



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

# Aviation Investigation Final Report

<b>Location:</b>	Aspen, Colorado	<b>Accident Number:</b>	CEN14FA099
<b>Date &amp; Time:</b>	January 5, 2014, 12:22 Local	<b>Registration:</b>	N115WF
<b>Aircraft:</b>	CANADAIR LTD CL 600 2B16	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Loss of control in flight	<b>Injuries:</b>	1 Fatal, 2 Serious
<b>Flight Conducted Under:</b>	Part 91: General aviation - Executive/Corporate		

## Analysis

The airplane, with two flight crewmembers and a pilot-rated passenger on board, was on a cross-country flight. The departure and en route portions of the flight were uneventful. As the flight neared its destination, a high-altitude, terrain-limited airport, air traffic control (ATC) provided vectors to the localizer/distance measuring equipment (LOC/DME)-E approach to runway 15. About 1210, the local controller informed the flight crew that the wind was from 290° at 19 knots (kts) with gusts to 25 kts. About 1211, the flight crew reported that they were executing a missed approach and then requested vectors for a second approach. ATC vectored the airplane for a second LOC/DME-E approach to runway 15. About 1221, the local controller informed the flight crew that the wind was from 330° at 16 kts and the 1-minute average wind was from 320° at 14 kts gusting to 25 kts.

The initial part of the airplane's second approach was as-expected for descent angle, flap setting, and spoilers. During the final minute of flight, the engines were advanced and retarded five times, and the airplane's airspeed varied between 135 kts and 150 kts. The final portion of the approach to the runway was not consistent with a stabilized approach. The airplane stayed nose down during its final descent and initial contact with the runway. The vertical acceleration and pitch parameters were consistent with the airplane pitch oscillating above the runway for a number of seconds before a hard runway contact, a gain in altitude, and a final impact into the runway at about 6 g.

The weather at the time of the accident was near or in exceedance of the airplane's maximum tailwind and crosswind components for landing, as published in the airplane flight manual. Given the location of the airplane over the runway when the approach became unstabilized and terrain limitations of ASE, performance calculations were completed to determine if the airplane could successfully perform a go-around. Assuming the crew had control of the airplane, and that the engines were advanced to the appropriate climb setting, anti-ice was off, and tailwinds were less than a sustained 25 kts, the airplane had the capability to complete a go-around, clearing the local obstacles along that path.

Both flight crewmembers had recently completed simulator training for a type rating in the CL-600 airplane. The captain reported that he had a total of 12 to 14 hours of total flight time in the airplane type, including the time he trained in the simulator. The copilot would have had close to the same hours as the captain given that they attended flight training together. Neither flight crew member would have met the minimum flight time requirement of 25 hours to act as pilot-in-command under Part 135. The accident flight was conducted under Part 91, and therefore, the 25 hours requirement did not apply to this portion of their trip. Nevertheless, the additional flight time would have increased the crew's familiarity with the airplane and its limitation and likely improved their decision-making during the unstabilized approach. Further, the captain stated that he asked the passenger, an experienced CL-600-rated pilot, to accompany them on the trip to provide guidance during the approach to the destination airport. However, because the CL-600-rated pilot was in the jumpseat position and unable to reach the aircraft controls, he was unable to act as a qualified pilot-in-command.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The flight crew's failure to maintain airplane control during landing following an unstabilized approach. Contributing to the accident were the flight crew's decision to land with a tailwind above the airplane's operating limitations and their failure not to conduct a go-around when the approach became unstabilized.

### Findings

<b>Personnel issues</b>	Aircraft control - Flight crew
<b>Aircraft</b>	Descent/approach/glide path - Not attained/maintained
<b>Personnel issues</b>	Decision making/judgment - Flight crew
<b>Environmental issues</b>	Tailwind - Effect on operation
<b>Aircraft</b>	(general) - Capability exceeded
<b>Personnel issues</b>	Use of policy/procedure - Flight crew
<b>Environmental issues</b>	Tailwind - Compliance w/ procedure
<b>Environmental issues</b>	Mountainous/hilly terrain - Contributed to outcome
<b>Aircraft</b>	Descent/approach/glide path - Capability exceeded

# Factual Information

## History of Flight

Landing	Loss of control in flight (Defining event)
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### HISTORY OF FLIGHT

On January 5, 2014, at 1222 mountain standard time (MST), a Bombardier (formerly Canadair) CL-600-2B16 Challenger, N115WF, impacted the runway during landing land on Runway 15 at Aspen-Pitkin County Airport/Sardy Field (ASE), Aspen, Colorado. The copilot was fatally injured; the captain and the passenger received serious injuries. The airplane was destroyed. The airplane was registered to the Bank of Utah Trustee and operated by Vineland Corporation Company, Panama, South America under the provisions of 14 *Code of Federal Regulations (CFR)* Part 91. Visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules (IFR) flight plan. The flight originated from the Tucson International Airport (TUS), Tucson, Arizona, at 1004.

The departure and en route portions of the flight were uneventful. As the flight neared ASE, air traffic control (ATC) provided vectors to the localizer/distance measuring equipment (LOC/DME) approach to runway 15 at ASE. At 1210:04, the local controller at the ASE air traffic control tower (ATCT) informed the flight crew that the wind was from 290° at 19 knots (kts), with gusts to 25 kts. At 1211:18, the crew reported that they were executing a missed approach and then requested vectors for a second attempt. ATC vectored the airplane for a second LOC/DME-E approach. At 1220:35, the local controller informed the flight crew that the wind was from 330° at 16 kts and the 1-minute average wind was from 320° at 14 kts gusting to 25 knots. He then cleared the flight to land. For further information about the communications between ATC and the flight crew during the first approach and the accident approach, see the Communications section of this report.

Airport surveillance video of the runway showed the airplane landing at ASE. The following sequence of events was seen in the video: the airplane above the runway in a slightly nose-down attitude, a flash of light consistent with a runway strike, the airplane in the air above the runway in a nose-down attitude, and the airplane impacting the runway in a nose-down attitude and being engulfed in light. About 4 seconds elapsed between the runway strike and the final impact.

The airplane came to rest inverted on the west side of runway 15, halfway between taxiways A5 and A6. The ASE airport operations and aircraft rescue and firefighting (ARFF) station was located on the west side of runway 15, about 0.3 miles north of the accident site. ASE ARFF had witnessed the accident occurring and responded immediately, requesting clearance onto the runway about 50 seconds after the accident occurred.

### PERSONNEL INFORMATION

The captain, age 52, was a citizen of Mexico. He held a Mexican air transport pilot certificate that included an Airbus-320 type rating and ratings for airplane multi-engine land and instrument airplane. The captain

also held a Federal Aviation Administration (FAA) temporary airman certificate issued on November 9, 2013. The temporary commercial pilot certificate included a CL-600 type rating and ratings for airplane single-engine land, airplane multi-engine land rating, and instrument airplane. The certificate was subject to a limitation for English proficiency. Upon FAA review of the pilot's temporary certificate after the accident, it was determined that a limitation on the pilot acting as pilot-in-command for the CL-600 should have been included on the temporary certificate; however, the limitation had been overlooked by the designated pilot examiner who issued the certificate. The limitation would have restricted the captain from serving as pilot-in-command in the CL-600 airplane with revenue passengers on board until he had acquired 25 hours of actual flight time in the CL-600 with another qualified pilot.

The captain was issued a first-class airman medical certificate on August 27, 2013, with the limitation: must have available glasses for near vision.

On November 8, 2013, the captain completed training for the CL-600 type rating at Simuflight in Dallas, Texas. According to the training records, the pilot received a "satisfactory" rating at the completion of the training checkride. During post-accident interviews, the captain stated that he did not have any trouble during his flight training other than with use of the flight management system (FMS). His flight experience in CL-601 airplanes at the time of the accident consisted of a ferry flight from Dallas, Texas, to Toluca, Mexico and a flight from Toluca, Mexico, to Eagle County Airport, Colorado, and back to Toluca, Mexico. He stated that his total flight time in the CL-601 was 12 to 14 hours, which included his flight training at Simuflight. He explained that he had accrued 8,000 hours flying the Airbus 318, 319, and 320 before flying the CL-601 and had about 17,000 hours of total flight time. The Airbus time reported was completed under his Mexican Flight Certificate and did not transfer to his FAA issued certificate.

The copilot, age 54, was a citizen of Mexico. He held a Mexican air transport pilot certificate that included an Airbus-320 type rating and ratings for airplane multi-engine land and instrument airplane. The copilot also held an FAA temporary airman certificate issued on November 14, 2013. The temporary commercial pilot certificate included a CL-600 type rating and ratings for airplane single-engine land, airplane multi-engine land and instrument airplane. The certificate was subject to a pilot-in-command limitation for the CL-600. This limitation restricted the copilot from serving as pilot-in-command in the CL-600 airplane with revenue passengers on board until he had accrued 25 hours of actual flight time in the CL-600 with another qualified pilot. The certificate was also subject to a limitation for English proficiency.

A limited first class medical certificate was issued to the copilot on December 13, 2012, with the limitation: must have available glasses for near vision. A limited first class medical is valid for 6 months from the time of issuance for operations requiring a first class medical; it is valid for 12 months from the time of issuance for operations requiring a second class medical; and, after 12 months, it is valid only for operations requiring a third class medical. At the time of the accident, 13 months after the time of issuance, the copilot's medical certificate would have been equivalent to a third class medical certificate. The copilot reported on his most recent medical certificate application that he had accumulated 20,398 total flight hours, with 31 hours in the previous 6 months. The copilot's logbook was not located during the investigation. The flight time reported on the copilot's medical certificate application was completed under his Mexican pilot certificate and did not transfer to his FAA issued certificate.

On November 9, 2013, the copilot completed training for the CL-600 type rating at Simuflight in Dallas, Texas. According to the training records, the copilot received an "Unsatisfactory" rating at the completion of the training checkride. Records indicate the copilot did not satisfactorily complete two tasks under the

"missed approach" approach skills, including "from a nonprecision approach" and "engine out." On November 14, 2013, the copilot was re-tested and received a "satisfactory" rating at the completion of the second training checkride.

The pilot-rated passenger, age 52, was a citizen of Mexico. The passenger also held an FAA, foreign-based commercial pilot certificate with airplane single-engine land and airplane multi-engine land ratings. No type rating for the CL-601 was included on the FAA- issued commercial certificate. The FAA certificate was issued on the basis of and only valid when accompanied by his Mexican pilot certificate. Additionally, the FAA certificate was not valid for the carriage of persons or property for compensation or hire or for agricultural aircraft operations. The passenger held a first class medical certificate issued on December 9, 2013, with the limitation: must have available glasses for near vision. According to the captain, the passenger was his and the copilot's friend. The captain also reported that the passenger was an experienced pilot on the CL-601 and was invited to join them on the trip to "provide any recommendations" because of the "special conditions" at ASE. The passenger was sitting in the flight deck jumpseat position.

## AIRCRAFT INFORMATION

The airplane, a Bombardier (formerly Canadair) CL-600-2B16 Challenger 601-3R variant, was a twin-engine corporate jet (serial number 5153) manufactured in 1994. It was powered by two General Electric, CF34-3A1 turbofan engines rated at 9,000 foot-pounds of thrust. The airplane had an occupancy of 12 passengers and 2 crewmembers, with an additional jumpseat for a cabin crewmember.

According to the information provided by the captain, the most recent inspection on the airplane's approved aircraft inspection program was completed on December 18, 2013, at an airframe total time of 6,750 hours.

According to the Canadair Challenger Airplane Flight Manual (AFM) PSP 601A-1-1, Section 3(f) Tailwind Conditions under Operating Limitations states,

"the maximum tailwind component approved for take-off and landing is 10 kts."

## METEOROLOGICAL INFORMATION

The observations for ASE indicated IFR conditions with light snow in the morning with visual flight rules (VFR) conditions prevailing at the time of the accident. Immediately before the airplane's arrival in the area, the wind speeds began to increase with gusts to 28 kts. The gusty winds lasted from 1153 to 1553, and northwesterly wind gusts of 25 kts or more were reported. The National Weather Service (NWS) Terminal Aerodrome Forecast (TAF) for ASE that was current at the time of the airplane's departure from TUS indicated that the wind at the airplane's estimated time of arrival into ASE would be from 340° at 11 kts with no gusts or low-level wind shear forecast.

The airport had a federally installed and maintained Automated Surface Observation System (ASOS) located east of the touchdown zone of runway 15. At 1153, the ASE automated ASOS reported the following weather conditions:

Wind from 310° true at 9 kts gusting to 28 kts, wind variable from 270° to 360°, visibility 9 miles in haze, a few clouds at 3,500 ft above ground level (agl), ceiling broken at 4,600 ft, overcast at 5,000 ft,

temperature - 11° Celsius (C), dew point temperature -20° C, altimeter 30.07 inches of mercury (Hg). Remarks: automated surface observation system, peak wind from 320° at 28 kts occurred at 1150, sea level pressure 1024.3-hPa, temperature -11.1° C, dew point -20.0° C.

At 1220, the approximate time of the accident, the ASOS indicated:

Wind from 320° at 14 kts gusting to 25 kts, wind variable from 280° to 360°, visibility 10 miles in haze, scattered clouds at 4,700 ft agl, ceiling broken at 6,000 ft, temperature - 12° C, dew point temperature - 21° C, altimeter 30.07 inches of Hg. The remarks indicated a peak wind from 320° at 26 kts occurred at 1204.

The ASE ASOS 1-minute data (which uses a 2-minute running average wind issued every minute) from 1218 to 1222 were:

TIME WIND GUST CROSS TAILWIND

1218 333° 15KT 345° 20KT 5KT 19KT

1219 323° 15KT 339° 22KT 0KT 22KT

1220 324° 14KT 324° 25KT 7KT 24KT

1221 333° 15KT 338° 22KT 1KT 22KT

**1222 333° 14KT 328° 17KT 3KT 17KT Accident**

An urgent pilot report (PIREP) over ASE at 1205 from a Learjet 35 flightcrew reported low-level wind shear with a 10 kt loss of airspeed on a 2-mile final to runway 15. It was undetermined if the accident airplane received this PIREP.

Several surrounding airports also reported strong gusting northwest winds during the period. Lake County Airport (LXV), Leadville, Colorado, located 25 miles east of ASE, reported IFR conditions in light to heavy snow with west-northwesterly winds gusting to 31 kts. Copper Mountain (CUU), Colorado, located 36 miles east of ASE reported westerly winds at 20 kts gusting to 46 kts during the period.

The NWS Grand Junction (GJT), Colorado, upper air sounding at 0500 depicted a shallow surface-based temperature inversion with light winds below 300 ft and northwesterly winds above that altitude with little variation in direction and increasing wind speeds. The mean wind was from 324° at 39 kts. The wind and temperature profile supported a light-to-moderate mountain wave formation with respect to updrafts, downdrafts, and turbulence potential.

**COMMUNICATIONS**

The following excerpt from the FAA ATC transcription details communications between the airplane's flight crew and ATC during the first approach and the accident approach.

The ASE ATCT began communication with the airplane at 1209:31, when the flight crew reported they were "nine miles out." The remainder of the communications were as follows:

1210:04 (ATCT) Wind 290 at 19, 1-minute average wind 320 at 12 gust 25, runway 15 cleared to land.

1210:15 (N115WF) Cleared to land, roger.

1210:38 (ATCT) Falcon just reported a gain of 20 kts, use caution for low level wind shear.

1210:45 (N115WF) Roger

1211:07 (ATCT) winds 310 at 10.

1211:18 (N115WF) Okay. Missed approach. 33 kts of tailwind.

1211:26 (ATCT) Execute publish missed.

1211:30 (N115WF) Okay.

1211:37 (ATCT) Climb and maintain 16,000, expedite your climb, execute published missed. 16,000 on the missed.

1211:45 (N115WF) Executing. Climbing to 16,000.

1212:38 (ATCT) Contact departure 123.8.

1212:50 (N115WF) 123.8.

N115WF contacted Aspen ATCT terminal control (approach) following the missed approach, as follows:

1212:53 (Approach) N115WF aspen departure, say intentions.

1213:03 (N115WF) Okay. We turn back and do another approach. We got a tailwind of 30 kts.

1213:10 (Approach) Roger. Fly heading 310, vector localizer DME echo approach.

1213:16 (N115WF) 310 and vectors again got localizer 15.

1213:42 (Approach) N115WF descend and maintain 13,400.

1213:44 (N115WF) 13,400.

1214:07 (Approach) N115WF fly heading 290.

1214:10 (N115WF) Now heading 290, 115WF.

1215:12 (Approach) N115WF turn right heading 020.

1215:18 (N115WF) 020 on the heading 115WF.

1215:32 (N115WF) Confirm 15WF 020 on the heading.

1215:36 (Approach) N115WF turn right heading 060 now.

1215:40 (N115WF) 060 now.

1216:56 (Approach) N115WF, 4 miles from jargu turn right heading 120 cross jargu at 13,400, cleared localizer DME echo approach.

1217:05 (N115WF) 120 on the heading to intercept localizer DME, 115WF.

1217:10 (Approach) and N115WF that's cleared localizer DME echo approach.

1217:15 (N115WF) localizer DME approach N115WF

1218:01 (Approach) N115WF contact tower.

1218:04 (N115WF) Contact tower.

N115WF contacted Aspen ATCT (local) for the second approach into ASE. This approach was the accident approach, with the following air traffic communications:

1218:37 (Local) N115WF Aspen tower.

1219:21 (Local) N115WF Aspen tower.

1219:24 (N115WF) Go ahead.

1219:26 (Local) Runway 15 continue for N115WF.

1219:28 (N115WF) We'll continue the 115WF.

1219:42 (Local) N115WF traffic 12 o'clock, 7 miles turning westbound 9,200 ft.

1219:47 (N115WF) IFR.

1220:08 (Local) N115WF traffic no factor. Disregard, no factor, westbound now.

1220:14 (N115WF) Roger 115WF. In IFR conditions now.

1220:35 (Local) N115WF winds 330 at 16, runway 15 cleared to land. 1-minute average 320 [at] 14 gust 25.

1220:45 (N115WF) Roger, 115WF.

1222:04 (Local) Go around, go around, go around, go around. [The accident occurred here. Emergency services were dispatched and ASE was closed.]

#### AIRPORT INFORMATION

Aspen-Pitkin County/Sardy Field is a certificated Part 139 airport, and the field elevation is 7,838 ft. It is a towered airport operating in Class-D airspace. The airport is equipped with one runway; runway 15/33



which is 8,006 ft in length and 100-ft wide. An aircraft rescue and firefighting station is located on the airfield and responded to the accident.

Runway friction measurements were taken immediately following the accident using a Dynatest 6875 runway friction tester. The average friction for Runway 15 was 1.087mu, and the lowest reading was 0.781 mu for the section at the departure end of runway 15. According to the FAA, the minimum friction for a runway tested with the Dynatest device is 0.50mu.

At the time of the accident, there was one notice to airmen (NOTAM) in effect at ASE related to Runway 15/33. This NOTAM, issued at 0609, stated "snow swept 75-feet wide" on the runway surface.

Because of the terrain features surrounding ASE, alternate minimums (other than the standard approach minimums) were established for instrument approaches into runway 15 at ASE. Additionally, there are no IFR or visual flight rule approaches into runway 33 at ASE because of terrain limitations and noise restriction areas.

## FLIGHT RECORDERS

### Flight Data Recorder (FDR)

The airplane was required to be equipped with an FDR that recorded a minimum of 18 parameters, as cited in 14 *CFR* Part 91.609(c). The NTSB's Vehicle Recorders Lab extracted the data contained on the Loral/Fairchild F1000 (P/N S603-1000-00, S/N 00523) FDR installed on the airplane.

The FDR recording contained about 124 hours of data. The event flight was the last flight of the recording, and its duration was about 2 hours 18 minutes.

The FDR data starting at 1208:00 showed a flight pattern consistent with the missed approach. After the missed approach, at 1219:45, about 2 minutes 37 seconds before the end of the FDR recording, the airplane began its final descent from a pressure altitude of about 12,900 ft. At this time, the left and right flaps were at 28°, the autopilot was "On", and the N1 speeds of both engines were decreasing through about 73%.

Twenty-four seconds later, at 1220:09, while descending through a pressure altitude of about 12,500 ft, the autopilot transitioned to "Off" and remained off for the rest of the FDR recording. At this time, the N1 speeds of both engines were steady about 33%.

Thirty-four seconds later at 1220:43, while descending through a pressure altitude of about 11,000 ft, the left and right flaps increased to 44°. Twenty-seven seconds later, while descending through a pressure altitude of about 9,150 ft, the N1 speeds of both engines began increasing.

For the next 56 seconds, the N1 speeds of both engines varied together between a maximum of about 75% and a minimum of about 42%. Because this airplane was not equipped with an autothrottle, these changes in N1 speeds would have been commanded by a flight crewmember. Also during this time, the pitch angle oscillated between a maximum of 4.3° nose up and a minimum of -5.2° nose down. At 1222:06, the vertical acceleration peaked at 2.91 g (which was beyond the airplane's design envelope for load factor), and the pitch angle increased to about 5.6°.

Over the next 16 seconds, until the end of the FDR recording at 1222:22, the pitch angle increased to about 15.3 ° nose up, decreased to about -13.1° nose down, increased to about 24.7° nose up, and then settled to about 0°. Additionally, the vertical acceleration decreased to -0.17 g, peaked at 5.76 g and then settled at -1.46 g.

#### Cockpit Voice Recorder (CVR)

The airplane was required to be equipped with a CVR that recorded at least the last 30 minutes of aircraft operation, as cited in 14 *CFR* Part 91.609(e). The NTSB's Vehicle Recorders Lab extracted the data contained on the Fairchild A100A (P/N 93-A100-83, S/N 61480) CVR installed on the airplane.

Most intracockpit communications were in Spanish and were translated into English. The translation was not word for word, rather, it was idiomatic and considered the context and meaning of the Spanish source language. The following is an excerpt from the CVR transcript of pertinent communications or events recorded:

The CVR recording began at 1152:34 as the flight crew began receiving radar vectors for the first localizer approach into ASE. At 1155:07, static similar to cell phone interference for about 25 seconds occurred followed by a chime similar to a cell phone alert. At 1155:19, another sound of a chime similar to a cell phone alert was heard, and the copilot stated he "turned it off, I do not know why it is ... it's Whatsapp." Static interference similar to cell phone interference continued until 1156:53.

At 1155:34, the approach controller advised the flight crew to turn left to a heading of 150 °. Between 1155:47 and 1157:16, there was discussion in the cockpit about the LOC/DME-E approach and discontent about being given delaying vectors instead of being given a slot in the landing sequence. At 1156:29, another airplane (N7HB, a Gulfstream 280) requested to divert to Garfield County Regional Airport (RIL) in Rifle, Colorado, located about 50 miles northwest of ASE.

At 1206:32, the flight crew listened to a recording of the ASE automated terminal information service (ATIS) report hearing only those parts broadcasting NOTAM information. Then the captain asked the passenger if vertical navigation (VNAV) could be used, and the passenger responded, "yes." The captain called for 20° of flaps. The copilot verified speed, and the flap handle was lowered.

At 1207:12, the approach controller requested that the flight crew verify they were descending to 13,400 ft. The copilot responded "yes, ah we're slowing down the aircraft." The captain and copilot discussed why the airplane was not "going down." The passenger instructed the crew to turn on VNAV.

At 1207:44, the approach controller directed the flight crew to turn left to a heading of 180 °, cross JARGU (an approach fix) at or above 13,400 ft, and cleared the flight to execute the LOC/DME-E approach.

At 1208:13, the flight crew continued to setup for the approach. The captain asked the copilot for flaps 20 °. The copilot stated, "they're there, flaps 30." Then power was reduced, followed by the landing gear being lowered. The crew discussed attempting to intercept the localizer, and the passenger explained that they had not entered it into the FMS. The copilot asked the captain if he should input flaps 30 °, the captain agreed, and the flap handle was lowered. The crew slowed the airspeed down, and the passenger remarked that the speed was 65 (165).

At 1208:51, the approach controller directed the flight crew to contact the tower. There was confusion about what altitude they needed to maintain to intercept the localizer. The captain and copilot thought they were too high, and the passenger advised "you're good." The flight crew continued to discuss being too high for the localizer.

At 1209:32, the local controller called the flight crew because they had not contacted the tower yet. The flight crew continued to discuss being too high and unsure what altitude they should be at when they crossed the next approach fix.

At 1210:00, the flight crew established contact with the local controller. The local controller advised that the wind was from 290 ° at 19 kts, and the 1-minute average wind was from 320 ° at 12 kts gusting to 25 kts. The local controller cleared the flight crew to land on runway 15. The copilot confirmed, "having the runway, cleared to land. And ah roger with the wind." Discussion about their altitude being too high continued in the cockpit.

At 1210:38, the local controller advised the flight crew that a Falcon had just reported a gain of 20 kts and to use caution for low-level windshear. At 1210:45, the copilot replied, "ah roger," and the flight crew continued discussing the airplane's high altitude.

The copilot said, "pull the power," and the passenger confirmed that the crew was "established." The copilot remarked, "we have a 30 knot tail wind dude," and "they had 20 tailwind gusts."

At 1211:08, the local controller announced "wind 310 at 10 kts". The copilot was repeating the winds just reported when the captain stated, "we're at 5 miles. Whoa dude the runway is right here dude." The copilot, passenger, and captain agreed the it was "impossible" to make the runway. The copilot announced a missed approach and stated, "there's 33 kts of tailwind." The flight crew executed a missed approach. The local controller cleared the flight crew to execute the published missed approach to 16,000 ft.

At 1212:38, the local controller advised the flight crew to contact approach control. No confirmation was received from the flight crew, the local controller repeated the instruction to contact approach control, and the flight crew acknowledged the frequency change.

At 1212:53, the flight crew contacted approach control, and the controller asked the flight crew their intentions. The passenger told the flight crew "to return back." The copilot informed the controller that they wanted to return for another approach and added "we had a tailwind of 30 knots." The approach controller began to provide the flight crew with vectors for the LOC/DME-E approach.

At 1213:24, the flight crew began setting up the approach in the FMS again. For about the next 4.5 minutes, the flight crew and passenger attempted to program the FMS.

At 1216:57, approach advised N115WF they were 4 miles from JARGU, fly heading 120, cross JARGU at 13,000 feet, and cleared the Localizer DME Echo approach. The copilot partially readback the clearance, with an error, and the controller corrected the error.

At 1218:01, the approach controller directed the flight crew to contact the tower. The flight crew acknowledged. The passenger began to instruct the captain through the approach, including input of flaps as well as altitude and airspeed guidance for descent.

At 1218:49, the captain said that the wind was at 26 kts and remarked that once through the mountains, the winds might decrease. The passenger replied, "don't worry" and continued to provide instructions on the approach.

At 1219:22, the local controller contacted the flight crew and instructed them to continue the approach to runway 15.

For about the next minute, the captain continued to fly the approach with some input from the passenger and copilot. There were multiple remarks that the altitude was too high and they needed to "go lower." At 1220:29, the copilot stated, "put in speed brakes, put in speed brakes." followed by pointing out, "there's the runway." The captain replied with an expletive and requested gear down.

At 1220:35, the local controller said "wind 330 at 16. Runway 15 cleared to land. One-minute average 320 at 14 kts gusting to 25 kts."

At 1220:35, the passenger called for full flaps, and the sound of an altitude alert was heard, followed shortly thereafter by the enhanced ground proximity warning system (EGPWS) alert "sink rate, sink rate." The copilot announced "tail wind is 39 kts. Like 35 kt tail wind. Careful." The passenger stated "as we get lower, I'll take out the flight spoiler for you." The EGPWS announced "sink rate, sink rate" again. The copilot told the captain to add a little power followed 10 seconds later by "take off power. Less less less less less less less less." The captain replied, "wait dude because I need to control this."

At 1221:36, the copilot said, "this wind is from the tail. This is screwed." He then remarked, "maybe it will calm down by the mountain." The copilot instructed, with strain in his voice, to "follow to the center. To the center. That's it. There you go"; this was followed by the sound of a reduction in power. The passenger and copilot called out 100 ft. The passenger instructed, "put it through." In a strained tone, the copilot remarked, "oy oy, oy ah." The pilot used some expletives and then stated, "the winds are screwed." The passenger instructed the flight crew to lower the spoiler, and the copilot told him, "No no. Careful careful." The passenger instructed, "lower it, lower us." The copilot said, "no, let's go." The passenger repeated, "lower us." There was a power increase, then decrease, and the airplane contacted the runway. A warning sound of either flight spoilers extended or take-off configuration warning was heard, followed by a stall warning. The tower remarked "go around, go around, go around," followed by someone in the flight deck stating, "let's go, let's go." The recording ended at 1220:10.

## WRECKAGE AND IMPACT INFORMATION

The airplane was found inverted beside the runway with fire damage on the fuselage and wings. The inside of the cockpit and cabin did not show evidence of fire. The airplane's under belly from the air driven generator to the underside of the inboard right wing had markings consistent with ground scraping. The right upper cockpit structure was partially collapsed and structurally breached. The right wing was folded beginning about 1/3 of the wingspan from fuselage. The left wing was bent downward (relative to the airplane's resting position) outboard of the outboard flap. The upper section of the vertical stabilizer, including the horizontal stabilizer, was detached from the main hull.

Both main landing gear were found in the extended position and connected only by their side stay actuators. Examination of the left and right main landing gear attachment points on the wing spars and trunions showed the pivot bushings intact and in their bore holes. The right main landing gear door link was still attached. Both main landing gear attachment fittings were found structurally intact. The nose

landing gear wheel well structure was deflected upward but did not contact any flight control beam assemblies under the cockpit floor. The nose landing gear was folded about 70° aft and 30° to the left. The right axle for the nose landing gear was severed, and the right nose wheel tire was missing. The left nose wheel was missing a portion of the inboard hub rim. The nose landing gear lower oleo strut had markings consistent with ground scraping on the axle jack point. A portion of the nose landing gear axle fracture surface had markings consistent with ground scraping.

The flaps were found in a deployed position. The right inboard and outboard flaps were disconnected from the wing. The left inboard flap's inboard and outboard actuator screws were severed. The left outboard flap was attached to the wing by both actuators and hinges. The outboard flap screw actuator was measured from the gearbox housing aft surface (just forward of the dog stop ring) to the face surface of the ball screw assembly and found a distance of 5 3/4 inches. The exposed threads were counted and found 26 threads indicating a flap position of 45°.

The horizontal stabilizer trim actuator jack screw was examined and found intact. The measurement from the gear box upper surface to the upper gimbal lower surface was 4.85 inches, indicating a trim setting of about 4.85 (trim indicator range is from 0-9; 0 is full nose-down and 9 is full nose-up; a measurement of 7.59 inches equates to about full nose-down). The left electrical connector for the horizontal stabilizer trim noise suppressor was found pulled from its connection.

The left and right main angle of attack (AOA) vanes were found intact with no visible damage. Both vanes moved normally when a finger force was applied. The right aux AOA vane had no visible damage; however, it did not move when a finger force was applied.

The outer cowl of the left engine, S/N 807029, did not appear to sustain any impact damage. The outside of the engine cowl, the fan inlet, and the fan blades exhibited smoke sooting. The cowls and core cowls were able to open normally. The engine under the cowls was free of soot and appeared normal. The main fuel control lever/linkage feedback match marks were aligned consistent with an engine that was in the "OFF" position. No other anomalies were noted while the engine was still mounted to the airplane. After the engine was removed from the airplane, it was placed on the ground and further inspection was conducted. During engine removal, all engine to pylon connections were visually inspected and appeared normal. The fan blades did not sustain any visible damage. The inner surface of the fan inlet appeared bubbled and heat distressed from 0-90° aft looking forward (ALF). The fan was free to turn by hand with no abnormal sounds noted. There were scrapes on the outside of the fan case from 270-0° ALF. Visual inspection of all under cowl areas indicated all hardware was consistent with a normal flight engine. The fan cowls were not removed from the engine. Visual inspection of the tailpipe indicated no anomalies with the low pressure turbine.

The right engine, S/N 807136, sustained fire damage from the exterior of the airplane. The outer cowls showed burn-through from outside to inside in several areas. Melted cowl material had dropped onto the exterior of the engine cases and components. The upper cowl had to be pried and cut with a saw in order to open it. Under the cowls, the engine appeared normal with no indications of an engine fire. The main fuel control linkage feedback match marks were aligned consistent with an engine that was in the "OFF" position. No other engine anomalies were noted while the engine was still mounted to the airplane. After the engine was removed from the airplane, it was placed on the ground, and further inspection was conducted. During engine removal, all engine to pylon connections were visually inspected and appeared normal. Impact damage to the inner surface of the fan inlet showed deformation from 0-90° ALF. The fan

did not rotate by hand. Contact was noted between the fan case and fan blades, as well as molten material from the postcrash fire in the area. A handful of blades showed un-blended foreign object debris (FOD) damage; both hard and soft body damage were noted. The un-blended FOD damage consisted of tears and bent material consistent with multiple foreign objects entering the fan with the engine still producing power. Visual inspection of all under cowl areas indicated all hardware was consistent with a normal flight engine with the exception of the soot and molten material from the postcrash fire. Fan cowls were not removed from the engine. Visual inspection of the tailpipe indicated no anomalies with the low pressure turbine.

A visual inspection of the cockpit found the following:

- The flap handle was at 45°.
- The engine power levers were in the shut off position.
- The engine reverse thrust levers was in the stowed position.
- The landing gear handle was in the down position.
- The flight spoiler handle was in the retract position.
- The ground spoiler switch was in the on position.
- The right control column was bent to the left about 20°.
- The left and right control yokes were deflected to the right about 20° and appeared to be synched.
- The pitch and roll disconnect handles were in their normally stowed position.
- The EGPWS PBAs were in their normal out positions.
- The pilot and copilot stall protection pusher switches were in the on position.
- The air driven generator was in the deployed position.

## MEDICAL AND PATHOLOGICAL INFORMATION

A post mortem examination of the copilot was conducted under the authority of Rocky Mountain Forensic Services, PLLC, Loma, Colorado. The cause of death for the copilot was attributed to multiple injuries.

The FAA's Civil Aeromedical Institute performed toxicology examinations for the copilot which were negative for carbon monoxide, alcohol, and drugs. No toxicology exam was completed for the captain or the passenger.

## TESTS AND RESEARCH

### Crew Training Requirements

Federal Aviation Regulation (FAR) 61.64, *Use of a Flight Simulator and Flight Training Device*, paragraph (b), states that if an airplane is not used during the practical test for a type rating for a turbojet airplane, an applicant must accomplish the entire practical test in a Level C or higher flight simulator and the applicant must:

- (1) Hold a type rating in a turbojet airplane of the same class of airplane for which the type rating is sought, and that type rating may not contain a supervised operating experience limitation;
- (2) Have 1,000 hours of flight time in two different turbojet airplanes of the same class of airplane for which the type rating is sought;
- (3) Have been appointed by the U.S. Armed Forces as pilot in command in a turbojet airplane of the same class of airplane for which the type rating is sought;
- (4) Have 500 hours of flight time in the same type of airplane for which the type rating is sought; or
- (5) Have logged at least 2,000 hours of flight time, of which 500 hours were in turbine-powered airplanes of the same class of airplane for which the type rating is sought.

Paragraph (f)(2) of this regulation states that if the applicant does not meet one of the experience requirements of paragraphs (b)(1) through (5), as appropriate to the type rating sought, then the applicant's pilot certificate will be issued with a limitation that states: "The type rating is subject to pilot in command limitations," and the applicant is restricted from serving as pilot in command in an aircraft of that type.

Paragraph (g) of this regulation explains that the limitation described under paragraph (f)(2) may be removed from the pilot certificate if the applicant complies with the following -

- (1) Performs 25 hours of flight time in an aircraft of the category, class, and type for which the limitation applies under the direct observation of the pilot in command who holds a category, class, and type rating, without limitations, for the aircraft;
- (2) Logs each flight and the pilot in command who observed the flight attests in writing to each flight;
- (3) Obtains the flight time while performing the duties of pilot in command; and
- (4) Presents evidence of the supervised operating experience to any Examiner or FAA Flight Standards District Office to have the limitation removed.

This rule applies to all pilot training accomplished for a Part 135 commuter and on-demand flight operator. The captain and copilot did not have the required 25 hours of flight time in the CL-600 airplane and therefore, did not meet the requirements of this regulation to act as pilot-in-command. However, because there were no revenue paying passengers on board the airplane, the accident flight was being operated under Part 91 as a general aviation flight. As such, the flight time requirement did not apply to the accident flight.

Aircraft Performance

An NTSB Vehicle Performance Specialist completed an airplane performance study using the data from the FDR. The study used the flight crew's calculations of the airplane's landing weight at 35,881 pounds and center of gravity (CG) at 512.6 inches.

During the last 6 minutes of flight, the airplane descended from 13,500 ft and slowed from an airspeed of 220 kts. The airplane's descent angle for the last nautical mile of flight was about 4°, and its airspeed was about 140 kts.

Runway 15 at ASE was on a magnetic heading of 151° (160° true); it began at an elevation of 7,680 ft and sloped upward at a gradient of 1.9%. During the last minute of flight, the airplane's track aligned with the runway heading. The wind was variable from 280° to 360° at 14 kts gusting to 25 kts. A 25 kt gust from 280° equates to a 21 kt crosswind and a 12 kt tail wind on runway 15. Wind from 340° would be a pure tailwind. The airplane's maximum tailwind component for takeoff and landing, as reported in the AFM, was 10 kts. According to the AFM, the maximum demonstrated crosswind component for landing on a dry runway was 24 kts.

ASE was a high-altitude, terrain-limited airport. For the LOC/DME-E approach, the missed approach point was 2.6 nm from the threshold. The missed approach procedure was to execute a climbing right turn to 14,000 ft on a heading of 300°. The airplane had performed a missed approach before the accident landing.

If attempting a go-around over the runway, there would be three points of high terrain (Aspen Mountain, the hill where the I-PKN localizer is installed, and Richmond Hill) beyond the end of Runway 15 to clear. Of the three, the location of the I-PKN localizer would require the steepest climb gradient from the runway threshold. To clear the I-PKN localizer, an aircraft would have to climb to 3,500 ft (to an altitude above 11,188 ft) in 31,000 ft of horizontal distance.

The Aircraft Operating Manual (AOM) provided climb data from sea level to various altitudes for different take-off weights for international standard atmospheric conditions (ISA). The temperature on the day of the accident was colder than ISA, so climb performance would have been better than this data indicates, making the following evaluation conservative. Data provided were the altitude gain, time, ground distance, and fuel burn for conditions with both engines operating; no information was provided to indicate the change in climb performance with the anti-icing systems on, but a 30% degradation was assumed using other data from the AFM. Given the information known from the FDR, AOM, and AFM and the elevations of the airfield and obstacles to clear, it was determined that the airplane should have been able to clear both Aspen Mountain and Richmond Hill if the anti-icing was off. Clearing the I-PKN localizer location would require a more optimal climb performance and less than a 25 kts tailwind. However, the climb performance data used was conservative, the atmosphere was cooler, and the winds were variable. Additionally, the weather (scattered clouds at 4,700 ft agl, and a broken ceiling at 6,000 ft) might have allowed the crew to maneuver around the worst case terrain obstacles.

#### ADDITIONAL INFORMATION

On January 11, 2014, based on the events of the accident, ASE ATCT changed its standard operating procedures for dissemination of wind information. The 1-minute average wind data was established to be the "official winds to be issued" to pilots at ASE. While the local controller provided the 1-minute wind average (and associated gust information) to the accident flight crew during arrival, the procedure in place



at the time of the accident allowed wind reporting to be controller discretion. Local controllers at ASE could provide flight crews either the instantaneous wind readings or the 1-minute average with 10-minute gust information.

Although the ASOS continued to provide pilots with the 2-minute average wind with 10-minute gust data via the ATIS, the most updated wind data available (the 1-minute average wind data) from the stand-alone weather station (SAWS) was required to be provided by the ASE ATCT controllers.

### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	52,Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	August 27, 2013
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	November 9, 2013
<b>Flight Time:</b>	17250 hours (Total, all aircraft), 14 hours (Total, this make and model), 498 hours (Pilot In Command, all aircraft)		

### Co-pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	54,Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 With waivers/limitations	<b>Last FAA Medical Exam:</b>	December 3, 2012
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	November 14, 2013
<b>Flight Time:</b>	(Estimated) 20355 hours (Total, all aircraft), 14 hours (Total, this make and model), 2219 hours (Pilot In Command, all aircraft)		

## Pilot-rated passenger Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	52, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Single
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>		<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	December 9, 2013
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>			

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	CANADAIR LTD	<b>Registration:</b>	N115WF
<b>Model/Series:</b>	CL 600 2B16 601	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1994	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	5153
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	December 18, 2013 AAIP	<b>Certified Max Gross Wt.:</b>	43100 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Turbo fan
<b>Airframe Total Time:</b>	6750 Hrs as of last inspection	<b>Engine Manufacturer:</b>	GE
<b>ELT:</b>	Installed, activated, did not aid in locating accident	<b>Engine Model/Series:</b>	CF34 SERIES
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	9140 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KASE, 7720 ft msl	<b>Distance from Accident Site:</b>	0 Nautical Miles
<b>Observation Time:</b>	18:53 Local	<b>Direction from Accident Site:</b>	346°
<b>Lowest Cloud Condition:</b>	Few / 3500 ft AGL	<b>Visibility</b>	9 miles
<b>Lowest Ceiling:</b>	Broken / 4600 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	9 knots / 28 knots	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	310°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.06 inches Hg	<b>Temperature/Dew Point:</b>	-11°C / -20°C
<b>Precipitation and Obscuration:</b>	Moderate - None - Haze		
<b>Departure Point:</b>	TUCSON, AZ (TUS )	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	Aspen, CO (ASE )	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>	10:04 Local	<b>Type of Airspace:</b>	Class E

## Airport Information

<b>Airport:</b>	ASPEN-PITKIN CO/SARDY FIELD ASE	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	7837 ft msl	<b>Runway Surface Condition:</b>	Dry; Snow
<b>Runway Used:</b>	15	<b>IFR Approach:</b>	LOC-backcourse; Localizer only; RNAV; VOR/DME
<b>Runway Length/Width:</b>	8006 ft / 100 ft	<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal, 2 Serious	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal, 2 Serious	<b>Latitude, Longitude:</b>	39.221942, -106.868331 (est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Liedler, Courtney
<b>Additional Participating Persons:</b>	John Berens; FAA FSDO; Denver, CO Dustin Havel; Aspen/Pitken County Airport; Aspen, CO Samuel Farmiga; GE Aviation; Cincinnati, OH
<b>Original Publish Date:</b>	April 20, 2017
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=88631">https://data.nts.gov/Docket?ProjectID=88631</a>

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