

National Transportation Safety Board

Office of Research and Engineering

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AUTOMATIC DEPENDENT SURVEILLANCE- BROADCAST (ADS-B) STUDY

Aircraft Performance Study

By

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A. ACCIDENT

Location: Thomson, Georgia
Date: October 5, 2021
Time: 05:44 Eastern daylight time (EDT)
09:44 UTC
Airplane: Dassault Fanjet Falcon, N283SA

B. SUMMARY

On October 5, 2021, at 0544 eastern daylight time, a Dassault Fanjet Falcon airplane, N283SA, was destroyed when it was involved in an accident near the Thomson-McDuffie County Airport (HQU), Thomson, Georgia. The captain and first officer were fatally injured. The airplane was operated as Pak West Airlines Flight 887 dba Sierra West Airlines, as an on-demand cargo flight under the provisions of Title 14 *Code of Federal Regulations* Part 135.

C. PERFORMANCE STUDY

1.0 Aircraft

The airplane was Dassault Fanjet Falcon, also known as a Falcon 20, a low-wing, two-engine business jet. The airplane can carry 8-14 passengers and two crew at a cruise speed of 400 kts. The accident airplane was equipped with a cargo conversion, which replaced the passenger seats with cargo containers in the cabin.



Figure 1. Dassault Fanjet Falcon, N283SA.

2.0 Available Data

This performance study is based on Automatic Dependent Surveillance-Broadcast (ADS-B) data provided by the Federal Aviation Administration (FAA). ADS-B broadcasts an airplane's Global Positioning System (GPS) position and other data to the ground where it is recorded. The GPS position has an accuracy of approximately 20 meters (65 ft) in both the horizontal and vertical dimensions.

The airplane was equipped with a cockpit voice recorder (CVR) [1].

3.0 Weather

Weather was recorded for 05:50 at Thomson-McDuffie County Airport (KHQU), 0.75 NM east of the airplane wreckage. Winds were calm, the temperature was reported as 68°F (20°C), and the barometric setting was 30.04 inHg. Overcast clouds were reported at 1,200 ft above ground level (agl) and visual night meteorological conditions prevailed.

4.0 Flight Path

The airplane departed Lubbock, Texas about 0309 EDT (0209 CDT, local). It climbed to an altitude of about 36,000 ft above mean sea level (msl), which it maintained until 05:18 when the airplane began to descend (Figure 2). As the airplane descended it left its easterly track and flew south of the Atlanta, Georgia area. The airplane descended to 3,000 ft by 05:35 (Figure 3) and held at that altitude.

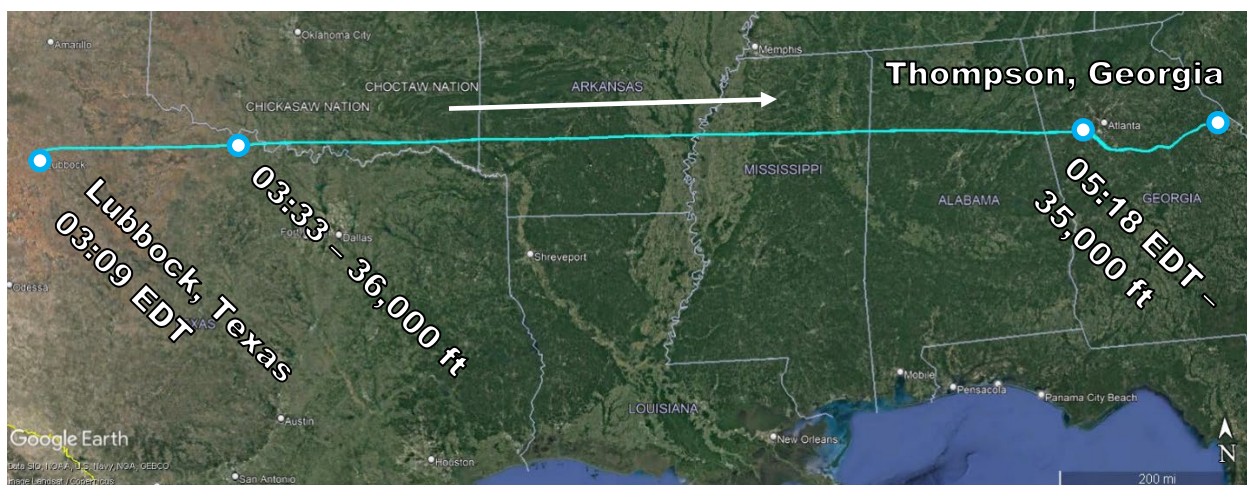


Figure 2. Flight path from ADS-B.

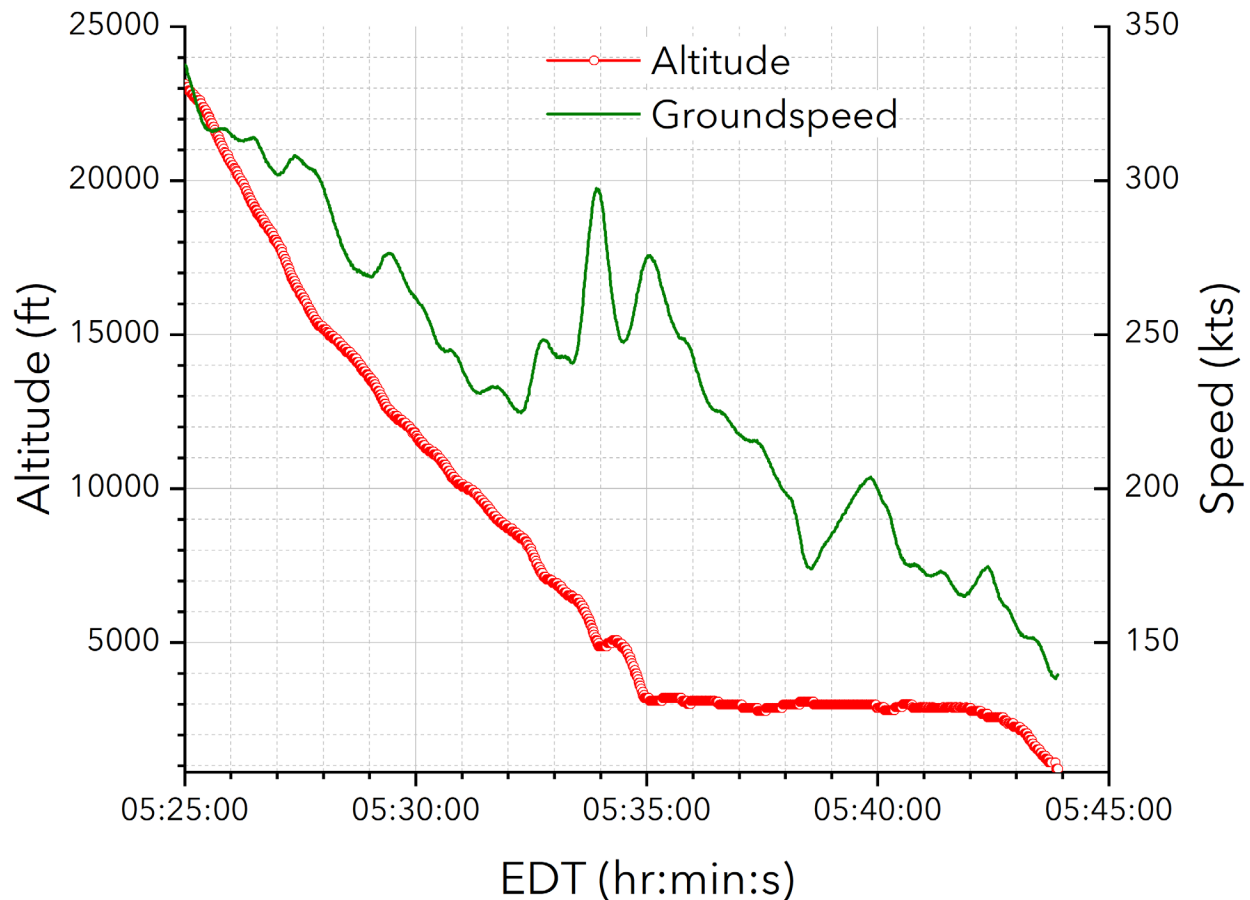


Figure 3. Altitude (msl) and calculated groundspeed final 20 minutes of flight.

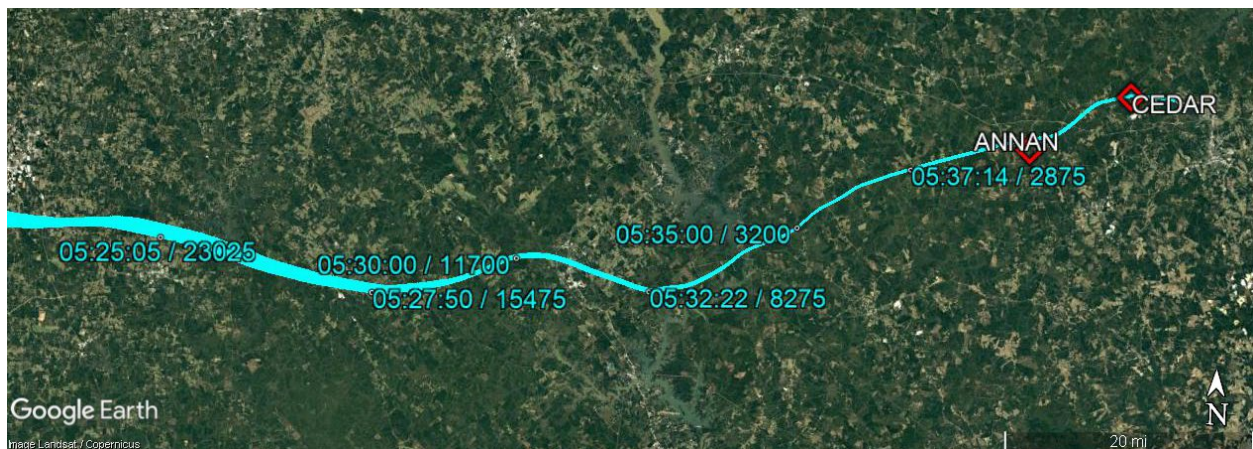


Figure 4. Flight path with selected times and altitudes (msl) for final 20 minutes of flight.

The terrain elevation on the 4.5 NM between the approach fix CEDAR and the runway 10 threshold varied between 450-500 ft. Runway 10 at KHQU has a two-light precision approach path indicator (PAPI) for the 3° glide slope. The instrument landing system (ILS) approach plate for runway 10 is shown in the Appendix, but at the time of

the accident, the glide slope signal had been taken out of service and was not available, only the localizer.

Figure 5 shows the airplane's altitude and flight path for the final 6 NM to the threshold of runway 10. The crew were instructed by air traffic control (ATC) to cross CEDAR at 3,000 ft. However, crossing CEDAR at 2,000 ft, as shown on the approach plate, would have the airplane join the 3° glide slope to runway 10. The airplane crossed CEDAR at 2,600 ft and 500 ft to the left of the extended runway centerline. It continued to be about 600 ft above the 3° glide slope and further deviated to the left of the runway heading until about 3 NM from the threshold when the descent rate increased. Airspeed at that time was about 150 kts. ADS-B coverage ended at 05:43:54, about 3,000 ft short of the first recorded tree strike. The final recorded altitude was 900 ft msl (400 ft agl) and the calculated airspeed was 137 kts. About 3,000 ft farther on, the airplane impacted the tops of trees at an altitude 150 ft below the glide slope at that location. The main wreckage was another 600 ft beyond the tree strikes at a ground elevation of 480 ft.

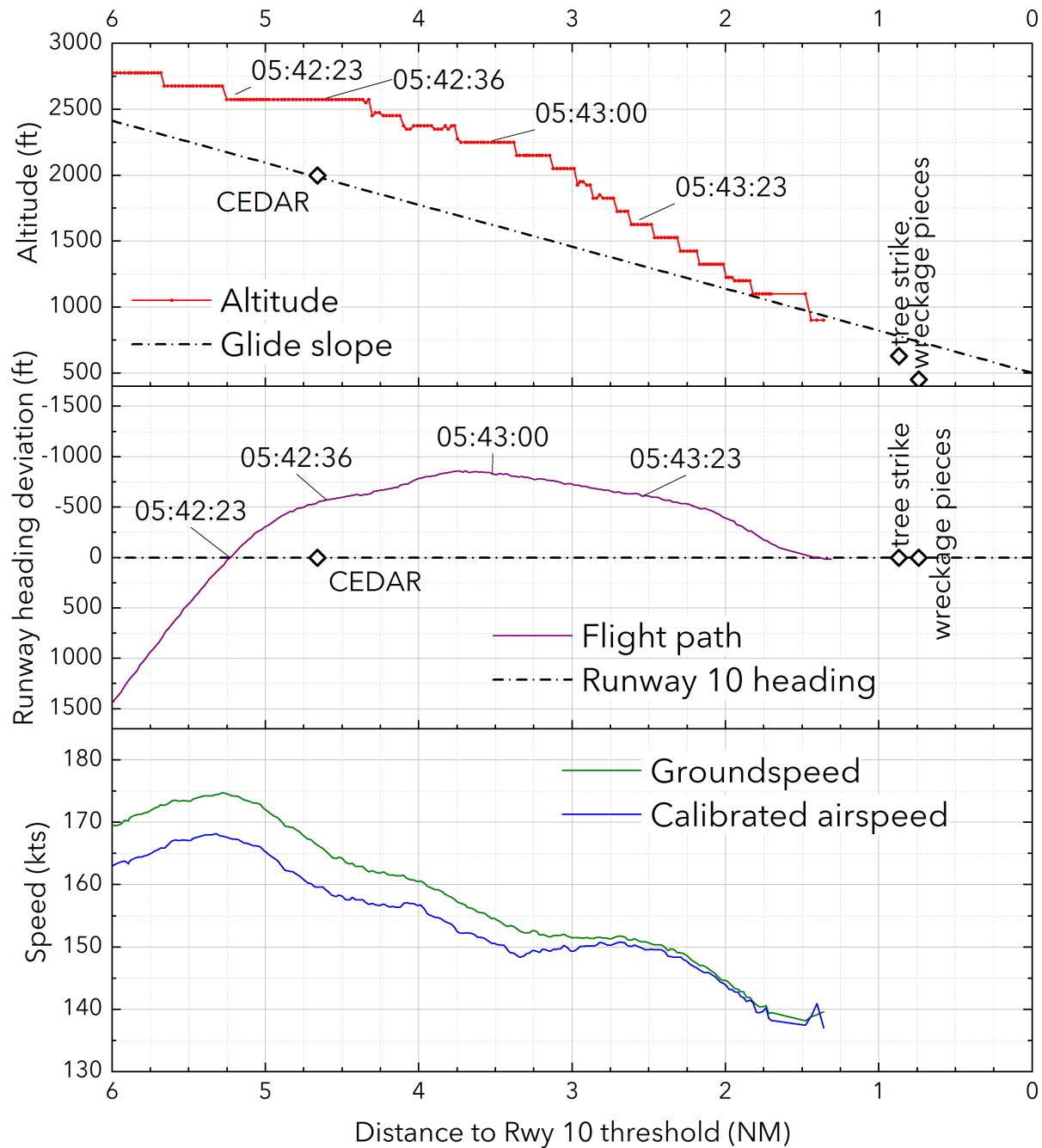


Figure 5. Altitude compared to 3° glide slope, flight path compared to runway heading, and calculated ground and airspeeds for final 6 NM of the approach.

The airplane had a CVR which recorded until 05:44:10.8 when the sound of final impact was heard. The crew discussed capturing the localizer at 05:41:44. While overcast ceilings were reported at 1,200 ft agl (~1,700 ft msl), the crew reported that they had visual sight of the runway at 05:42:40 while at an altitude of 2,600 ft msl.

Figure 6 shows selected end of flight events with the altitude and calculated speeds. Comments or events are paraphrased or abbreviated from the CVR transcript. It was not possible to determine whether the "high" and "low" comments were in reference to the PAPI lights, a visual glidepath assessment based upon the crew's perception of the lighted runway environment, or cockpit instrumentation. The glideslope portion of the ILS was not broadcasting a signal; however, the investigation was unable to determine what the glideslope indication displayed in the cockpit due to impact related damage.

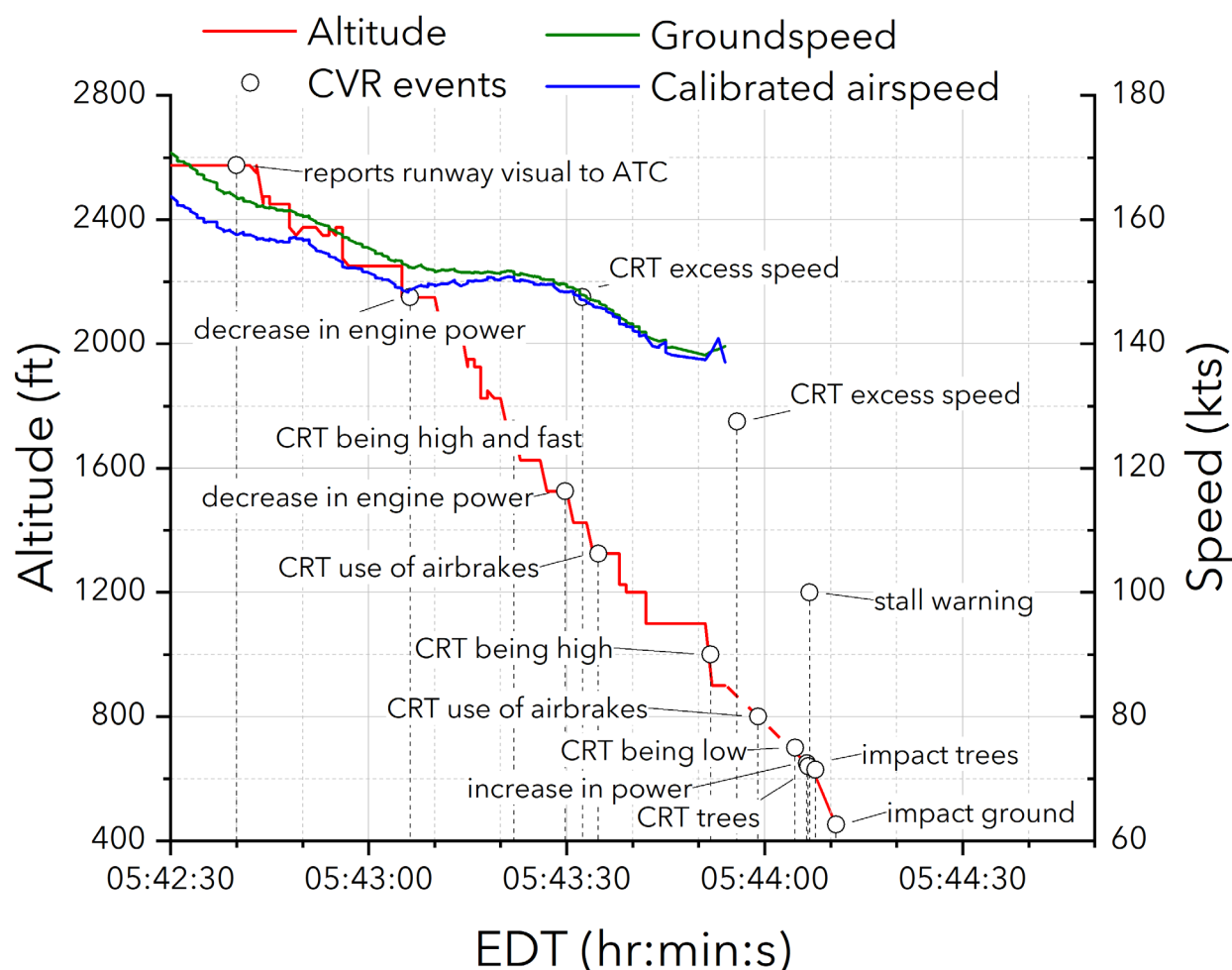


Figure 6. Altitude, calibrated airspeed, and groundspeed with selected end of flight CVR events. "CRT" is "Comment related to -". Red dotted line shows estimated altitude trend. ADS-B data ended at 05:43:54.

At 05:43:22 a comment related to being high (about 400 ft above the glideslope) and fast (the airspeed was 150 kts) was made and was followed by a second decrease in engine power. The airplane continued to descend and slowed about 5 kts before a second comment related to excess speed and then airbrakes was made. Another comment related to the airplane being high was made as it descended

through the glide slope. The ADS-B data ended at 05:43:54, but the CVR recorded until 05:44:10.8.

The airplane's landing reference speed, V_{REF} , for flaps 40 (which was indicated in the CVR transcript), 20,000 lbs, and no airbrakes was 113 kts, indicated airspeed [2]. With airbrakes, the V_{REF} would be 123 kts (published as $V_{REF} + 10$ for airbrake use, as part of Abnormal Procedures, Airbrake Failure). There were no normal published approach speeds for airbrakes extended because under normal conditions, airbrakes are required to be stowed when flaps are deployed and the anti-ice system is off. There was no evidence the crew was utilizing anti-ice for the approach. When the ADS-B data ended at 05:43:54, the airplane's airspeed was 137 kts, 25 kts above the V_{REF} and 48 kts above the 89 kts calibrated stall speed for flaps 40, no airbrakes. Two seconds later a comment related to excess speed was made and at 05:43:59, another comment related to airbrake use was made.

At 05:44:05, six seconds after the airbrakes comment, a comment related to being low was made. Starting at 05:44:06.4, there was an increase in power, the captain called out a comment related to trees, and the stall warning activated. The first sound of impact with trees was at 05:44:07.7 and the final impact at 05:44:10.8.

The cause for the stall warning is not known. The stall speed for 20,000 lbs could be as low as 89 kts for flaps 40 or as high as 102 kts for no flaps. The stall speeds with airbrakes are not published but based on the V_{REF} guidance, airbrakes may add 10 kts.

D. CONCLUSIONS

The crew captured the localizer and stated they could see the runway, before crossing the approach fix CEDAR 600 ft above the 3° glideslope and 500 ft to the left of the extended runway centerline. The airplane slowed and descended and about 1.5 NM before the threshold aligned with the runway and descended below the glideslope. The final calculated calibrated airspeed at this point was 137 kts, 25 kts above the suggested V_{REF} for the airplane configuration. The CVR continued past the end of the ADS-B data and recorded an instruction to use the airbrakes. The airplane was then commented on being low, power increased, and the stall warning activated.

The airplane was not aligned with the runway and was above the glideslope until 1.5 NM before the threshold. The airplane's speed at that point was 25 kts above the recommended V_{REF} . The airplane descended below the glideslope at that point. The CVR conversation indicated that the use of airbrakes was necessary to slow the airplane. The airplane continued to descend, power was applied, the stall warning sounded, and the airplane impacted trees and then the ground about 0.75 NM before the runway threshold.

E. REFERENCES

1. Cockpit Voice Recorder Transcript, ERA22FA004, National Transportation Safety Board.
2. Fan Jet Falcon, Airplane Flight Manual, Avion Marcel Dassault-Breguet Aviation.

F. APPENDIX

