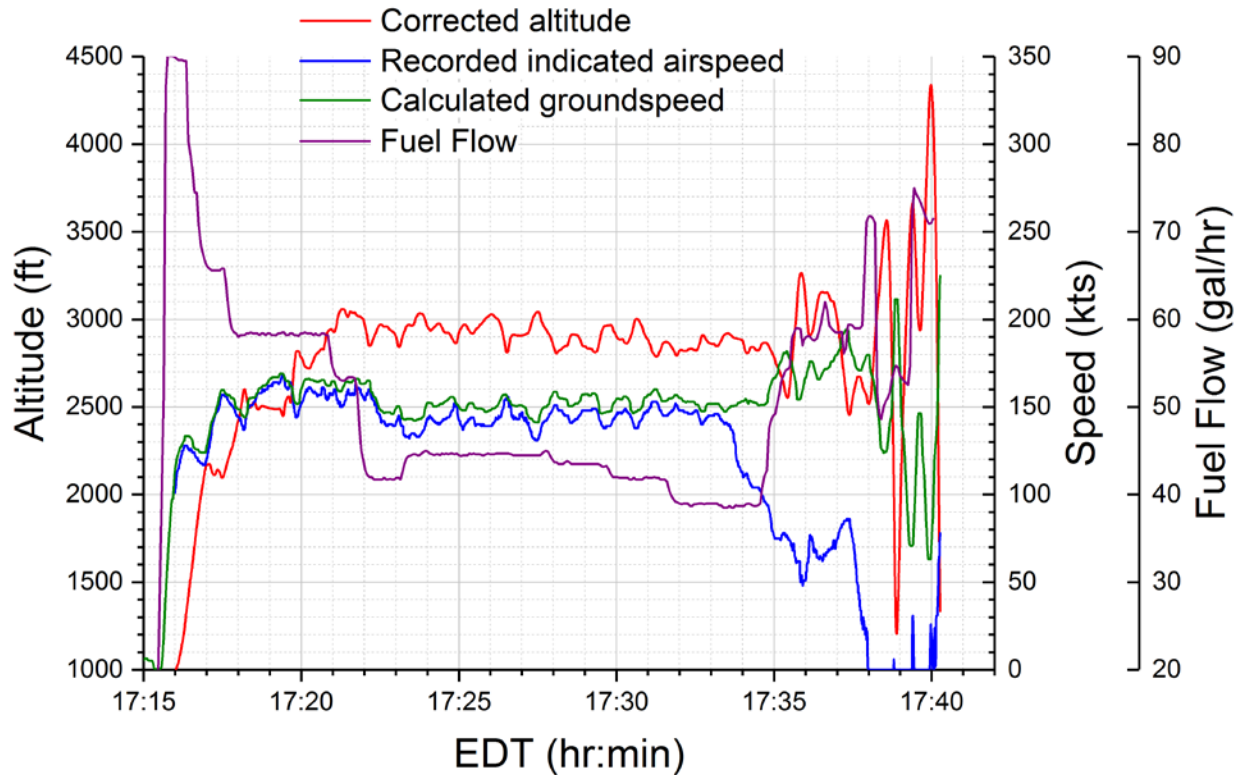
Figure 1 shows the accident flight path. The airplane left Dayton (elevation 1,009 ft) about 17:15:40 from runway 24. The airplane climbed and turned to a ground track of about 70° at an altitude near 3,000 ft mean sea level (msl). Altitudes for the airplane will be reported in msl. The reported overcast cloud ceiling was between 2,100 and 2,600 ft msl.



**Figure 1.** Accident flight in yellow with select times and altitudes annotated in blue.

Figure 2 shows the recorded altitude, airspeed, and fuel flow from the airplane and groundspeed calculated from the recorded latitude and longitude. From 17:21 to 17:33, the airplane's altitude varied between 2,800 and 3,000 ft while the airspeed was between 130 and 150 kts. The calculated groundspeed was about 10 kts greater than the measured airspeed for this portion of the flight. After 17:33, the indicated airspeed dropped and diverged from the groundspeed and by 17:38 it had gone to zero. The calculated groundspeed from position data shows that the airspeed after 17:33 was inaccurate. As discussed in the weather section, icing was possible in the area, which may have impeded the pitot tube and resulted in an inaccurate airspeed reading.

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**Figure 2.** Accident recorded altitude (red), recorded indicated airspeed (blue), calculated groundspeed (green) calculated from latitude and longitude, and recorded fuel flow (purple).

Navigation changes were recorded at 17:33:48 and 17:33:55 as the pilot updated navigation to KDLZ. Then, at 17:34:30, fuel flow increased to near 60 gal/hr, indicating the pilot increased power, likely in response to the drop in displayed airspeed. At this point the measured airspeed had dropped to 100 kts, while the groundspeed had remained a consistent 150 kts. Calculated groundspeed increased above 150 kts with the increase in fuel flow and the airplane began a series of climbs and descents that continued until the end of flight. The airplane's maneuvering speed,  $V_A$ , is 150 kts of airspeed and its maximum structural cruising speed,  $V_{NO}$ , is 200 kts [2]. Airspeed was about 10 kts lower than groundspeed for the flight, so airspeed also exceeded  $V_A$  near the end of flight.

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**Figure 3.** Accident flight in yellow with select times and altitudes annotated in blue.

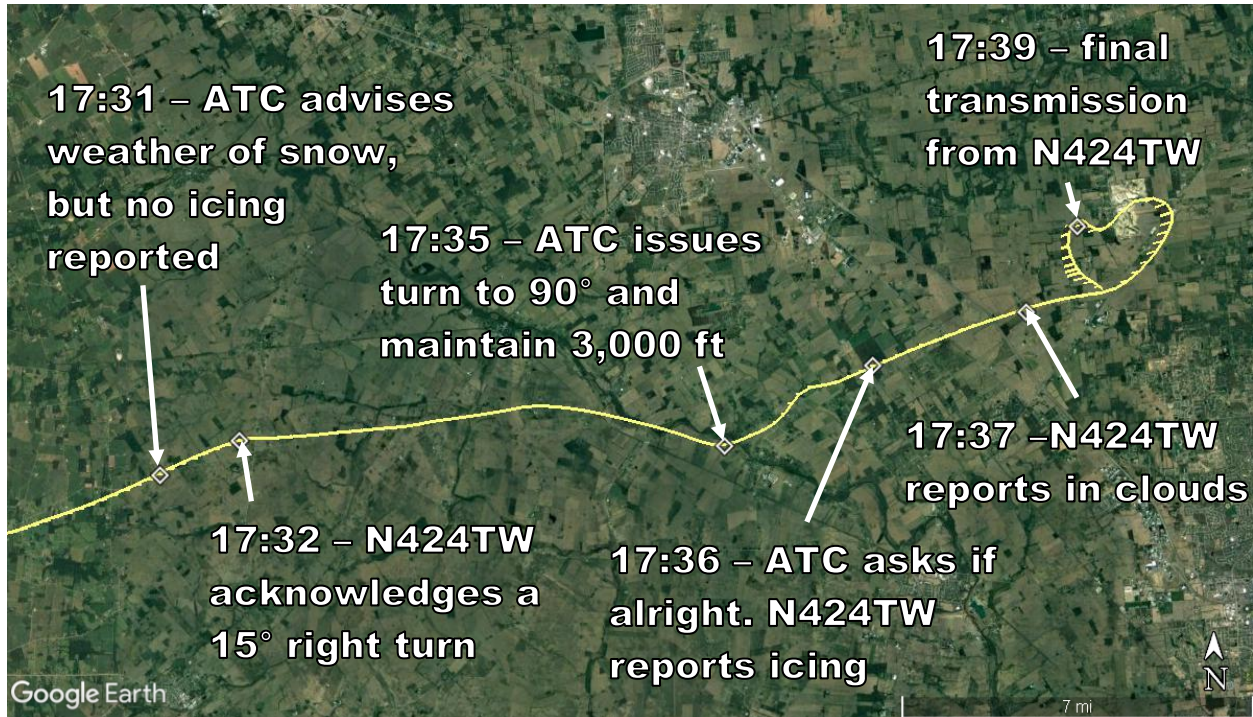
Air traffic control (ATC) communications between the accident airplane, N424TW, and Columbus North Radar were summarized by the Federal Aviation Administration (FAA) and provided to the NTSB [3]. Communications between the two were assigned to the nearest minute of time and are shown in Table 1. The pilot reported icing and stated a need to pick up speed, likely in response to the erroneously dropping airspeed. The pilot also reported that he was in the clouds and was descending and ascending in an attempt to get out of them.

**Table 1.** Summary of ATC communications.

<b>Time</b>	<b>Communication summary</b>
17:29	N424TW reports level at 3,000 ft and bound for DLZ. ATC advises there's weather at DLZ and N424TW acknowledges and states it is looking at the RNAV 28 approach
17:31	ATC advises there is weather within one mile of N424TW's position. Reports snow, but no icing reported
17:32	N424TW acknowledges a turn 15° to the right.
17:35	ATC issues a turn onto a heading of 90° and advises to maintain 3,000 ft. N424TW acknowledges turn.
17:36	ATC asks if N424TW is doing alright, notes altitude is 3,300 ft. N424TW says it's picking up icing and needs to pick up speed. ATC advises in a mile they can descent to 2,500 ft or climb. N424TW advises it wants to descent when able.
17:37	ATC descends N424TW to 2,500 ft and asks if out of the clouds at that altitude. N424TW replies "negative"
17:39	ATC notes N424TW is in a climb and asks if it is trying to get out of the clouds. N424TW replies affirmative. ATC replies climb to 6,000 ft or altitude that works. No traffic in area so left or right deviations approved. N424TW acknowledges. ATC then issues a low altitude alert and advises of nearby airports. N424TW reports climb. ATC issues a climb altitude at or below 10,000 ft. N424TW reports in climb.
17:41	ATC advises N424TW it is not receiving an altitude. N424TW does not reply.

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Figure 4 shows six of these communications on the flight path. Again, the timing of the communications was rounded to the nearest minute. ATC communications explain the track changes at 17:32 and 17:35.

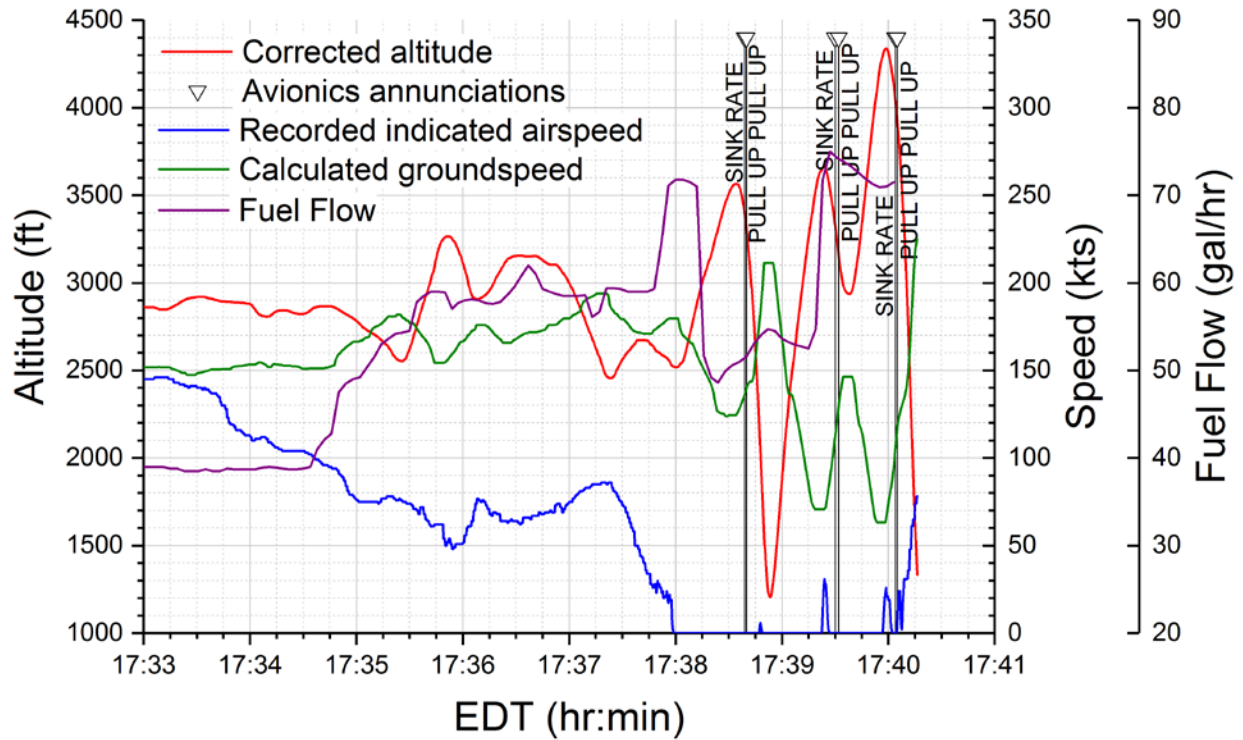


**Figure 4.** End of accident flight path with ATC communication annotated.

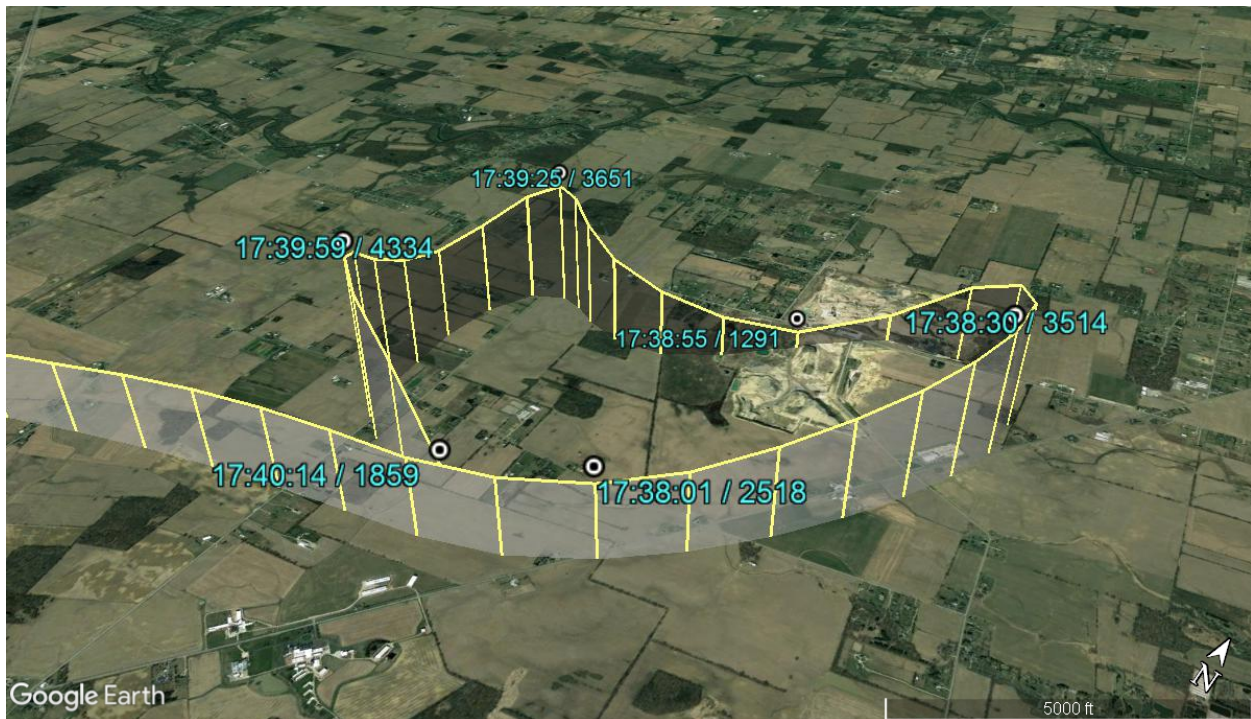
Figure 5 shows the altitude, speed, and fuel flow for the of the end flight with avionics annunciators (recorded by the Avidyne IFD) and Figure 6 shows the flight path. After 17:37, the airplane descended to 2,500 ft, consistent with the request to ATC. For the final two and a half minutes of flight the airplane was in a mostly left-hand turn. ATC had given clearance to climb and make right or left turns as needed to get out of the clouds. At about 17:38:50, fuel flow increased again to over 70 gal/hr. The airplane entered a 1,000 ft climb as fuel flow was then quickly cut back to 50 gal/hr. Just above 3,500 ft the airplane began descending rapidly at more than 5,000 ft/min. The avionics in the cockpit then annunciated “SINK RATE” and “PULL UP PULL UP”. The airplane’s descent was arrested about 300 ft above the ground and it climbed rapidly as fuel flow went to 75 gal/hr. Twice more the airplane climbed and descended as the avionics annunciated “SINK RATE” and “PULL UP PULL UP”. In all, the pilot twice responded to the avionics sink rate and pull up annunciations, but the third time the airplane did not recover from the descent.

During this time, the airplane’s groundspeed (and likely its airspeed) exceeded  $V_A$  (150 kts) and during the first and final “SINK RATE” descents, groundspeed exceeded  $V_{NO}$  (200 kts). The airplane at the time was performing large maneuvers as it climbed and descended while turning left and right. It is possible the airplane experienced loads greater than its structural limitations.

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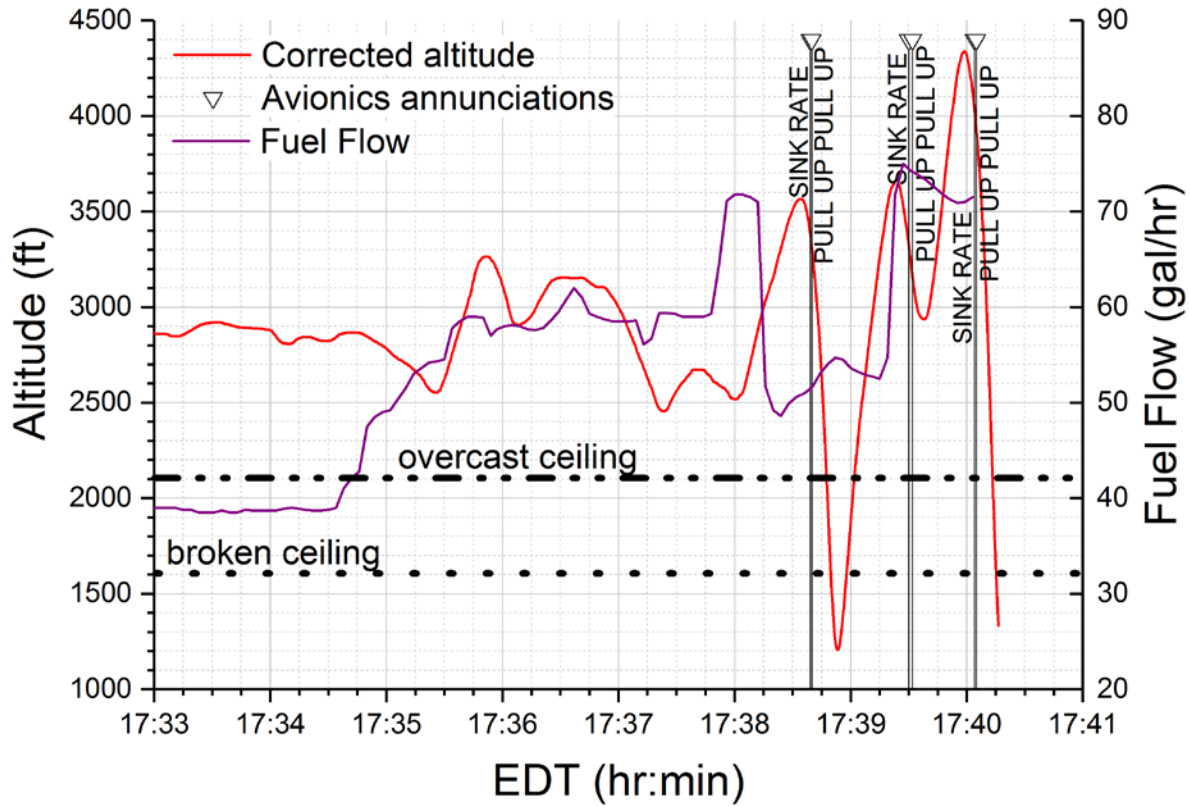
**Figure 5.** End of accident recorded altitude (red), recorded indicated airspeed (blue), calculated groundspeed (green) calculated from latitude and longitude, and recorded fuel flow (purple).



**Figure 6.** End of accident flight path with selected times and altitudes annotated.

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As discussed in the weather section, at 600 ft agl was a broken cloud layer and at 1,100 ft agl it was overcast. Elevation in the area was between 960 ft and 980 ft. Figure 7 shows the altitude and fuel flow with avionics annunciations from Figure 5 with the cloud ceilings noted. This is consistent with the pilot's report to ATC that he was in the clouds.



**Figure 7.** Altitude and fuel flow at end of flight with overcast and broken ceiling heights noted.

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**D. CONCLUSIONS**

The airplane took off from Dayton (KDAY), Dayton, Ohio about 17:15. The airplane climbed to near 3,000 ft msl and turned onto a northeasterly ground track towards its destination of Delaware, Ohio. At 17:32 the airplane turned onto a more easterly ground track. At about 17:33, the recorded airspeed began to drop, eventually to zero, possibly caused by icing of the pitot probe. Groundspeed initially remained constant before increasing as fuel flow increased from less than 40 gal/hr to near 60 gal/hr. The airplane's actual airspeed also likely increased above the  $V_A$  maneuver speed.

The pilot reported to ATC that he was experiencing icing and needed to increase speed, likely in response to the erroneously decreasing onboard airspeed. The pilot requested both descents and climbs in an unsuccessful effort to get out of the clouds.

The airplane then entered a series of climbs and descents with variable airspeed and changing ground track angles. At about 17:38 the airplane entered a final mostly left-hand maneuver with significant climbs and descents, made in the clouds out of view of the ground. Three times the avionics annunciated "SINK RATE" and "PULL UP PULL UP" and twice the airplane's groundspeed exceeded  $V_{NO}$ , possibly overstressing the airframe. The first two times the avionics provided a warning, the airplane regained a positive rate of climb and was able to regain altitude, indicating the airplane was responsive to pilot inputs. The third time the airplane's descent was not arrested and it impacted the ground.

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**E. REFERENCES**

1. Weather Study, CEN19FA100, National Transportation Safety Board, 2020.
2. Cessna Model 421C, Airplane Flight Manual, Cessna Aircraft Company, November 1980.
3. Air Traffic Control Summary, CEN19FA100, Federal Aviation Administration and National Transportation Safety Board, 2020.