



Aviation Investigation Final Report

Location:	Bellevue, Tennessee	Accident Number:	ERA14FA112
Date & Time:	February 3, 2014, 16:55 Local	Registration:	N840V
Aircraft:	GULFSTREAM AM CORP COMM DIV 690	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The instrument-rated private pilot was conducting a personal cross-country flight in the multiengine airplane under instrument flight rules (IFR). As the flight neared its destination, the controller issued clearance for a GPS approach, and, shortly thereafter, the pilot informed the controller that he needed to review the approach procedure before continuing the approach. The controller acknowledged, and, after the pilot reported that he was ready to proceed with the approach, the controller again issued clearance for the GPS approach. Radar data showed that, during the approach, the airplane tracked a course that was offset about 0.5 miles right of the final approach course until it was about 1 mile from the runway threshold. The airplane then turned left towards the threshold and descended to an altitude of about 145 ft above ground level over the runway threshold before the pilot performed a missed approach. It is likely that the pilot performed the missed approach because he was unable to align the airplane with the runway before it crossed the threshold.

The controller provided radar vectors for the airplane to return to the approach course and cleared the airplane a third time for the GPS approach to the runway. Radar data showed that the airplane was established on the final approach course as it passed the initial approach fix; however, before it reached the final approach fix, its airspeed slowed to about 111 knots, and it began a left turn with a 25 degree bank angle. About 18 seconds later, while still in the turn, the airplane slowed to 108 knots and began descending rapidly. The airplane's rate of descent exceeded 10,000 feet per minute, and it impacted the ground about 9 miles from the destination airport.

Examination of the accident site showed that the airplane was severely fragmented and fire damaged with debris scattered for about 450 feet. Postaccident examination of the wreckage did not reveal evidence of any preimpact failures; however, damage to the left engine indicated that it was not producing power at the time of the accident. The severity of impact and fire damage to the airplane and engine precluded determination of the reason for the loss of left engine power.

Weather conditions present at the time of the accident were conducive to super cooled liquid water droplets, and the airplane likely encountered moderate or greater icing conditions. Several pilot reports (PIREPs) for moderate, light, trace, and negative icing were reported to air traffic control but were not distributed publicly into the national airspace system, and there was no airmen's meteorological information (AIRMET) issued for icing. However, the pilot received standard and abbreviated weather briefings for the flight, and his most recent weather briefing included three PIREPs for icing conditions in the area of the accident site. Given the weather information provided, the pilot should have known icing conditions were possible. Even so, the public distribution of additional PIREPs would have likely increased the weather situational awareness by the pilot, weather forecasters, and air traffic controllers.

The airplane was equipped with deicing and anti-icing systems that included wing and empennage deice boots and engine inlet heaters. Due to impact damage to the cockpit, the positions of the switches for the ice protection systems at the time of the accident could not be determined. Although the airplane's airspeed of 108 knots when the steep descent began was above its published stall speed of 77 knots, both bank angle and ice accretion would have increased the stall speed. In addition, the published minimum control airspeed was 93 knots. It is likely that, after the airplane passed the initial approach fix, the left engine lost power, the airplane's airspeed began to decay, and the asymmetric thrust resulted in a left turn. As the airspeed continued to decay, it decreased below either stall speed or minimum control airspeed, and the airplane entered an uncontrolled descent.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain airspeed with one engine inoperative, which resulted in a loss of control while on approach. Contributing to the accident were airframe ice accumulation due to conditions conducive to icing and the loss of engine power on one engine for reasons that could not be determined due to the extent of damage to the airplane.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Airspeed - Not attained/maintained
Environmental issues	Conducive to structural icing - Contributed to outcome
Aircraft	(general) - Not specified

Factual Information

History of Flight

Approach	Structural icing
Approach	Loss of engine power (partial)
Approach-IFR final approach	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On February 3, 2014, about 1655 central standard time, a Gulfstream Commander 690C, N840V, operated by a private pilot, was destroyed when it impacted the ground near Bellevue, Tennessee, while on approach to the John C. Tune Airport (JWN), Nashville, Tennessee. The private pilot and three passengers were fatally injured. Instrument meteorological conditions prevailed and an instrument flight rules (IFR) flight plan had been filed for the flight that departed Great Bend Municipal Airport (GBD), Great Bend, Kansas. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91.

According to information obtained from the Federal Aviation Administration (FAA), the airplane was based at GBD. On the date of the accident, the pilot flew the airplane from the Clarence E. Page Municipal Airport (RCE), Oklahoma City, Oklahoma, where it had been undergoing maintenance, which included a 150-hour periodic inspection, to GBD. The pilot and three passengers then departed for JWN about 1445, and planned to attend a convention and trade show that was being held in the Nashville area.

The flight progressed toward Nashville and the pilot was cleared for a GPS (RNAV) approach to runway 2 at JWN, about 1628. At 1629:27, the pilot stated, "I'd like to climb and uh review the approach and uh do it again."

At 1629:28, the pilot was directed to maintain 3,000 feet and turn right to a heading of 020 degrees. The pilot acknowledged the clearance correctly; however, turned to a heading of 200 degrees. The controller reported that she did not correct the pilot because the incorrect heading did not create a conflict with any other traffic.

About 1631, the pilot stated "you can directed me back..." and reported that he had the initial approach fix (IAF) for the approach "...on my system." The pilot was subsequently provided a clearance for the GPS runway 2 approach.

At 1637, the controller asked the pilot if he was established on the approach and the pilot responded that he was. The controller then advised the pilot that the airplane was about 1/2 mile east of the final approach course, and the pilot replied, "That's correct I'm a little east of course."

At 1642, the pilot reported that he was executing a missed approach. About 1653, the pilot was cleared for a third GPS approach to runway 2 at JWN.

At 1655:37, the controller informed the pilot that radar services were terminated, instructed him to report cancellation of IFR in the air or on the ground, and advised him that traffic was ten miles in trail. The pilot did not respond, and there were no further transmissions received from the pilot.

According to radar data, during the accident approach, the airplane was on the final approach course when it veered to the left and began a descent. The airplane had turned to a heading of about 210 degrees before radar contact was lost.

The airplane impacted trees and a field adjacent to a building, about 9 miles south of JWN.

Pilot Information

Certificate:	Private	Age:	62, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Unknown
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	February 23, 2012
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	3205 hours (Total, all aircraft), 719 hours (Total, this make and model)		

The pilot, age 62, held a private pilot certificate, with ratings for airplane single-engine land, multiengine land, and instrument airplane. The pilot's logbook was not located. His most recent FAA third-class medical certificate was issued on February 23, 2012. At that time, he reported a total flight experience of 3,000 hours, which included 30 hours during the previous 6 months.

According to training records, the pilot successfully completed a turbo commander 690 recurrent course during May 2013. At that time, the pilot reported 3,205 hours of total flight experience, which included 1,392 hours in multiengine airplanes, and 436 hours of instrument flight experience. In addition, he reported 719 hours flown in the accident airplane, and 20 hours flown during the previous 12 months.

Aircraft and Owner/Operator Information

Aircraft Make:	GULFSTREAM AM CORP COMM DIV	Registration:	N840V
Model/Series:	690 C	Aircraft Category:	Airplane
Year of Manufacture:	1982	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	11727
Landing Gear Type:	Tricycle	Seats:	11
Date/Type of Last Inspection:	February 1, 2014 Continuous airworthiness	Certified Max Gross Wt.:	10325 lbs
Time Since Last Inspection:	5 Hrs	Engines:	2 Turbo prop
Airframe Total Time:	4460 Hrs at time of accident	Engine Manufacturer:	Garrett
ELT:	Installed	Engine Model/Series:	TPE331-5-511
Registered Owner:	On file	Rated Power:	715 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

The pilot was the President of an agricultural company that purchased the airplane on August 29, 2000.

The high wing, all-metal, pressurized airplane, serial number 11727, was manufactured in 1982. It was powered by two Executive Wings Inc. supplemental type certificate modified Garrett TPE331-5-511K, 715-horsepower engines, equipped with Hartzell three-bladed constant speed propeller assemblies.

According to maintenance records, the airplane's most recent inspection was a 150-hour periodic inspection, which was performed on February 1, 2014. At the time of the accident, the airframe and both engines had been operated for about 4,460 total hours since new. The airplane had been operated for about 70 hours during the 13 months that preceded the accident.

According to the pilot operating handbook, the airplane was equipped with deicing and anti-icing systems. The deice system included the wing and empennage deice boots and the propeller deice system. The function of the deice systems was to eliminate ice after it accumulated. The anti-icing system included heated stall warning, rudder horn anti-ice, rudder tab anti-ice, generator inlet anti-ice, electrically heated wind shield, and pitot-static heaters. The anti-icing systems were designed to prevent ice accumulation and should be placed in operation prior to entering flight conditions conducive to the formation of ice. Engine inlet heaters utilized hot engine compressor bleed air to prevent icing. The ice protection systems were controlled by switches in the "ICE PROTECTION" group of the cockpit overhead switch panel.

The following warning was included under the Engine Inlet Anti-Ice Systems:

"Warning: When icing conditions may be encountered, do not delay operation of the engine inlet heat systems. Turn the systems on before any ice accumulates. Engine inlet heat must be on if icing conditions exist or are anticipated."

The airplane was also equipped with a Negative Torque Sensing (NTS) system which was designed to reduce drag caused by a wind milling propeller in the event of a loss of engine power by moving the blades toward the feathered position to reduce drag and yaw.

Honeywell Operating Information Letter OI331-11R11, issued on September 16, 2013, emphasized proper use of engine inlet anti-ice and provided additional information on the use of engine ignition in icing conditions. The operating letter stated in part, that engine inlet anti-ice should be used during all flight in potential icing conditions and icing conditions should be considered to exist when flying in precipitation or visible moisture (including clouds or fog) with an outside air temperature 10 degrees Celsius or 50 degrees Fahrenheit (F), or colder. In addition, "If the use of anti-ice is inadvertently delayed after encountering icing conditioning, ice may accumulate on engine and airframe inlet surfaces. In such instances, subsequent application of engine inlet anti-ice can cause ice shedding and ingestion, which may cause flameout...."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	JWN,495 ft msl	Distance from Accident Site:	9 Nautical Miles
Observation Time:	16:55 Local	Direction from Accident Site:	20°
Lowest Cloud Condition:		Visibility	5 miles
Lowest Ceiling:	Overcast / 800 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	5 knots /	Turbulence Type Forecast/Actual:	/ None
Wind Direction:	360°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.29 inches Hg	Temperature/Dew Point:	5°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	GREAT BEND, KS (GBD)	Type of Flight Plan Filed:	IFR
Destination:	NASHVILLE, TN (JWN)	Type of Clearance:	IFR
Departure Time:	14:45 Local	Type of Airspace:	Class E

A weather observation taken at JWN, which was located 9 miles north-northeast of the accident site, at an elevation of 495 feet, at 1655, reported wind from 360 degrees at 5 knots; visibility 5 statute miles; overcast ceiling at 800 feet; temperature 41 degrees F; dew point 25 degrees F; altimeter 30.29 inches of mercury.

AIRMET Sierra issued at 1445, was valid at the time of the accident, and forecasted IFR conditions around the accident site with ceilings below 1,000 feet and visibilities below 3 miles. There were no AIRMETS for icing conditions valid at the time of the accident. The pilot received standard and abbreviated weather briefings from Lockheed Martin Flight Service. The last weather briefing requested by the pilot was at 1538, and included three pilot reports (PIREPs) for icing conditions in the Nashville area that were applicable to the pilot's flight.

The National Weather Service (NWS) surface analysis chart around the time of the accident depicted a frontal system located across the southeastern United States with a surface trough in the vicinity of the

accident site. Station models around the accident site depicted air temperatures in the mid-20's to mid-30's F, with temperature-dew point spreads of 3 degrees F or less, a north to northeast wind less than 10 knots, cloudy skies, and fog.

Geostationary Operational Environmental Satellite number 13 (GOES-13) data indicated abundant cloud cover over the accident site with approximate cloud-top heights of 19,500 feet around the time of the accident.

A review of pilot weather reports (PIREPs) that were publicly available in the National Airspace System (NAS) for the vicinity of the accident site revealed that, from about 3 hours before the accident to about the time of the accident, there were seven PIREPs that contained icing information that ranged from trace rime to a light to moderate mixed icing, with the reported icing conditions only occurring between 2,000 and 3,500 feet.

Review of Current Icing Potential (CIP) images produced by the NWS Aviation Weather Center depicted light to moderate icing was likely at 2,000 to 3,000 feet around the time of the accident. It was noted that CIP data was intended to be supplemental to other icing advisories (e.g. AIRMETS and SIGMETS).

A witness driving around areas south and southwest of the Nashville between 1400 and 1730 reported that he noticed ice on some street signs and noted the vehicle outside temperature sensor indicated 34 degrees F.

A review of recorded audio information from the Nashville terminal radar approach control (TRACON) revealed that, from about 90 to 55 minutes before the accident, the radar west controller received seven verbal PIREPs, six of which included icing information that ranged from negative icing to clear ice. None of these PIREPs were communicated to the radar west controller (who was handling the accident flight), and none were distributed publicly in the NAS. The recordings also revealed that, about the time of the accident, the Nashville tower controller received two PIREPs of moderate rime ice, and the tower controller called Nashville flight data to relay one of the PIREPs for distribution in the NAS.

During interviews, TRACON personnel stated that, once receiving a PIREP, the standard procedure was for the supervisor to call Lockheed Martin Flight Service (LMFS) for LMFS to distribute the PIREP publicly into the NAS; however, TRACON personnel said that, 20 to 30 percent of the time, LMFS would not answer the phone or LMFS was unavailable to receive the PIREP information. In addition, TRACON personnel stated that when receiving an icing report in one sector, they did not believe that that pilot report would be valid in an adjacent sector and therefore would not necessarily distribute the PIREP internally.

[Additional information can be found in the NTSB Meteorology and Air Traffic Control Factual Reports located in the public docket.]

Airport Information

Airport:	JOHN C TUNE JWN	Runway Surface Type:	Asphalt
Airport Elevation:	495 ft msl	Runway Surface Condition:	Unknown
Runway Used:	02	IFR Approach:	RNAV
Runway Length/Width:	5500 ft / 100 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	3 Fatal	Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 Fatal	Latitude, Longitude:	36.041667,-86.938331

The airplane's impact with the ground created an 11-foot-long, 11-foot-wide, 6-foot-deep impact crater. Broken tree branches that contained 45-degree angled cuts were observed at a height about 50 feet. The airplane impacted the ground at an approximate 70-degree angle, consistent with being in an inverted position. It was severely fragmented with debris scattered on a course about 320 degrees, for about 450 feet. In addition, a postcrash fire consumed a majority of the airframe. Portions of both outboard wings, the nose section, empennage and all flight control surfaces were located at the accident site; however, fragmentation of the wreckage precluded the ability to confirm control continuity to the respective flight control surfaces. A portion of the outboard left wing approximately 15 feet in length from the wing tip was located, as well as fragments of the left and right wing that exhibited crushing completely to the rear spar assemblies. The left main landing gear was in the retracted position, the right and nose landing gear were separated from their surrounding structure. Due to impact damage to the cockpit, the positions of ice protection system switches at the time of the accident could not be determined. Portions of the deice boot system were observed on wing debris and portions of the horizontal stabilizer. The boots were destroyed by impact forces and fire damage.

Both propellers remained attached to their respective gearboxes, which separated from their respective engines. All three left propeller blades separated from the hub. Two right propeller blades remained attached to the hub, and one blade had separated. Both propeller assemblies were severely impact damaged and displayed evidence of rotational scoring; however, it was noted that the right propeller blades displayed significantly greater degree of rotational scoring, tears, and missing blade tips, than the left propeller blades.

Both engines were impact and fire damaged. Their respective fuel pumps and fuel control units were separated. They did not display any evidence of catastrophic failure and were forwarded to the engine manufacturer for further examination under the supervision of an NTSB investigator.

A subsequent teardown examination of both engines did not reveal any preimpact conditions that would

have prevented normal operation. The type and degree of damage to the left engine was indicative of an engine that was not operating, with rotation consistent with a wind milling propeller at the time of impact. Static impact marks were observed on the first and second stage centrifugal compressor shrouds and no evidence of rotational scoring was noted on the turbine section. The type and degree of damage to the right engine was indicative of an engine that was operating under power at the time of impact. Rotational scoring was observed on the first and second stage centrifugal compressor shrouds and the first, second, and third stage turbine shroud. Almost all of the vanes on the first stage centrifugal compressor impeller were deformed and or separated. In addition, the forward curvic coupling of the second stage centrifugal compressor impeller was heavily smeared.

The left engine fuel control unit was examined at Woodward, Rockford, Illinois, under the supervision of an FAA inspector. The fuel control unit was extensively damaged and could not be functionally tested. Subsequent disassembly did not reveal evidence any preimpact malfunctions.

Computed Tomography scans of the left and right engine fuel shutoff valves revealed that they were both in the closed position; however, their respective preimpact position could not be confirmed. A subsequent teardown of the valves under the supervision of an NTSB investigator did not reveal evidence of any preimpact failures. The left engine fuel shutoff valve solenoids could be opened and closed by applying electrical power directly to the solenoids. The right engine fuel shutoff valve solenoids did not function when electrical power was applied.

Examination of a vertical and directional gyro recovered from the wreckage was performed by the NTSB Materials Laboratory. The examination revealed that although both gyros were impact and fire damaged, internal damage was consistent with rotation at the time of the accident.

Medical and Pathological Information

An autopsy was performed on the pilot by the Office of the Medical Examiner, Center for Forensic Medicine, Nashville, Tennessee. The autopsy report listed the cause of death as "multiple blunt force injuries."

Toxicological testing was performed on the pilot by the FAA Bioaeronautical Science Research Laboratory, Oklahoma City, Oklahoma with no anomalies noted.

Additional Information

Radar Performance Study

A performance study of the airplane's flight path was created by an NTSB airplane performance

specialist. The study revealed that the airplane's airspeed was nominally 150 knots during the approach prior to the accident and showed good acceleration after the pilot declared a missed approach. During the accident approach, the airplane's airspeed had slowed to 111 knots, when it began a left 25 degree turn away from the final approach course, and 18 seconds later, while still in the turn, the airplane slowed to 108 knots and descended at over 10,000 feet per minute until impacting the ground.

The study further noted that while the airplane's published stall speed for straight and level flight with the flaps and gear retracted was 77 knots, the stall speed would increase to approximately 108 knots in a 60 degree level turn. In addition, all speeds assumed a clean wing with no ice accretion.

The airplane pilot operating handbook listed the minimum control airspeed as 93 knots.

Administrative Information

Investigator In Charge (IIC):	Schiada, Luke
Additional Participating Persons:	James Bostrom; FAA\FSDO; Nashville, TN Geoffrey Pence; Twin Commander; Arlington, WA Jay Eller; Honeywell; Phoenix, AZ Les Doud; Hartzell Propeller Inc.; Piqua, OH Larry Lowry; National Flight Services, Inc.; Swanton, OH
Original Publish Date:	March 14, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=88759

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