Accident Rpt# CEN16FA130 03/20/2016 1110	**Regis# N84580**	**Ellsworth, NE**	**Apt: N/a**
Acft Mk/Mdl AERONCA 7AC	**Acft SN 7AC-3289**	**Acft Dmg: DESTROYED**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-235-C1	**Acft TT 1855**	**Fatal 1 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: ANDRICK BEN	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STN

Summary

The private pilot departed for a local personal flight on a winter day with an outside air temperature of about 6øC. About 1 hour after takeoff, the pilot's brother saw the airplane maneuvering near his home, which was in a rural area about 31 miles from the departure airport. The airplane did not return to the departure airport, and the accident site was located in an open field 2 days later, about 4 miles from the pilot's brother's home. Examination of the accident site revealed wreckage and impact signatures consistent with the pilot losing control of the airplane. Examination of the engine's exhaust muffler revealed cracks in several locations, and the muffler's shroud contained a layer of exhaust residue. Six months before the accident, the pilot and the mechanic who had previously performed an annual inspection on the airplane became aware of a crack in the muffler near a weld that the pilot had performed. The pilot had purchased a replacement muffler, but it was not installed before the accident. A carbon monoxide detector was not on board the airplane.

Toxicology testing of the pilot's blood revealed a carbon monoxide level of 40%, which was more than enough to severely impair the pilot. The carbon monoxide likely entered the airplane's cabin because of the cracked engine exhaust muffler. The toxicology testing also revealed several non-impairing medications and two potentially impairing medications (temazepam and buspirone). According to the pilot's medical records, he was being treated for anxiety with temazepam and buspirone, and he may have been fatigued from insufficiently treated sleep disorders (insomnia and obstructive sleep apnea). However, it could not be determined whether the pilot's anxiety, the medications used to treat it, or fatigue contributed to his poor judgment in flying the airplane with known cracks in the exhaust muffler.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's impairment due to carbon monoxide poisoning from a known cracked engine exhaust muffler, which resulted in a loss of aircraft control. Contributing to the accident was the pilot's decision to continue flying the airplane without properly repairing the exhaust muffler.

Events

1. Maneuvering - Loss of control in flight
2. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft power plant-Engine exhaust-(general)-Incorrect service/maintenance - C
2. Personnel issues-Physical-Impairment/incapacitation-Carbon monoxide-Pilot - C
3. Personnel issues-Action/decision-Info processing/decision-Decision making/judgment-Pilot - F
4. Aircraft-Aircraft power plant-Engine exhaust-(general)-Damaged/degraded - C

Narrative

HISTORY OF FLIGHT

On March 20, 2016, about 1110 mountain daylight time, an Aeronca 7AC airplane, N84580, impacted terrain near Ellsworth, Nebraska. The private pilot sustained fatal injuries, and the airplane was destroyed. The airplane was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations (CFR) Part 91 as a personal flight. Day visual meteorological conditions prevailed for the local flight, which departed without a flight plan from Alliance Municipal Airport (AIA), Alliance, Nebraska.

At 1000, an airport surveillance camera captured the airplane departing from AIA. About 1100, the pilot's brother observed the airplane maneuvering near his home, which was in a rural area about 31 miles northeast of AIA. After concerned family members reported the pilot missing, the accident site was subsequently located on March 22, 2016, about 4 miles southwest of the pilot's brother's home.

PERSONNEL INFORMATION

The pilot, age 68, held a private pilot certificate with an airplane single-engine land rating. The pilot was last issued a Federal Aviation Administration (FAA) third-class medical certificate on July 7, 2005. The pilot held a valid driver's license.

The Aeronca 7AC is defined by the FAA as a light sport aircraft (LSA). Pilots flying LSAs are only required to possess a valid driver's license and comply with 14 CFR 61.53(b), which states that no person may act "as pilot in command, or in any other capacity as a required pilot flight crewmember, while that person knows or has reason to know of any medical condition that would make the person unable to operate the aircraft in a safe manner."

A review of the pilot's logbook showed that the pilot had accumulated 355 flight hours of which 3 flight hours were in the last 30 days. The pilot's most recent flight review was completed on February 22, 2016.

AIRCRAFT INFORMATION

The airplane, serial number 7AC-3289, was manufactured in 1946 and registered to the pilot on September 10, 2013. It was a two-place, tandem, high-wing monoplane equipped with a Lycoming O-235-C1 engine, rated at 115 horsepower at 2,600 rpm.

Review of the maintenance records showed that the most recent annual inspection was completed on July 25, 2015, at a total time of 1,848.2 hours. At the time of the accident, the airplane had accumulated 7 hours since the annual inspection. Although the airplane held a standard airworthiness certificate, it met the definition of an LSA as contained in 14 CFR Part 1.1.

The mechanic who performed the last annual inspection stated that he and the pilot became aware of an engine exhaust muffler crack in September 2015. The crack was located near a weld that the pilot had performed. The pilot had intended to replace the muffler; a new muffler was in the pilot's hangar when the accident occurred.

WEATHER INFORMATION

At 1053, the weather observation station at AIA, located about 27 miles southwest of the accident site, reported the following conditions: wind variable at 6 knots, 10 miles visibility, clear skies, temperature 6øC, dew point minus 12øC, and an altimeter setting of 30.23 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The aircraft impacted rolling terrain on a southeasterly heading. The main wreckage came to rest upright on a northerly heading, about 340 ft from the initial impact point. The left and right wings separated from the fuselage with the front and rear wood spars of both wings fractured near the wing roots. Both spars of the right wing were also fractured near the wing tip. The right wing was about 210 ft northwest of the main wreckage, and the left wing was about 5 ft to the right of the main wreckage. The propeller separated from the engine and came to rest about 180 ft northwest of the main wreckage.

The flight control surfaces remained attached to their respective airframe surfaces. The elevator, rudder, and elevator trim tab cables had normal continuity with their respective cockpit controls. The aileron flight control cable was fractured in four locations. The fractures had a broomstraw appearance consistent with overload. Both aileron bellcrank connecting rods were fractured adjacent to the bellcranks, and the fracture surfaces were consistent with overload. No preimpact anomalies were noted with the flight control system.

The engine remained attached to the airframe. The top Champion REM40E spark plugs were removed from the cylinders. All displayed a normal worn condition when compared to the Champion Aviation Service Manual (AV-27). A borescope inspection of the four cylinders was conducted, which revealed no anomalies with the pistons, cylinder barrels, cylinder heads, valves or valve seats. Both magnetos were rotated by hand and produced spark at all leads. The carburetor float bowl was removed with no anomalies noted.

Both propeller blades were significantly twisted and curled aft with chord-wise polishing. The engine and propeller exhibited damage consistent with operation at impact. The cabin heat control was in the "off" position. The left muffler shroud was removed, and the muffler was found rusted and cracked in several locations. The muffler shroud contained a layer of exhaust residue. A carbon monoxide detector was not located in the wreckage.

MEDICAL AND PATHOLOGICAL INFORMATION

The pilot had reported no chronic medical conditions and no medications during his last FAA medical exam in 2005. However, according to his personal medical records, he had been treated for prostate cancer in 2000 and had intermittently been treated for hypertension. In 2009 and 2011, he underwent a series

of interventions (angioplasty and stenting) for severe coronary artery disease. Since 2013, he had been treated for stress, insomnia, and anxiety with two antianxiety medications, temazepam and buspirone; both of these drugs carry warnings about behavior changes. In 2011, he had been diagnosed with obstructive sleep apnea and instructed to use a continuous positive airway pressure machine. A physician's review in 2016 revealed that he was not using his machine to the desired extent (at least 4 hours/night).

As of February 18, 2016, the pilot was taking the following medications that are not generally considered impairing:

- aspirin (an antiplatelet drug to decrease the risk of recurrent heart attack),
- finasteride and tamsulosin to treat symptoms from his prostate gland (known also as Proscar and Flomax, respectively),
- simvastatin (a cholesterol lowering drug also known as Zocor),
- metoprolol (a blood pressure medication that also decreases the risk of recurrent heart attacks), and
- clopidogrel (an antiplatelet drug used to prevent clots in coronary stents, also known as Plavix).

As previously mentioned, the pilot was also taking the potentially impairing anti-anxiety medications buspirone and temazepam. Finally, the pilot used nitroglycerin as needed for chest pain.

According to the autopsy performed by the Regional West Medical Center, Western Pathology Consultants, P.C., Pathology Departmentin Scottsbluff, Nebraska, the pilot's cause of death was blunt force trauma, and the manner of death was accident. The autopsy also identified coronary artery disease with a 50% stenosis in the proximal left anterior descending artery.

Toxicology testing performed by the FAA's Bioaeronautical Sciences Research Laboratory identified carbon monoxide (carboxyhemoglobin) at 40% in subclavian blood. In addition, metoprolol, buspirone, and temazepam (0.123 ug/ml) were identified in subclavian blood. These drugs and clopidogrel, diazepam, oxazepam, and ranitidine (a heartburn medication) were identified in urine. The finding of diazepam and oxazepam only in urine and not in blood was consistent with their presence as metabolites of temazepam.

Carbon monoxide is an odorless, tasteless, colorless, nonirritating gas formed by hydrocarbon combustion. Carbon monoxide binds to hemoglobin with much greater affinity than oxygen, forming carboxyhemoglobin; elevated levels result in impaired oxygen transport and utilization. Nonsmokers may normally have up to 3% carboxyhemoglobin in their blood; heavy smokers may have levels of 10% to 15%. The pilot was not a smoker.

Carboxyhemoglobin levels between 10% and 20% can result in confusion, impaired judgment, and difficulty concentrating. The primary effects of acute carbon monoxide poisoning are on the brain and heart and include headache, arrhythmias, confusion, coma, and death.

ADDITIONAL INFORMATION

FAA Advisory Circular 91-59A, Inspection and Care of General Aviation Exhaust Systems, emphasizes the safety hazards of poorly maintained exhaust systems and highlights points at which exhaust system failures occur.

Accident Rpt# ERA18FA046	**12/07/2017 2100 AST**	**Regis# N4494A**	**St. Croix, VI**	**Apt: Henry E Rohlsen Airport TISX**
Acft Mk/Mdl BEECH 58-UNDESIGNAT		**Acft SN TH-30**	**Acft Dmg: DESTROYED**	**Rpt Status: Prelim** **Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR IO 520 SERIES			**Fatal 5** **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: RICHARDSON DAVID		**Opr dba:**		**Aircraft Fire: GRD**
				AW Cert: STN

Events

2. Emergency descent - Powerplant sys/comp malf/fail

Narrative

On December 7, 2017, about 2100 Atlantic standard time, a Beech BE58, N4494A, was destroyed after it impacted terrain while attempting to return to the Henry E. Rohlsen Airport (TISX), Christiansted, St. Croix, United States Virgin Islands (USVI), shortly after takeoff. The private pilot and four passengers were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91, and was destined for Cyril E. King Airport (TIST), Charlotte Amalie, St. Thomas, USVI.

According to preliminary review of air traffic control (ATC) audio information, the airplane departed runway 10 at TISX. Shortly thereafter, the pilot reported "the engines are not running right" and requested to return to the airport. The controller instructed the pilot to fly north and cleared the airplane to land on runway 10. There were no further communications with the pilot.

The airplane was destroyed by impact forces and consumed by fire. The wreckage was located on flat terrain, about 380 ft from the threshold of runway 10, about 60 ft right of the extended runway centerline.

All flight controls surfaces were accounted for at the accident site, and flight control continuity was confirmed from the cockpit to their respective control inputs. The landing gear was in the up position.

The right wing was folded over the cockpit; the right engine was attached and inverted. The right engine cylinders were inspected with a lighted borescope; all intake and exhaust valves were intact, and the cylinders appeared normal. The top spark plugs showed normal wear. The fuel manifold was thermally damaged, the fuel screen was free of contaminants. The engine driven alternator, oil filter, and oil cooler were thermally damaged. The right engine three-bladed propeller was separated from the engine just aft of the engine crankshaft propeller flange. The propeller was located about 30 ft from the main wreckage with one blade buried in the ground, the second blade was partially buried, and the third blade had minimal damage.

The left wing remained attached to the fuselage, but sustained extensive fire damage. The left engine was separated from its engine mounts, but remained in the nacelle. A hole was observed in the top forward portion of the engine crankcase. A visual inspection noted that connecting rod Nos. 4, 5, and 6 were broken. The left engine cylinders were inspected with a lighted borescope; all intake and exhaust valves were intact, and the cylinders appeared normal. The top spark plugs showed normal wear; the No. 4 spark plug was oil fouled. The left engine three-bladed propeller was separated from the engine, but remained attached to the engine crankshaft propeller flange. The propeller was located about 20 ft left of the right propeller location. The blades appeared to be in the feathered position; one of the three blades was buried in the ground.

The wreckage was retained for further examination.

The six-seat, low-wing, retractable-gear equipped airplane was manufactured in 1970. It was powered by two Continental IO-520, 285-horsepower engines, driving Hartzell three-bladed, constant-speed, full feathering propellers.

The pilot held a private pilot certificate with an airplane single-engine land rating. His most recent Federal Aviation Administration third-class airman medical certificate was issued on August 1, 2016, with the limitation, "must have available glasses for near vision." At that time, he reported 765 total flight hours.

At 2053, the weather conditions reported at TISX included, wind from 070ø at 8 knots; visibility 10 statute miles; scattered clouds at 6,000 ft; temperature 25ø C, dew point 21ø C; and an altimeter setting of 30.01 inches of mercury.

Accident Rpt# ERA16FA108 02/18/2016 1910 EST	**Regis# N61WB**	**Marshville, NC**	**Apt: N/a**	
Acft Mk/Mdl BEECH A36-UNDESIGNAT	**Acft SN E-2110**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl CONTINENTAL MOTORS INC IO-520-BB	**Acft TT 1884**	**Fatal 1 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: INDIGO AIR LLC	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: STN	

Events

1. Enroute - Loss of engine power (total)
2. Enroute - Fuel exhaustion

Narrative

HISTORY OF FLIGHT

On February 18, 2016, about 1910 eastern standard time, a Beech A36, N61WB, made a forced landing after a total loss of engine power near Marshville, North Carolina. The airline transport rated pilot was fatally injured. The airplane was substantially damaged. The airplane was registered to and operated by Indigo Air LLC as a 14 Code of Federal Regulations Part 91 business flight. Night visual meteorological conditions existed near the accident site at the time of the accident, and the flight was operated on an instrument flight rules flight plan. The flight originated at Daytona Beach International Airport (DAB), Daytona Beach, Florida, about 1554, and was destined for Davidson County Airport (EXX), Lexington, North Carolina.

According to a representative of the operator, the pilot flew part-time for Indigo Air LLC. The flight originated earlier that day from EXX, where the airplane was based, and departed with full fuel (80 gallons total, 74 usable). The pilot flew to Piedmont-Triad International Airport (GSO), Greensboro, North Carolina, picked up the company's owner and a passenger, then flew direct to DAB. No fuel was purchased at GSO. At DAB, the pilot parked the airplane at a fixed-base operator (FBO). According to the owner, the pilot told him he was "going to put 15 [gallons of fuel] in a side." The owner went inside the FBO, paid for the fuel, and left because he "was in a rush." The lineman that fueled the airplane stated that the bladder tanks were "bulging" out of the fuel port on each tank. When the lineman, along with the FBO's safety director, pointed out the bulging tanks to the pilot, the pilot touched the bladder, then told the lineman it was okay to fuel. The FBO fueling records indicated that 30 gallons of 100LL fuel were purchased and distributed evenly between the two tanks. The flight then departed for EXX.

About 3 hours into the flight, while at a cruise altitude of 5,000 ft mean sea level, about 50 miles south of EXX, the pilot reported a loss of engine power to air traffic control and requested vectors to the nearest airport. The pilot subsequently made a forced landing about 10.5 miles east-northeast of Charlotte Executive Airport (EQY), Monroe, North Carolina. A witness, who was located about 3.5 miles east of the accident site, stated that he was in his shop when he heard the airplane. He said the engine was cutting in and out like it "ran out of gas." The witness went outside and saw the airplane in level flight about 1,000 to 1,500 ft above the ground. The airplane's landing light and navigation lights were turned on. He said the pilot tried to start the engine 4 or 5 times, but the engine would only start and run for a few seconds, then quit. On the last attempt, the engine started, and it sounded like the pilot pulled the throttle to idle. The witness watched as the airplane descended "in a gradual glide" before it disappeared from view.

PILOT INFORMATION

The pilot held an airline transport pilot certificate with a rating for airplane multiengine land, and a commercial pilot certificate with ratings for airplane single-engine land and instrument airplane. He also held numerous corporate jet type ratings. His last Federal Aviation Administration (FAA) second-class medical certificate was issued on October 13, 2015, with a restriction to wear corrective lenses. At that time, he reported a total of 17,000 flight hours. The pilot's logbooks were not located.

AIRCRAFT INFORMATION

The airplane was a single-engine, 6-seat, low-wing airplane, equipped with a Continental Motors Inc. IO-520-BB, 6-cylinder engine. The engine was equipped with a three-blade Hartzell constant-speed propeller.

The most recent annual inspection was conducted on May 15, 2015, at a total tachometer time of 1,843.60 hours.

A review of the airplane's flight and refueling history revealed that the pilot landed in DAB with about 15 gallons of total of fuel. With the fuel added at DAB

about 45 gallons was onboard at the time of departure. According to the airplane's Pilot Operating Handbook, the IO-520-BB engine burned about 15.2 gallons per hour, not including taxi, takeoff and climb.

METEOROLOGICAL INFORMATION

The 1853 weather observation at Charlotte Executive Airport (EQY), Monroe, North Carolina, included clear skies, visibility 10 miles, and wind 030ø at 5 knots. The temperature was 9øC, dewpoint -2øC, and the altimeter setting was 30.43 inches of mercury.

WRECKAGE INFORMATION

The airplane came to rest upright in wooded area behind a private residence on a heading of 180ø magnetic. There was no postimpact fire. Examination of the wreckage revealed that the airplane initially collided with a stand of about 60-ft-tall trees in a left-wing-low attitude and traveled about 134 ft to where it came to rest in a nose low, slightly tail-high attitude. The landing gear and flaps were fully retracted. The firewall, leading edges of both wings, a propeller blade, and the leading edge of the right horizontal stabilizer were damaged. Pieces of the windscreen were dispersed just forward of the engine. The throttle, mixture, and propeller controls were all full forward.

Examination of the airplane's fuel system revealed the fuel selector handle was set to the right tank. A visual examination inside each fuel tank revealed there was a small amount of fuel in each bladder. When electrical power was applied to the airplane, the left and right fuel gauges each indicated about 1/8 full. The remaining fuel was then drained from each fuel tank; just under 1 quart of fuel was drained from each. The fuel was absent of debris and water. The bladder tanks were inspected, and no breaches were observed; however, neither bladder tank was properly seated and they were pushing up on their respective fuel sensor.

There was no fuel staining observed on the airplane. The main fuel line to the fuel pump was removed, and no fuel was found in the line. Air was blown back through the line into each fuel tank and no obstructions were noted. The fuel pump was removed and rotated and no fuel was observed in the pump. The top of the fuel manifold was disassembled, and a small amount of fuel was noted in the manifold chamber. About 2 ounces of 100LL fuel was drained from the airframe fuel filter and the fuel was absent of debris and water. The fuel strainer screen exhibited some light corrosion, but no debris was observed.

Flight control continuity was established for all flight control surfaces. Examination of the airframe revealed no anomalies that would have precluded normal operation.

The propeller remained attached to the engine crankshaft propeller flange. The crankshaft flange appeared to be undamaged and no ladder cracking was noted. Two of the three propeller blades were undamaged, and the third propeller blade was bent rearward about 90ø.

The engine was removed from the airframe and an initial examination was performed. The top spark plugs were removed and inspected. When compared to a Champion Spark Plug "Check A Plug" chart, the spark plugs appeared to be "normal" with light coloration signatures. The engine was rotated manually via the propeller; thumb compression was verified for each cylinder and spark was produced to each spark plug ignition lead. A lighted borescope inspection on each cylinder revealed that all valves were intact and exhibited normal combustion signatures.

The engine was placed on a test stand for an operational check. The engine ran through all power settings with no abnormalities. There were no mechanical discrepancies that would have precluded normal operation before the accident.

A handheld Garmin 496 GPS unit was found in the wreckage; however, the accident flight was not captured.

MEDICAL INFORMATION

Examination of the pilot's lap belt and shoulder harness assembly revealed that it remained intact, but was found unbuckled with the shoulder harness not attached. The pilot's lap belt shoulder harness attachment post elastic grommet was not installed (or found in the wreckage), and, when manually assembled, the shoulder harness attachment buckle would not seat securely to the lap belt attachment post.

According to the death investigator's notes, the pilot was found deceased, slumped over in the left seat, still wearing his seatbelt. Although the airplane was

equipped with a single shoulder harness (across the left shoulder), injuries sustained by the pilot were consistent with the pilot not being restrained by the shoulder harness at the time of the impact.

According to the autopsy performed by the Mecklenburg County Medical Examiner's Office, the cause of death was blunt force injuries due to airplane crash and the manner of death was accident. No significant natural disease was identified. The pilot's injuries included contusions and abrasions of the face, fractured teeth, contusions, abrasions, and fractures of the torso, disruption of the proximal descending aorta with massive left hemothorax.

At his last FAA medical, the pilot reported hypertension and high cholesterol and was being treated with doxazosin (also called Cardura) and simvastatin (also called Zocor), respectively. Toxicological analysis was conducted by the FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. The tests were positive for doxazosin in blood and urine. Doxazosin is not considered to be an impairing medication.

Accident Rpt# ERA16FA312A 09/07/2016 1048 EDT	**Regis# N6027K**	**Carrollton, GA**	**Apt: West Georgia Regional CTJ**
Acft Mk/Mdl BEECH F33-A	**Acft SN CE-833**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONTINENTAL IO-520-BB	**Acft TT 4549**	**Fatal 3 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: LINDSEY WILLIAM L	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STN

Summary

The Diamond flight instructor and student pilot were in the traffic pattern at the non-towered airport practicing landings. The Beech pilot entered the traffic pattern on an extended left downwind leg with the intention of landing. Pilots of other airplanes in the pattern reported that the Diamond instructor was making standard traffic pattern callouts on the common traffic advisory frequency (CTAF); however, the Beech pilot was not transmitting on the CTAF. Witness observations, radar data, GPS data, and examination of the wreckage of the two airplanes revealed that, while both airplanes were on final approach for landing, the Beech overtook the Diamond from above and behind. The landing gear of the Beech struck the horizontal stabilizer and elevator of the Diamond, and then both airplanes abruptly descended into the terrain short of the runway. The Beech came to rest inverted and on top of the Diamond. An examination of wreckage of both airplanes did not reveal evidence of any preaccident anomalies or malfunctions.

Testing of the Beech's VHF communications radio revealed that it was set to an old CTAF frequency for the airport that had been changed about 5 years before the accident. A local airport frequency card dated 7 years before the accident that was found in the Beech's cockpit listed the old CTAF frequency that was set in the Beech's radio. Another pilot at a different airport heard the Beech pilot making pattern calls on the incorrect frequency about the time of the accident.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The failure of the Beech pilot to see and avoid the Diamond that was in front of and below his airplane on final approach and his use of an incorrect radio communication frequency for the airport.

Events

1. Approach-VFR pattern final - Midair collision
2. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft systems-Communications system-VHF communication system-Incorrect use/operation - C
2. Personnel issues-Task performance-Use of equip/info-Use of equip/system-Pilot - C
3. Personnel issues-Task performance-Use of equip/info-Use of policy/procedure-Pilot - C
4. Personnel issues-Psychological-Attention/monitoring-Monitoring other aircraft-Pilot - C

Narrative

HISTORY OF FLIGHT

On September 7, 2016, at 1048 eastern daylight time, a Beech F33A, N6027K, and a Diamond Aircraft Industries DA20-C1, N85WP, collided in midair on the final approach leg of the traffic pattern to runway 35 at West Georgia Regional Airport (CTJ), Carrollton, Georgia. The Beech was substantially damaged, and the private pilot was fatally injured. The Diamond was destroyed, and the flight instructor and the student pilot were fatally injured. The Beech was registered to and operated by the private pilot. The Diamond was registered to and operated by Falcon Aviation Academy LLC. Both flights were conducted under the provisions of 14 Code of Federal Regulations (CFR) Part 91; the Beech pilot was conducting a personal flight, and the Diamond pilots were conducting an instructional flight. Visual meteorological conditions prevailed, and no flight plans were filed for either flight. The Beech departed from Fulton County Airport (FTY), Atlanta, Georgia, about 0915, and the Diamond departed from Newnan Coweta County Airport (CCO), Newnan, Georgia, about 1000.

According to personnel from Falcon Aviation Academy, the pilots of the Diamond were practicing traffic pattern operations and landings at CTJ. The Diamond entered the traffic pattern, followed a few minutes later by N263CF and then by N169PS, both Falcon Aviation Academy DA20s. The flight instructor and student pilot on board N263CF saw the Beech on the downwind leg of the traffic pattern. Moments later, the flight instructor and student pilot on board N169PS entered the traffic pattern from the east. They looked down and to the left, in the direction of the final approach path for runway 35, and saw two airplanes collide. The instructors and the students on board both trailing DA20s reported that they did not hear the Beech pilot broadcasting his intentions on the CTJ common traffic advisory frequency (CTAF) but they heard the accident Diamond making position calls in the traffic pattern before the collision, with the last call being made on the final approach.

Another flight instructor employed by Falcon Aviation Academy reported that he was familiar with the Beech pilot and his airplane. He had just completed a

flight at CCO and heard the Beech pilot broadcasting traffic pattern calls for CTJ about the time of the accident; however, the Beech pilot was broadcasting over the CCO CTAF of 122.7 MHz. The flight instructor reported that the Beech pilot was not in the traffic pattern at CCO at the time of the transmissions.

Radar data provided by Federal Aviation Administration (FAA) air traffic control personnel indicated that the Beech pilot entered an extended left downwind for CTJ from the north, above and behind the accident Diamond, which was on the downwind leg of the traffic pattern. The ground speed of the Beech was about 50 knots greater than the ground speed of the Diamond. The last radar returns were on the downwind leg, about 2,000 ft above mean sea level, or about 850 ft above the ground. The locations of the last radar returns showed the airplanes approaching the base leg for runway 35.

The Diamond was not equipped with GPS data recording capability. A portable GPS receiver recovered from the Beech recorded the accident flight. The recording indicated that the Beech was established on the downwind leg for runway 35, about 2,500 ft GPS altitude and 150 knots groundspeed. The CTJ airport elevation was 1,164 ft. The Beech descended toward the base leg, turning base about 2,200 ft and 122 knots. The Beech turned onto final about 1,450 ft and 79 knots. The last recorded data point was at 1048:00, with the Beech at 1,201 ft and 76 knots, about 607 ft south of the runway 35 threshold.

PERSONNEL INFORMATION

The Beech Pilot

The pilot of the Beech, age 79, held an FAA private pilot certificate with airplane single-engine land and instrument airplane ratings. He held an FAA third-class medical certificate with a restriction to have glasses available for near vision. He reported 2,500 total hours of flying experience on his FAA third-class medical certificate application that was dated October 5, 2015. His personal pilot logbook was not located.

According to the owner's representative (insurance adjuster), the Beech pilot reported that he completed a Beechcraft Pilot Proficiency Program on October 30, 2015, at Blairsville, Georgia. This was confirmed verbally and accepted as a current flight review by the insurance company.

The Diamond Flight Instructor

The flight instructor in the Diamond, age 24, held an FAA commercial pilot certificate with ratings for airplane multi-engine land, airplane single-engine land, and instrument airplane. She held an FAA flight instructor certificate with a rating for airplane single-engine, and she held an FAA first-class medical certificate with a restriction to wear glasses. She was seated in the right cockpit seat. She reported 600 total hours of flying experience on her FAA first-class medical certificate application that was dated March 16, 2016. A review of her pilot logbook revealed about 850 hours total time, including 721 hours in single-engine airplanes and 366 hours as a flight instructor.

The Diamond Student Pilot

The student pilot in the Diamond, age 20, held an FAA student pilot certificate. He held an FAA second-class medical certificate with no restrictions. He was seated in the left cockpit seat. He enrolled in the ab initio training program at Falcon Aviation Academy on August 4, 2016, and had logged about 22 hours of flight time.

AIRCRAFT INFORMATION

Beech

The off-white- and blue/gold-colored Beech F33A was a single-engine, low-wing airplane with a conventional tail. A review of the airplane's maintenance and airworthiness records revealed that an enhanced Whelen light-emitting diode (LED) wingtip position and anti-collision light system, model OR6502GE/OR6502RE, and a Whelen LED tail position and anti-collision light system, model OR5002V, were installed on the airplane per FAA Supplemental Type Certificate, dated November 10, 2014. The airplane was equipped with landing and taxi lights. The airplane was not equipped with a traffic advisory system (TAS), traffic alert and collision avoidance system (TCAS), or automatic dependent surveillance-broadcast (ADS-B) equipment or displays. The Beech's avionics suite included a King KX 155 VHF communication/navigation transceiver and a Garmin GNS 530 GPS/communication/navigation all-in-one

unit.

According to information provided by the owner's representative, the Beech's most recent annual inspection was completed on or about July 13, 2016. At the time of the inspection, the airframe had accumulated about 4,549 total hours of operation.

Diamond

The white- and blue-colored Diamond DA20 was a single-engine, low-wing airplane with a T-tail configuration. It was equipped with wingtip-mounted anti-collision strobe lights and navigation position lights, and a landing and taxi light. The airplane was not equipped with a TAS, TCAS, ADS-B equipment or displays. The Diamond's avionics suite included an iCOM AC-A200 VHF air band transceiver and a Garmin GNS 430 GPS/communication/navigation all-in-one unit.

The Diamond's most recent annual inspection was completed on August 9, 2016. At the time of the inspection, the airframe had accumulated about 1,990 total hours of operation.

METEOROLOGICAL INFORMATION

The CTJ 1055 weather observation included wind calm, visibility 10 statute miles, scattered clouds at 8,500 ft, temperature 30øC, dew point 19øC, and an altimeter setting 30.30 inches of mercury.

AIRPORT INFORMATION

CTJ was a public, non-towered, uncontrolled airport with a single runway, designated 17/35. The runway was 5,503 ft long and 100 ft wide. The published traffic pattern direction for runway 35 was to the left. Falcon Aviation Academy personnel reported that their pilots frequently used CTJ for training purposes.

The CTAF/UNICOM frequency for CTJ at the time of the accident was 122.975 MHz. CTAF communications were not recorded. The airport manager reported that the CTJ CTAF frequency was changed from 122.7 MHz to 122.975 MHz in 2011.

WRECKAGE AND IMPACT INFORMATION

General

The main wreckage of both airplanes came to rest in a grass field, about 408 ft south of the approach end of runway 35, on the extended centerline of the runway. The Diamond came to rest in an upright position. The Beech came to rest inverted and on top of the Diamond wreckage. The wreckage debris field was about 350 ft long and about 80 ft wide, oriented on a heading of 350§. All major structural components of both airplanes were accounted for within the wreckage debris field.

Beech

The wreckage of the Beech was generally intact; the wings and empennage remained attached to the fuselage. Flight control cable continuity was established from the cockpit controls to the flight control surfaces. The ailerons, elevator, and rudder remained attached in their respective positions on the wings, horizontal stabilizer, and rudder. Blue-colored paint transfer marks were found on the lower surface of the right wing, near wing station 108. Impact damage with paint transfer was found on the top of the fuselage around station 131.

The nose gear separated from the airplane during the impact sequence. White paint transfer markings were observed on the nose gear tire. The left and right main landing gear were found in the extended positions. White paint transfer markings were observed on the left, main gear tire. The wing flaps were extended 20§.

The master and avionics switches were found in the "on" positions. The strobe light switch was found in the "on" position. The taxi light switch was found in the "on" position, and the landing light was found in the "off" position; however, both switches had impact damage. The position of the navigation light switch could not be determined because of impact damage.

The engine remained attached to the firewall. External examination of the engine did not reveal physical evidence of a mechanical malfunction or anomaly. The propeller assembly separated from the engine at the crankshaft/propeller flange junction. The fracture surfaces exhibited features consistent with overload. The propeller blades remained attached to the hub and displayed chordwise scratches, blade twisting, leading edge gouging, and surface polishing.

A laminated card titled "LOCAL AREA FREQ" and dated April 27, 2009, was found in the Beech's cockpit. The card, which listed the frequencies for multiple airports in the area, listed the frequency for the CTAF at CTJ as 122.7 MHz.

Diamond

The Diamond came to rest upright, under the wreckage of the Beech. Flight control continuity was confirmed from the elevator and rudder to the cockpit controls. Aileron control continuity was confirmed from the right aileron to the cockpit controls. The left wing separated from the fuselage during the impact sequence. The left aileron control tubes had multiple fractures that exhibited overload signatures. The empennage separated from the fuselage about 14 inches forward of the vertical stabilizer root leading edge.

Blue paint transfer marks were observed on the leading edge of the Diamond's right wing. The marks were about 8 inches long and 12 inches from the wing root. The Diamond's landing, taxi, strobe, and position light switches were impact-damaged, and their preimpact positions could not be determined.

Lightweight pieces of the Diamond were found on a northerly path, beginning 340 ft south of the main wreckage. One of the most southerly pieces of wreckage debris was the right half of the Diamond's elevator. Closer examination revealed black transfer markings on the upper surface of the elevator that were consistent in color and tread pattern with the right main landing gear tire of the Beech. Examination of the Diamond's horizontal stabilizer revealed similar transfer markings on its upper surface. The other small pieces of debris located south of the main wreckage were identified as sections of the Diamond's canopy and wing root/fuselage skin.

MEDICAL AND PATHOLOGICAL INFORMATION

The Beech Pilot

The Georgia Bureau of Investigation Division of Forensic Sciences performed an autopsy of the Beech pilot and the cause of death was blunt trauma of the head and chest, and the manner of death was accident.

The FAA's Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing and identified doxazosin and losartan in the pilot's blood, and doxazosin, dextromethorphan, and its metabolite dextrorphan in urine. Doxazosin and losartan are blood pressure medications also named Cardura and Cozaar, respectively. The pilot reported the use of doxazosin and losartan to the FAA during his most recent FAA third-class physical. Dextromethorphan is an over-the-counter cough suppressant available in a number of products.

The Diamond Flight Instructor

The Georgia Bureau of Investigation Division of Forensic Sciences performed an autopsy of the Diamond flight instructor and the cause of death was blunt head trauma, and the manner of death was accident.

The FAA's Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing of the flight instructor. The specimens tested negative for carbon monoxide, ethanol, and a wide range of drugs, including major drugs of abuse.

The Diamond Student Pilot

The Georgia Bureau of Investigation Division of Forensic Sciences performed an autopsy of the Diamond student pilot and the cause of death was blunt trauma of the head and torso, and the manner of death was accident.

The FAA's Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing of the student pilot. The specimens tested negative for carbon monoxide, ethanol, and a wide range of drugs, including major drugs of abuse.

TESTS AND RESEARCH

The King KX 155 VHF transceiver and the Garmin GNS 530 all-in-one unit from the Beech were sent to the NTSB Vehicle Recorders Laboratory to determine the frequencies in use at the time of the accident. The examination revealed that the KX 155 communication frequencies were set to 118.17 MHz (active) and 126.22 MHz (standby). The GNS 530 communication frequencies were set to 122.7 MHz (active) and 124.050 MHz (standby). The waypoint communications information page for CTJ was accessed during the examination even though the installed GNS 530 aviation database expired as of November 12, 2015. The CTAF/UNICOM on the displayed page showed the correct frequency of 122.975 MHz.

ADDITIONAL INFORMATION

FAA Rules, Regulations, and Guidance to Pilots

Title 14 CFR 91.113 addresses aircraft right-of-way rules and states, in part, the following:

(b) General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

(f) Overtaking. Each aircraft that is being overtaken has the right-of-way and each pilot of an overtaking aircraft shall alter course to the right to pass well clear.

(g) Landing. Aircraft, while on final approach to land or while landing, have the right-of-way over other aircraft in flight or operating on the surface, except that they shall not take advantage of this rule to force an aircraft off the runway surface which has already landed and is attempting to make way for an aircraft on final approach. When two or more aircraft are approaching an airport to landing, the aircraft at the lower altitude has the right-of-way, but it shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft.

The FAA's Aeronautical Information Manual (AIM), dated December 10, 2015, paragraph 5-5-8, includes pilot procedures for see-and-avoid while in flight and states, "When meteorological conditions permit, regardless of type of flight plan or whether or not under control of a radar facility, the pilot is responsible to see and avoid other traffic, terrain, or obstacles."

The AIM, paragraph 4-1-9, also describes operations to/from airports without an operating control tower and the use of a CTAF and states, in part, the following:

a. Airport Operations Without Operating Control Tower

1. There is no substitute for alertness while in the vicinity of an airport. It is essential that pilots be alert and look for other traffic and exchange traffic information when approaching or departing an airport without an operating control tower.To achieve the greatest degree of safety, it is essential that all radio-equipped aircraft transmit/receive on a common frequency identified for the purpose of airport advisories.

b. Communicating on a Common Frequency

The key to communicating at an airport without an operating control tower is selection of the correct common frequency.A CTAF is a frequency designated for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating control tower.

The AIM describes the recommended communication procedures regarding departure aircraft on the CTAF and states, "Pilots of inbound traffic should monitor and communicate as appropriate on the designated CTAF from 10 miles to landing. Pilots of departing aircraft should monitor/communicate on the appropriate frequency from start-up, during taxi, and until 10 miles from the airport unless the CFRs or local procedures require otherwise."

The Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-24A), section 13, addresses scanning procedures for visually acquiring traffic:

The pilot can contribute to collision avoidance by being alert and scanning for other aircraft. This is particularly important in the vicinity of an airport.

The See-and-Avoid Concept

The FAA issued AC 90-48D, "Pilots' Role in Collision Avoidance," in April, 2016 to alert all pilots ".to the potential hazards of midair collisions and near midair collisions (NMAC), and to emphasize those basic problem areas related to the human causal factors where improvements in pilot education, operating practices, procedures, and improved scanning techniques are needed to reduce midair conflicts."

AC 90-48D stated that each person operating an aircraft, regardless of whether the operation was conducted under IFR or VFR, shall maintain a vigilant lookout for other aircraft at all times. Regarding visual scanning, the AC specifically stated that "Pilots should remain constantly alert to all traffic movement within their field of vision, as well as periodically scanning the entire visual field outside of their aircraft to ensure detection of conflicting traffic.". AC 90-48D also described several specific methods that pilots could use to visually acquire other traffic.

Accident Rpt# GAA18CA055 11/21/2017 1440 CST	**Regis# N62979**	**El Dorado, MO**	**Apt: El Dorado Springs Memorial 87K**
Acft Mk/Mdl BELLANCA 8KCAB-NO SERIES	**Acft SN 36-72**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim Prob Caus: Pending**
		Fatal 0 Ser Inj 0	**Flt Conducted Under: FAR 091**
Opr Name:	**Opr dba:**		**Aircraft Fire: NONE**

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Accident Rpt# GAA18CA079	**12/03/2017 1109 PST**	**Regis# N1431C**	**Chino, CA**	**Apt: Chino CNO**
Acft Mk/Mdl BOEING A75N1(PT17)-UNDESIGN		**Acft SN 75-1702**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
			Fatal 0 **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name:		**Opr dba:**		**Aircraft Fire: NONE**

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Accident Rpt# GAA17CA343	**06/15/2017 1540 CDT**	**Regis# N103GH**	**Boerne, TX**	**Apt: Boerne Stage Field 5C1**
Acft Mk/Mdl BURKHART GROB G103C-TWIN II AC		**Acft SN 34110**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
			Fatal 0 Ser Inj 0	**Flt Conducted Under: FAR 091**
Opr Name: SAN ANTONIO SOARING SOCIETY INC.		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STA

Events

1. Landing - Landing area undershoot

Narrative

The flight instructor of a glider report that, during landing, about 100 above the ground, a "a sink rate started to develop". He added that, he took over the flight controls and closed the spoilers. The glider impacted the airport perimeter fence and landed short of the runway, then slid into a culvert.

The glider sustained substantial damage to the empennage.

The flight instructor failed to submit the NTSB Form 6120.1 Pilot/ Operator Aircraft Accident/ Incident Report.

Accident Rpt# GAA18CA027	**10/21/2017 1030 EDT**	**Regis# N72552**	**New Bern, NC**	**Apt: Coastal Carolina Regional EWN**
Acft Mk/Mdl CESSNA 120-NO SERIES		**Acft SN 9722**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR C85 SERIES		**Acft TT 5005**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: DARRELL D. LEONHARDT		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

2. Landing - Loss of control on ground

Narrative

The pilot of the tailwheel-equipped airplane reported that, during landing, he believed he "just hit a little to[o] hard" and the airplane porpoised. He added that, he attempted to recover but could not get control of the airplane. Subsequently, the airplane exited the runway to the left and nosed over.

The airplane sustained substantial damage to the empennage and the left wing lift strut.

The pilot reported that there were no preaccident mechanical failures or malfunctions with the airplane that would have precluded normal operation.

Accident Rpt# GAA18CA020 10/22/2017 1815 EDT	**Regis# N22092**	**Pottsville, PA**	**Apt: Schuylkill County /joe Zerbey ZER**
Acft Mk/Mdl CESSNA 150-H	**Acft SN 15068059**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR O-200 SERIES		**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: POCONO MOUNTAINS FLYING CLUB INC	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STU

Events

1. Unknown - Flight control sys malf/fail

Narrative

The pilot reported that, during approach, the automatic weather observation station at the destination airport reported that the wind was from 170ø at 12 knots. He added that there was "very massive choppy wind, including what could have been windshear, updrafts, and downdrafts". During the landing roll on runway 11, a wind gust blew the airplane off the runway to the left. The pilot attempted to recover, but the airplane impacted a ditch.

The airplane sustained substantial damage to the fuselage and right wing.

The pilot reported that there were no preaccident mechanical failures or malfunctions with the airplane that would have precluded normal operation.

The Federal Aviation Administration (FAA) inspector reported that, during a postaccident examination, the rudder cable that passed along the left side of the fuselage was separated into three pieces. The rudder cable was covered in debris, which contained red fibers. The rudder cable was splayed and exhibited signatures consistent with tension overload.

The airplane's illustrated parts catalog contained a diagram, titled "Rudder Control System Installation". This diagram displayed the cable along the left side of the fuselage cross over the right side of the airplane, in the tailcone section, and connect to the right side of the rudder horn, which provided right rudder authority.

The airplane's most recent inspection was an annual, conducted 6 months prior to the accident flight.

The FAA inspector interviewed the mechanic who performed the most recent annual inspection. During the interview, the mechanic reported that, during inspections, he uses manufacturer data and the FAA advisory circular, AC 43.13-1B. He further reported, multiple times, that he should probably "tighten up" his inspections.

The FAA's advisory circular, AC 43.13-1B, titled "Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair", contains a section titled "Cable System Inspection", which stated:

"Aircraft cable systems are subject to a variety of environmental conditions and deterioration. Wire or strand breakage is easy to visually recognize. Other kinds of deterioration such as wear, corrosion, and/or distortion are not easily seen; therefore, control cables should be removed periodically for a more detailed inspection.

At each annual or 100 hour inspection, all control cables must be inspected for broken wires strands. Any cable assembly that has one broken wire strand located in a critical fatigue area must be replaced."

It further stated:

"Close inspection in these critical fatigue areas, must be made by passing a cloth over the area to snag on broken wires. This will clean the cable for visual inspection, and detect broken wires if the cloth snags on the cable."

Accident Rpt# WPR18LA042 12/03/2017 1325 PST	**Regis# N714TD**	**Everett, WA**	**Apt: Snohomish County (paine Fld) PAE**
Acft Mk/Mdl CESSNA 152-NO SERIES	**Acft SN 15279413**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-235 SERIES		**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: MORCOM AVIATION SERVICES INC	**Opr dba: REGAL AIR**		**Aircraft Fire: NONE**

Events

1. Approach-VFR go-around - Loss of engine power (total)

Narrative

On December 3, 2017, about 1325 Pacific standard time, a Cessna 152, N714TD, sustained substantial damage during a forced landing after a loss of engine power near Snohomish County Airport - Paine Field (PAE) Everett, Washington. The certified flight instructor and student pilot sustained minor injuries. The airplane was registered to Morcom Aviation Services Inc., and operated by Regal Air under the provisions of 14 Code of Federal Regulations Part 91 as an instructional flight. Visual meteorological conditions prevailed and no flight plan was filed for the local flight. The flight departed PAE about 1240.

According to the flight instructor, after conducting local area work, they returned to the airport to conduct practice touch and go landings. On the first approach, the airplane was high on the glide path and a go-around was initiated. During the go-around, about 150 ft above ground level, the engine sputtered and lost power. The flight instructor stated that they were unable to make the runway, and elected to land in a nearby field. During the landing sequence, the airplane struck a tree and a utility pole.

Postaccident examination of the airplane by the Federal Aviation Administration, revealed substantial damage to the wings. The airplane was recovered to a secure storage facility for further examination.

Accident Rpt# GAA18CA076	**11/30/2017 1140 PST**	**Regis# N417CB**	**Fullerton, CA**	**Apt: Fullerton Muni FUL**
Acft Mk/Mdl CESSNA 152-NO SERIES		**Acft SN 15281010**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
			Fatal 0 **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: IVAN ROMERO		**Opr dba:**		**Aircraft Fire: NONE**

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Accident Rpt# GAA18CA078	**12/08/2017 1510 PST**	**Regis# N4801D**	**Everett, WA**	**Apt: Snohomish County (paine Fld) PAE**
Acft Mk/Mdl CESSNA 172		**Acft SN 17272362**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim Prob Caus: Pending**
			Fatal 0 Ser Inj 0	**Flt Conducted Under: FAR 091**
Opr Name: BOEING EMPLOYEES FLYING ASSOCIATION INC		**Opr dba:**		**Aircraft Fire: NONE**

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Accident Rpt# ERA17LA024	**10/19/2016 725 EDT**	**Regis# N1827Y**	**Cedar Key, FL**	**Apt: George T Lewis CDK**
Acft Mk/Mdl CESSNA 172-C		**Acft SN 17249427**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR O-300D		**Acft TT 5013**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: GREENE JOE E		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Summary

Two witnesses reported that, during the first takeoff attempt, the accident airplane's engine was "sputtering," and the pilot aborted the takeoff about halfway down the 2,355-ft-long runway. The noncertificated pilot reported that, during the accident takeoff, the airplane would not climb out of ground effect. (The witnesses stated that the engine sounded normal.) When the airplane reached about 100 ft above ground level, the pilot attempted to return to the airport; however, the airplane descended and impacted shallow water about 600 ft short of the runway. Postaccident examination of the airplane revealed damage consistent with a

Review of weight and balance data and loading information revealed that the airplane's gross weight at the time of the accident was about 50 lbs over its maximum allowable gross weight and that the center of gravity was at or beyond the forward limit. The pilot's loading of the airplane placed it outside of its operating envelope, which likely significantly degraded its performance.

Postaccident examination of the engine found one exhaust valve stuck in the "open" position. If the valve had been stuck during all or a portion of either takeoff, the airplane's acceleration and climb performance would have been significantly degraded.

It is likely that the airplane was unable to attain a positive climb rate due to a combination of the stuck exhaust valve and the pilot's operation of the airplane over its weight limit. It is also likely that, while attempting to return to the airport instead of landing straight ahead, the pilot failed to maintain adequate airspeed and exceeded the airplane's critical angle of attack, which led to an aerodynamic stall.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: A partial loss of engine power due to a stuck exhaust valve and the noncertificated pilot's inadequate preflight planning, which resulted in the airplane being overloaded, both of which led to the airplane's inability to attain a positive climb rate. Contributing to the accident was the pilot's improper decision to attempt to return to the airport at low altitude and his subsequent failure to maintain adequate airspeed and his exceedance of the airplane's critical angle of attack, which led to an aerodynamic stall.

Events

1. Takeoff - Loss of engine power (partial)
2. Maneuvering-low-alt flying - Loss of control in flight
3. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft power plant-Engine (reciprocating)-Recip eng cyl section-Malfunction - C
2. Personnel issues-Task performance-Planning/preparation-Weight/balance calculations-Pilot - C
3. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Climb rate-Not attained/maintained - C
4. Aircraft-Aircraft oper/perf/capability-Aircraft capability-Maximum weight-Capability exceeded - C
5. Personnel issues-Action/decision-Info processing/decision-Decision making/judgment-Pilot - F
6. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Airspeed-Not attained/maintained - F
7. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Angle of attack-Capability exceeded - F
8. Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - F
9. Personnel issues-Experience/knowledge-Experience/qualifications-Qualification/certification-Pilot
10. Environmental issues-Physical environment-Terrain-Water-Contributed to outcome

Narrative

On October 19, 2016, about 0725 eastern daylight time, a Cessna 172C, N1827Y, was substantially damaged when it impacted terrain during an attempt to return to the airport immediately after takeoff from George T. Lewis Airport (CDK), Cedar Key, Florida. The pilot was not injured and the two passengers received minor injuries. Visual meteorological conditions prevailed, and no flight plan was filed for the personal flight. The airplane was privately owned, and was operated under the provisions of 14 Code of Federal Regulations Part 91.

According to the pilot, during takeoff from runway 05, the airplane "wasn't climbing" as he attempted to climb "out of ground effect." At an altitude about 100 feet above ground level, the pilot attempted to return to the airport and land on runway 23. The airplane then descended and impacted a swamp about 600 feet short of the runway. The pilot indicated that the engine sounded normal, and there were no issues with the airplane other than the climb performance.

Two witnesses reported that the pilot had aborted a previous takeoff immediately prior to the accident takeoff. They reported that the airplane's engine was "sputtering" as it accelerated. When it was approximately halfway down the runway, the pilot aborted the takeoff, then turned around and performed the accident takeoff. They indicated that the accident takeoff roll was unremarkable.

According to Federal Aviation Administration (FAA) records, the pilot's certificate status was "revoked", effective July 2005. He had held a commercial pilot certificate with ratings for airplane single and multiengine land, and instrument airplane. He also held private pilot certificate with privileges for airplane single engine sea. His most recent FAA third-class medical certificate was issued in January 2009, at which time he reported a total of 1,800 flight hours of flight experience.

The four-seat, single-engine, high-wing airplane was manufactured in 1962, and was equipped with a Continental O-300D, 145-horsepower reciprocating engine. According to the pilot, its most recent annual inspection was completed on October 3, 2015, at 5,013 total aircraft hours, and 1,031 hours since engine overhaul. The airplane's maintenance logbooks were not recovered.

CDK was located at an elevation of 11 feet mean sea level, and was surrounded by water. The airport was equipped with one asphalt runway, oriented 05/23, which measured 2,355 feet long by 100 feet wide.

Examination of the airplane by an FAA inspector revealed that it came to rest upright and partially submerged in shallow water. The outboard 3 feet of both wingtips were crushed aft and bent upwards. Both ailerons were damaged. The fuselage was buckled on the right side in the area of the cabin door, and the firewall was damaged. The airplane was further damaged during the recovery operation due to being submerged in water. The engine's crankshaft was rotated by hand via the propeller, and compression was confirmed on all cylinders with the exception of the No. 4 cylinder. Valve action was observed on all rocker arms; however, the exhaust valve on the No. 4 cylinder was found stuck in the open position. The top spark plugs were removed. Their electrodes were intact, and slightly corroded with surface rust consistent with water immersion.

The pilot reported that the fuel tanks were nearly full, as the airplane had flown one flight leg (about 20 minutes long) since the last full fueling. The airplane was equipped with an 18-gallon auxiliary fuel tank that was installed in the baggage compartment, which was also full. According to first responders, there was an estimated 25 pounds of baggage found in the unoccupied rear seat.

According to the owner's manual, the maximum allowable gross weight for the airplane was 2,250 pounds. The airplane's weight at the time of the accident was estimated to be 2,307 pounds based on the available weight and balance data for the airplane, fuel records, and self-reported occupant weights. The center of gravity was estimated to be 90.6 pound-inches, which was slightly forward of the maximum gross weight forward limit of 91.

Takeoff performance data found in the airplane owner's manual indicated that a maximum gross weight takeoff at sea level and 59 degrees F would require a ground roll of 825 feet, with a distance of 1430 feet require to clear an obstacle 50 feet tall.

Crystal River Airport, Crystal River Florida, was located about 30 nautical miles southeast of the accident site, at an elevation of 9 feet. At 0715 the reported weather included wind calm, temperature 17 degrees C (62 F), dew point 17 degrees C (62 F), and an altimeter setting of 30.06 inches of mercury.

Accident Rpt# GAA18CA074	**11/30/2017 1745 EST**	**Regis# N474SP**	**Mitchellville, MD**	**Apt: Freeway W00**
Acft Mk/Mdl CESSNA 172-S		**Acft SN 172S8020**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
			Fatal 0 **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: GODDARD AIRCRAFT CLUB INC		**Opr dba:**		**Aircraft Fire: NONE**

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Accident Rpt# GAA18CA080	**11/26/2017 1507 EST**	**Regis# N452ER**	**Daytona Beach, FL**	**Apt: Daytona Beach Intl DAB**
Acft Mk/Mdl CESSNA 172-S		**Acft SN 172S11586**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim Prob Caus: Pending**
			Fatal 0 Ser Inj 0	**Flt Conducted Under: FAR 091**
Opr Name:		**Opr dba:**		**Aircraft Fire: NONE**

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9865 Tower View, Helotes, Texas 78023
210-695-2204 - info@airsafety.com - www.airsafety.com

Accident Rpt# GAA18CA063	**11/20/2017 1130 PST**	**Regis# N172SX**	**San Diego, CA**	**Apt: Montgomery-gibbs Executive MYF**
Acft Mk/Mdl CESSNA 172N-N		**Acft SN 17273641**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim Prob Caus: Pending**
			Fatal 0 Ser Inj 0	**Flt Conducted Under: FAR 091**
Opr Name: PERSONAL AVIATION INC.		**Opr dba:**		**Aircraft Fire: NONE**

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210-695-2204 - info@airsafety.com - www.airsafety.com

Accident Rpt# WPR18LA039 11/02/2017 930 PST	**Regis# N2103T**	**Redding, CA**		
Acft Mk/Mdl CESSNA 172R-R	**Acft SN 17281205**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim**	**Prob Caus: Pending**
Eng Mk/Mdl LYCOMING IO-360-L2A		**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: IASCO FLIGHT TRAINING INC	**Opr dba:**		**Aircraft Fire: NONE**	

Events

2. Landing-landing roll - Collision during takeoff/land

Narrative

On November 2, 2017, about 0930 Pacific standard time, a Cessna 172R, N2103T, was substantially damaged during an off airport landing after the engine experienced a loss of power shortly after takeoff from Redding Municipal Airport (RDD), Redding, California. IASCO Flight Training operated the airplane as an instructional flight under the provisions of 14 Code of Federal Regulations Part 91. The certified flight instructor and two students were not injured. Visual meteorological conditions prevailed for the local area training flight, and no flight plan had been filed.

According to the Federal Aviation Administration (FAA), the flight departed to the southeast. About 3 miles from the airport, the pilot contacted RDD tower personnel and reported an engine failure with sparks coming from the engine. The tower controller cleared the flight to land runway 34. During the approach, the airplane was too high, and the pilot elected to go around. The tower controller then cleared the pilot to land any runway. The pilot made a turn back for runway 16, crossed the runway and landed in a field.

The airplane was recovered for further investigation.

Accident Rpt# GAA17CA353	**06/06/2017 1615 ADT**	**Regis# N207RB**	**Homer, AK**	**Apt: N/a**
Acft Mk/Mdl CESSNA 207-A		**Acft SN 20700606**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONTINENTAL IO-520F		**Acft TT 21450**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 135**
Opr Name: NORTHAIR, INC.		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

1. Landing - Landing gear collapse

Narrative

The pilot reported that, while landing on a beach, he "felt a significant push to the right toward the water and was concerned with going into the water" ... He added that he initiated a go-around, but the nose wheel "caught and apparently broke off".

The airplane sustained substantial damage to the left wing.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

Accident Rpt# GAA18CA071	**12/04/2017 1720 EST**	**Regis# N2748Y**	**Hyannis, ME**	**Apt: Barnstable Muni-boardman/polan HYA**
Acft Mk/Mdl CESSNA 402		**Acft SN 402C0248**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim Prob Caus: Pending**
			Fatal 0 Ser Inj 0	**Flt Conducted Under: FAR 091**
Opr Name: CAPE ASSOCIATES INC		**Opr dba:**		**Aircraft Fire: NONE**

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Accident Rpt# CEN17LA303	**08/04/2017 900 CDT**	**Regis# N3047J**	**Marshall, MO**	**Apt: Marshall Memorial Muni MHL**
Acft Mk/Mdl CESSNA A188B		**Acft SN 18803596T**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING IO-540-S1A5		**Acft TT 7845**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 137**
Opr Name: LLOYD R DARTER		**Opr dba:**		**Aircraft Fire: NONE**

Events

1. Takeoff - Loss of control in flight

Narrative

On August 4, 2017, about 0900 central daylight time, a Cessna A188B airplane, N3047J, was substantially damaged when it settled into a bean field after takeoff from runway 18 (5,006 feet by 75 feet, concrete) at the Marshall Memorial Municipal Airport (MHL), Marshall, Missouri. The pilot was not injured. The airplane was registered to and operated by private individuals as a 14 Code of Federal Regulations Part 137 flight. Visual meteorological conditions prevailed. The flight was not operated on a flight plan. The local aerial application flight was originating at the time of the accident.

The pilot stated that the airplane was loaded with about 120 gallons of fertilizer and 54 gallons of fuel at the time of the accident takeoff. The pretakeoff run-up was normal. After takeoff, he reduced engine power for climb. When he did so, the engine "surged." He responded by increasing the throttle "a little," but the engine "surged" again. He subsequently applied full throttle, but was unable to maintain a positive rate of climb. The airplane settled into a bean field and encountered a fence before coming to rest in the adjoining corn field.

The pilot informed a Federal Aviation Administration (FAA) inspector that the airplane seemed to be "sagging" after takeoff. The engine indications appeared to be normal before the accident. The airplane had a full load of fertilizer and fuel at the time of the accident takeoff. The pilot also informed the inspector that the airspeed indicator had been inoperative for some time.

A postaccident engine examination conducted by FAA inspectors did not reveal any anomalies consistent with a preimpact loss of engine power. The wing flaps were positioned at 20 degrees deflection at the time of the exam.

The airplane flight manual noted that the recommended takeoff wing flap setting for restricted category airplanes was 10 degrees. The approved takeoff range for normal category airplanes was 0 to 20 degrees. The information manual indicated that optimum takeoff performance at heavy weights is obtained using 10 degrees wing flaps.

FAA regulations (14 CFR 91.205) require an operational airspeed indicator for civil aircraft operating under a standard airworthiness certificate. The accident airplane was operating under a restricted category airworthiness certificate and was not required to comply with that regulation.

Accident Rpt# CEN16FA111 02/28/2016 859 CST	**Regis# N477TC**	**Navasota, TX**	**Apt: Navasota Municipal Airport 60R**
Acft Mk/Mdl CIRRUS DESIGN CORP SR20	**Acft SN 1378**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR IO-360-ES6B	**Acft TT 487**	**Fatal 4 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: AIR AKHTAR HEATING & AIR CONDITIONING LLC	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STN

Summary

The flight instructor and the airplane owner, who did not hold a pilot certificate, were practicing takeoffs and landings in the airplane at an uncontrolled airport. Based on logbook records, this was most likely an instructional flight and the owner was most likely flying the airplane. Air traffic control radar and primary flight display data showed that they had performed two touch-and-go landings followed by two full stop landings before the accident. Shortly after taking off following the second full stop landing, while climbing through 550 ft mean sea level (msl) at an indicated airspeed of about 92 knots, the airplane entered a left bank and began to decelerate. The airplane began to descend, and the airspeed subsequently decreased below 75 knots before it began to increase. The airplane reached a 61ø left-wing-down attitude at an airspeed of about 79 knots before entering a rapid roll to the right, through an inverted position. At about the same time, the airplane began a rapid pitch down, reaching a 69ø nose-down attitude. The airplane briefly recovered to nearly wings level but again began to pitch down until the final recorded data point, which showed the airplane in a 65ø nose-down and 45ø right-wing-down attitude, at 268 ft msl, and 89 knots indicated airspeed. The airplane impacted terrain about 0.43 miles from the departure end of the runway.

Postaccident examination of the airplane did not reveal any mechanical malfunctions or failures that would have prevented normal operation. Calculations based on the airplane's weight at the time of the accident indicated that, at 1g with flaps up, the aerodynamic stall speed would have been 75 to 78 knots calibrated airspeed. The stall speed in a 60ø turn (2 g) would have been 105 to 109 knots. Therefore, it is likely that the combination of a steep left bank and low airspeed resulted in an accelerated aerodynamic stall.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The flight instructor's delayed remedial action to prevent a stall at an altitude that was too low to recover. Contributing to the accident was the owner/non-certificated pilot's failure to maintain control of the airplane, which resulted in an accelerated aerodynamic stall.

Events

1. Approach-VFR pattern downwind - Loss of control in flight
2. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Personnel issues-Action/decision-Action-Delayed action-Instructor/check pilot - C
2. Personnel issues-Task performance-Use of equip/info-Aircraft control-Student/instructed pilot - F
3. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Airspeed-Not attained/maintained - F
4. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Lateral/bank control-Not attained/maintained - F

Narrative

HISTORY OF FLIGHT

On February 28, 2016, about 0859 central standard time, a Cirrus SR-20, N477TC, collided with terrain following a loss of control near the Navasota Municipal Airport (60R), Navasota, Texas. The flight instructor, the non-certificated pilot/owner who was receiving instruction, and the two passengers were fatally injured. The airplane was substantially damaged. The airplane was registered to Air Akhtar Heating & Air Conditioning LLC and was operated by the pilot/owner under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed, and no flight plan was filed. The instructional flight originated from the David Wayne Hook Airport (DWH), Spring, Texas, at 0818.

Radar data indicated that after departing DWH, the airplane turned northwest toward 60R. The last DWH air traffic control communication with the airplane was at 0821. Radar data indicated that the airplane subsequently entered a left downwind to runway 17 at 60R about 0836. The airplane turned onto base leg, turned onto final approach, and descended below radar coverage; at 0837:51, the airplane was on final approach to runway 17.

At 0839:37, radar data indicated a target about 0.75 nautical mile (nm) south of runway 17 at an altitude of 800 ft mean sea level (msl) that was consistent with the airplane having executed a touch-and-go landing on runway 17. The radar data indicated that the airplane then conducted a second touch-and-go landing before conducting a full stop landing about 0844:46. A still photo from a security camera at 60R, an uncontrolled airport, showed the airplane taxiing north on the taxiway at 0847:26.

At 0850:58 the airplane departed 60R, entered a left downwind for runway 17, and executed a second full stop landing. By 0858:51, the airplane had departed runway 17 and was climbing on a south heading.

Data recovered from the airplane's primary flight display (PFD) showed the same flight path as the radar data. In addition to GPS position and altitude, the PFD also recorded other parameters including airspeed, pitch, and roll attitudes. The PFD data indicated that, at 0859:02, while the airplane was climbing through 550 ft msl and about 92 knots indicated airspeed, it began to roll to the left and decelerate. Starting at 0859:06, the airplane started to pitch down and descend. At 0859:10, the airspeed decreased below 75 knots. At 0859:13, the airspeed had increased to about 79 knots, and the airplane had reached 61ø left-wing-down before starting a rapid roll to the right, through an inverted position. At about the same time, the airplane began a rapid pitch down, reaching a 69ø nose-down attitude.

Radar contact was lost at 0859:15 when the airplane was about .43 nm southeast of the departure end of runway 17 and about 0.16 nm from the accident site. The PFD data continued, and it showed that the airplane briefly recovered to nearly wings level at 0859:18, but then it began to pitch down again. The final data point recorded by the PFD was at 0859:19, and it showed the airplane in a 65ø nose-down and 45ø right-wing-down attitude at 268 ft msl and 89 knots indicated airspeed. There were no known witnesses to the accident.

At 0904:14, radar data indicated that another airplane departed runway 17 at 60R and completed one complete circle around the accident location descending from 1,300 ft msl to 600 ft msl before climbing and resuming a downwind entry to runway 17. The pilot of this airplane reported that he was practicing touch-and-go landings when he spotted the wreckage southeast of the airport. He subsequently reported the accident to local authorities. The pilot stated that he did not hear or see the accident airplane in the area before seeing the wreckage.

PERSONNEL INFORMATION

The flight instructor's logbook(s) were not located during the investigation. On the application for his last Federal Aviation Administration (FAA) medical dated January 15, 2016, he reported having a total of 6,550 hours of flight time; 120 of those hours were flown within the previous 6 months. It is unknown how much experience he had in SR-20 airplanes before flying with the airplane owner.

The airplane owner, who was receiving flight instruction, did not hold a student pilot or medical certificate. He had taken a FAA medical examination on October 20, 2015. Due to the pilot's history of arrests, the aviation medical examiner deferred issuing a medical certificate. The FAA requested additional information, which the owner did not supply. On January 20, 2016, the FAA sent a letter to the owner notifying him that they could not determine his eligibility for a medical certificate.

According to the owner's pilot logbook, he had a total of 106 hours of flight time of which 57.1 hours were in SR-20 airplanes. The owner had previously flown with the flight instructor on 11 dual instructional flights, which totaled 25.7 hours.

AIRCRAFT INFORMATION

The airplane, serial number 1378, was a four-place, low-wing, single-engine airplane with fixed landing gear. The airplane was manufactured in 2003 and equipped with a Cirrus Airframe Parachute System (CAPS). The owner purchased the airplane on January 12, 2016.

Maintenance records indicated that the last annual inspection on the airframe was completed on January 12, 2016, at a total airplane and Hobbs meter time of 431.5 hours. The Hobbs meter at the time of the accident indicated 487.2 hours.

The airplane was equipped with a 210-horsepower, Continental Motors IO-360-ES6B engine, serial number 357628. The last annual inspection of the engine was completed on January 12, 2016, at an airframe total time of 431.5 hours. The last maintenance entry in the engine logbook was an oil and oil filter change on February 26, 2016, at an airframe total time of 481.6 hours.

There were no entries in the engine logbook showing that the engine had been overhauled or torn down; however, during the postaccident engine examination it was discovered that the crankshaft and bearings were not the original parts installed when the engine was manufactured in 2003. The owner of the maintenance facility that performed the most recent annual inspections stated that the engine had been removed for a teardown inspection for metal

contamination in April 2015. Records of the teardown inspection provided by the maintenance facility and the engine overhaul facility that performed the teardown inspection indicated that the engine overhaul facility completed the teardown inspection on August 17, 2015. A copy of the logbook entry prepared by the engine overhaul facility stated, in part, that the engine was "disassembled for metal contamination due to #6 piston burnt, replace cracked crankshaft with customer supplied New VAR crankshaft, repair 6ea.cylinders as necessary." The owner of the maintenance facility stated that the facility provided the previous airplane owner with the information and records for the engine logbook.

The airplane was fueled twice the day before the accident. The time on the fuel receipt indicated that the last fueling took place at 1655 when the airplane was fueled with 22.6 gallons of 100LL aviation fuel. According to the operator who fueled the airplane, the fuel added had topped-off the fuel tanks. It is not known if the airplane was flown between the last fueling and the accident flight.

Cirrus Aircraft performed stall speed calculations for the airplane. The calculations showed that, at gross weights of 2,904 pounds (full fuel) and 2,688 pounds (20 gallons of fuel), the flaps up stall speeds at 1g would have been 78 knots calibrated airspeed (KCAS) and 75 KCAS, respectively.

METEOROLOGICAL CONDITIONS

WRECKAGE AND IMPACT INFORMATION

The accident site was located about 0.43 mile southeast of the departure end of runway 17 at 60R in a lightly wooded area that was surrounded by open pasture. The airplane came to rest in the middle of a field that was bordered by three large trees spaced about 60 ft apart forming a triangular shape around the wreckage. The terrain at the accident site was wet and muddy. The main wreckage consisted of the entire airplane with a minor amount of airplane debris scattered in the immediate surrounding area. The airplane came to rest upright on a magnetic heading of 60ø.

Although it sustained impact damage, the empennage was relatively intact. The elevator remained attached to the horizontal stabilizer, which remained attached to the empennage. The rudder remained attached to the vertical stabilizer, which remained attached to the empennage. A 6 to 8-inch-deep ground scar was located under the tail tie down and rudder. The bottom of the rudder was crushed upward. Both elevator and rudder control continuity were verified. The elevator trim motor was positioned to slightly nose down trim.

The spar cover, wing spar, and wings were angled downward, and the floor under the cabin seats exhibited impact damage. There was a ground impact scar correlating to the leading edge of both wings.

The entire leading edge of the left wing was crushed rearward. A 45ø tear was present midspan in the top skin of the wing. The left aileron sustained impact damage, and it remained attached to the wing by its inboard hinge. The position of the roll trim motor was between neutral and full left trim. The left flap remained attached to the wing and was fully retracted.

The leading edge of the right wing was crushed aft. The outboard section of the upper wing skin was mostly separated from the torque box structure, and spar damage was observed. The right aileron and flap both exhibited impact damage; however, they remained attached to the wing. The right flap was fully retracted.

The right aileron cable was separated about 2 ft away from the cross-over turnbuckle. The separated ends of the cable showed signatures consistent with an overload separation. Aileron control continuity for the rest of the cable circuit was verified. The flap actuator was extended about 4 inches, which correlated to a fully retracted flap position.

Both wing fuel tanks were compromised, and there was no fuel present in the tanks. However, first responders reported there was a strong odor of fuel near the wreckage.

The four seats remained attached to their respective seat tracks and floor mounts. Both the left rear seat and the right front seat showed deformation to the left. All seat belt inertial reels functioned except for the left front seat. The left front seatbelt could be pulled out, but did not retract due to damage.

The CAPS activation handle was observed in its handle holder. The activation handle holder mounting bracket was bent downward and aft with an S-shaped bend. The rocket motor was expended and found on the ground near the airplane. The partially packed parachute bag was on the ground near the wreckage.

The harnesses, risers, and a portion of the suspension lines had deployed. The three-ring release mechanism remained loosely interlocked. The break-away cover for the parachute enclosure was located on the ground near the rudder, indicating that the system had deployed during the ground impact.

An external examination of the engine was conducted at the accident site. The engine remained attached to the engine mounts, which remained attached to the firewall. The forward portion of the engine was buried at an angle of about 25ø with only the top of the propeller spinner remaining above ground level. The firewall had impacted the rear of the engine with some of the engine accessories making an imprint on the firewall.

All engine cylinders displayed varying degrees of impact damage and remained attached to the crankcase. The crankcase sustained impact damage but was intact. The oil cooler remained attached to the engine. The oil filter and filter adapter had separated from the engine.

Both magnetos had separated from the engine. Both magneto impulse coupling engaged when the magneto drives were turned by hand. The ignition harness sustained impact damage. The top spark plugs were in place and undamaged. The bottom spark plugs were not removed during the on scene examination.

The fuel pump sustained impact damage. The fuel line going to the pump inlet remained secured at both the pump and the fuel bowl. The fuel line was removed from the fuel bowl, and no fuel was present in the line; however, there was fuel present in the fuel bowl. The throttle and fuel metering assembly remained attached to the engine. The throttle control arm remained secured to the shaft, and the throttle cable rod end remained secured to the throttle arm. The throttle position was observed at idle. The fuel manifold valve was intact, and it remained attached to the engine. All of the fuel nozzles were intact.

The exhaust system sustained impact damage with bent exhaust risers and flattened exhaust outflow pipes. The induction system sustained impact damage.

The propeller remained attached to the propeller flange. Both propeller blades remained intact within the propeller hub. One blade displayed forward bending, and the other propeller blade was bent aft.

During the on scene examination, there were no anomalies identified with the airframe, engine, or propeller that would have precluded normal operation of the airplane.

MEDICAL AND PATHOLOGICAL INFORMATION

The Central Texas Autopsy LLC, Lockhart, Texas, completed autopsy examinations for both the flight instructor and the airplane owner. The autopsy report for both listed the cause of death as multiple blunt force injuries.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, conducted toxicological testing for both the flight instructor and the airplane owner. The tests conducted on the instructor were negative for alcohol and tested drugs.

Toxicology testing for the airplane owner detected diphenhydramine in cavity blood at 69 ng/ml and in urine. Naproxen was detected only in urine. Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter under the trade names Benadryl and Unisom and carries the following FDA warning: "may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery)." Naproxen is an anti-inflammatory analgesic available over the counter and by prescription with the names Aleve and Naprosyn, respectively.

TESTS AND RESEARCH

Primary Flight Display (PFD)

The PFD was removed from the instrument panel and sent to the NTSB Recorder Laboratory for download. Impact damage to the PFD disabled the ability to read the data directly from the unit, so an extraction of the interior memory module was performed. See the History of Flight section of this report for a discussion of the data recovered from the unit.

Multifunction Display (MFD)

The compact flash card from the MFD was removed and sent to the NTSB Recorder Laboratory. The laboratory verified that there was no recorded data on the card, which was expected since the airplane was not equipped with the exhaust gas temperature and cylinder head temperature probes required for engine

monitoring.

Engine Teardown Examination

The engine was shipped to the Continental Motors, Inc., factory in Mobile, Alabama, for a teardown examination. The engine was disassembled, and the internal engine components including the crankshaft, camshaft, cylinders, pistons, bearings, and connecting rods appeared to be capable of normal operation. The crankshaft main journals, connecting rod journals, and main bearings displayed normal operating and lubrication signatures. The crankshaft to camshaft timing was verified to be correct. The piston pins for all cylinders were able to be pushed out by hand. There was no carbon build-up observed on the piston pins.

Both magnetos were bench tested with a slave ignition harness. Both magnetos produced a spark on all posts when bench tested. All spark plugs were removed and appeared to be in good condition with normal operation signatures.

The fuel pump, fuel manifold assembly, and throttle/fuel metering assembly were tested to manufacturer's production standards. The fuel pump was placed on a production test bench, and it was noted that there was a significant leak at the fuel pump relief valve diaphragm, which was consistent with impact damage to the fuel pump. The throttle body and fuel pump tested slightly out of tolerance at some of the test points; however, the fuel flows noted would not have prevented normal operation of the engine. The fuel manifold assembly tested within specifications.

The oil pump was removed from the engine and disassembled. The pump gears were intact. The oil screen and oil filter were free of debris.

As previously discussed in the Aircraft Information section of this report, the postaccident teardown revealed indications that the engine had been disassembled at some point since it was manufactured. There were no anomalies noted during the postaccident teardown that would have prevented normal operation of the engine or production of rated horsepower.

Accident Rpt# CEN16FA211	**06/09/2016 1309 CDT**	**Regis# N4252G**	**Houston, TX**	**Apt: William P Hobby HOU**
Acft Mk/Mdl CIRRUS DESIGN CORP SR20		**Acft SN 2217**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR IO-360-ES		**Acft TT 429**	**Fatal 3 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: SAFE AVIATION LLC		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Summary

The pilot was attempting to land the airplane at a busy airport with high volume airline traffic. While attempting to sequence the airplane between airplanes, the air traffic controller issued numerous instructions to the pilot, which included changing runways multiple times. The pilot was instructed to go around twice by the local controller; the first time because an air carrier airplane was overtaking the accident airplane and the second time because the airplane was too high to make a safe landing. During the airplane's third approach, a new local controller came on duty. On this approach, the pilot again had difficulty descending fast enough to make a safe landing, and she elected to perform another go-around. The new local controller then issued the pilot a lengthy clearance as the pilot was performing the go-around procedure. Data retrieved from the airplane revealed that, during the go-around, the pilot did not follow the recommended go-around procedure; specifically, the pilot did not attain a speed between 81 to 83 knots indicated airspeed (KIAS) before raising the flaps. Rather, the airplane's airspeed was 58 KIAS when the pilot raised the airplane's flaps while in a left turn, which resulted in exceedance of the critical angle of attack and a subsequent aerodynamic stall and spin into terrain.

Postaccident examination of the airframe and engine did not reveal any anomalies that would have precluded normal operation. The air traffic control instructions given to the pilot during the three approaches were complex and potentially distracting. The initial local controller elected to keep the airplane in the traffic pattern rather than transferring the airplane to an approach controller for resequencing when airline traffic interrupted the pilot's first landing attempt and when the pilot displayed difficulty landing the airplane on her second landing attempt. The complex instructions from the second local controller during the pilot's go-around following her third landing attempt, were unnecessary at that time and likely distracted the pilot from monitoring critical flight parameters.

The pilot was attempting to comply with ATC instructions throughout the flight and the pilot's actions are understandable as the instructions were largely consistent with the pilot's goal to land at the busy airport. However, compliance with ATC instructions greatly increased the pilot's workload as it led to an extended period of close-in maneuvering at a Class B airport due to the larger and faster airplanes converging on the airport. During this extended period of maneuvering the pilot did not assert the responsibilities that accompany being a pilot-in-command and did not offload the workload by either requesting to be re-sequenced, telling the controller to standby, or stating "unable." This allowed for an increased likelihood of operational distractions associated with air traffic communications and affected the pilot's ability to focus on aircraft control.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's improper go-around procedure that did not ensure that the airplane was at a safe airspeed before raising the flaps, which resulted in exceedance of the critical angle of attack and resulted in an accelerated aerodynamic stall and spin into terrain. Contributing to the accident were the initial local controller's decision to keep the pilot in the traffic pattern, the second local controller's issuance of an unnecessarily complex clearance during a critical phase of flight. Also contributing was the pilot's lack of assertiveness.

Events

1. Approach-VFR go-around - Loss of control in flight
2. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Personnel issues-Action/decision-Action-Incorrect action performance-Pilot - C
2. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Angle of attack-Capability exceeded - C
3. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Airspeed-Not attained/maintained - C
4. Personnel issues-Psychological-Personality/attitude-Motivation/respond to pressure-Pilot - F
5. Personnel issues-Action/decision-Info processing/decision-Decision making/judgment-ATC personnel - F
6. Personnel issues-Action/decision-Action-Unnecessary action-ATC personnel - F

Narrative

HISTORY OF FLIGHT

On June 9, 2016, at 1309 central daylight time, a Cirrus SR20 airplane, N4252G, impacted terrain following a loss of control during a go-around at William P. Hobby Airport (HOU), Houston, Texas. The private pilot and the two passengers were fatally injured, and the airplane sustained substantial damage. The

airplane was registered to and operated by Safe Aviation, LLC, Moore, Oklahoma, under the provisions of 14 Code of Federal Regulations (CFR) Part 91 as a personal flight. Visual meteorological conditions prevailed, and a visual flight rules flight plan had been filed. The airplane departed from University of Oklahoma Westheimer Airport (OUN), Norman, Oklahoma, about 1000 and was destined for HOU.

As the airplane approached HOU, a high-volume air carrier airport surrounded by Class B airspace, the pilot was given numerous instructions by air traffic controllers to sequence it between several Boeing 737 airplanes. An air traffic control (ATC) group was formed to review the interactions between the controllers and the pilot. The following information was extracted from the ATC group report, which is available in the public docket of this investigation.

1252:47 - The pilot contacted HOU tower, and the local controller cleared the pilot to land on runway 4 and told her to follow a Boeing 737 that was on a 3-mile final approach to runway 4.
1254:39 - The local controller directed the pilot to maintain maximum forward airspeed due to a Boeing 737 on a 9-mile final approach that was trailing the airplane and traveling 80 knots faster.
1256:58 - Due to the trailing Boeing 737, which was overtaking the airplane, the local controller directed the pilot to go around and fly runway heading.
1257:37 - The local controller instructed the pilot to make a right base to runway 35, informed her of another Boeing 737 on a 5-mile final for runway 4, and stated that she would be landing before the Boeing 737.
1258:16 - The local controller told the pilot that he would call her base turn.
1258:48 - The local controller issued a traffic advisory for an additional Boeing 737 inbound to runway 4, and the pilot reported that traffic in sight. The local controller told the pilot to pass behind that traffic and land on runway 35.
1259:20 - The local controller asked the pilot to turn left 30ø to resolve a perceived traffic conflict between the airplane and the inbound Boeing 737.
1259:30 - The local controller asked the pilot if she would like to follow the Boeing 737 to runway 4. The pilot responded that she would, and the local controller cleared her to land on runway 4. A few seconds later the local controller told the pilot, "just maneuver back for the straight-in, I don't know which way you're going now, so just turn back around to runway 35."
1300:13 - The local controller asked the pilot which direction she was turning. She responded, "I thought I was turning a right base for 35." The controller asked her to keep the right turn "tight," and the pilot acknowledged.
1300:31 - The local controller cleared the pilot to perform a straight-in approach to runway 35, and the pilot replied, "straight in to runway 35 and I don't believe I'm lined up for that." According to radar data, at this time, the airplane was about 2 nautical miles south of runway 35. The local controller told the pilot to turn right to a heading of 040ø and climb to 1,600 ft.
1301:16 - The airplane was southeast of runway 35, heading 040ø, and the local controller told the pilot to make a right turn to land on runway 35. 1302:02 - The local controller prompted the pilot to begin her descent to land on runway 35, and the pilot replied that she was "trying to lose altitude."
1303:25 - The local controller told the pilot that she "might be too high." The pilot replied that she would perform a go-around, and the controller acknowledged and told her to fly a right traffic pattern for runway 35.
1304:38 - The local controller told the pilot that she was cleared to land on runway 35 and that no other traffic was expected inbound.
1306:00 - The local controller advised the pilot of a Boeing 737 on a short final to runway 4 ahead of her, and the pilot acknowledged that she had the airplane in sight.
1307:03 - The local controller provided a wind check and cleared the pilot to land on runway 35, and the pilot replied, "35 cleared to land trying to get down again."
1307:49 - A new local controller took over the position.
1308:21 - The airplane was over runway 35, and the pilot called that she was going around. The new local controller responded with the following 16-second transmission, "OK, Cirrus 52G, just go ahead and make the left turn now to enter the downwind, midfield downwind for runway 4, if you can just keep it in a nice tight low pattern, I'm going to have traffic 4 miles behind you so I need you to just kind of keep it in tight if you could." The pilot responded, "OK, this time will be runway 4, turning left, 4252G." The controller continued with the following 23-second transmission, "And actually I might end up sequencing you behind that traffic, he's on 4 miles a minute, um, it is gonna be a bit tight with the one behind it so when you get on the downwind, stay on the downwind and advise me when you have that 737 in sight. We'll either do 4 or we might swing you around to 35, uh, uh, ma'am, ma'am, uh, straighten up, straighten up!"

Witnesses saw the airplane at a low altitude when it turned to the left and descended. A security camera video showed that the airplane spun to the left and was about 45ø nose down in a slightly left-wing-low attitude before impact with terrain. The airplane impacted an unoccupied automobile in a hardware store parking lot about «-mile north of runway 35. The video showed that the airplane's airframe parachute rocket motor activated during the impact; however, the parachute remained stowed in the empennage and did not deploy.

PERSONNEL INFORMATION

A review of the pilot's logbook revealed that she received her private pilot certificate on May 2, 2014. According to the logbook, she had landed within Class B airspace at least four times. Her most recent flight in Class B airspace was to Dallas Love Field (DAL), Dallas, Texas, and consisted of a landing on May 30, 2016, and a takeoff on June 3, 2016. There was no evidence that she had flown to HOU before the accident flight.

Interviews with the pilot's flight instructors and review of her logbook did not find evidence that the pilot had completed a flight review in the previous 24 calendar months, as required by 14 CFR 61.56(c). (Title 14 CFR 61.56(c) states that a person may not act as pilot-in-command of an aircraft unless that person has accomplished a satisfactory flight review within the preceding 24 calendar months.)

AIRCRAFT INFORMATION

The manufacturer's checklist for a balked landing/go-around states that the airplane should be pitched to maintain the best angle of climb, between 81 to 83 knots indicated airspeed (KIAS), before raising the flaps. The manufacturer's published stall speed at 0ø bank angle, idle power, and flaps up is 69 KIAS. The stall speed at 0ø bank angle, idle power, and flaps full down is between 59-61 KIAS. An excerpt from the pilot's operating handbook concerning stall speeds is located in the public docket of this investigation.

METEOROLOGICAL INFORMATION

Data from the National Oceanic and Atmospheric Administration showed that, at the accident location, at 1309, the altitude of the sun was about 83ø above the horizon, and the azimuth of the sun was about 158ø.

AIRPORT INFORMATION

HOU has 4 runways: 4/22, 35/17, 13L/31R, and 13R/31L. According to HOU tower personnel, in the period leading up to the accident, HOU was landing runways 4 and 35 and departing runways 4, 12L/R, and 35. Most of the traffic was landing on runway 4 and departing from runway 12R.

WRECKAGE AND IMPACT INFORMATION

All major airplane components were accounted for at the accident site. The nose of airplane was aligned about 330ø magnetic. The propeller was separated just aft of the propeller flange. All three blades remained attached to the hub and displayed curling, chordwise scratches, and leading edge nicks and gouges. The wing remained attached to the fuselage.

MEDICAL AND PATHOLOGICAL INFORMATION

The Harris County Institute of Forensic Sciences, Houston, Texas, conducted an autopsy on the pilot. The cause of death was multiple blunt force injuries, and the manner of death was ruled an accident.

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed forensic toxicology on specimens from the pilot. Testing was negative for carbon monoxide and ethanol. The following substances were detected:

Ibuprofen detected in urine
Naproxen detected in urine
Zolpidem detected in heart blood

Ibuprofen and naproxen are non-steroidal anti-inflammatory drugs, and their use would generally not present a hazard to aviation safety. Zolpidem is a prescription medication used to treat insomnia and may impair mental and/or physical ability required for the performance of potentially hazardous tasks, such as driving, flying, and operating heavy machinery. Due to adverse side-effects, the FAA recommends waiting at least 24 hours after use of zolpidem before flying.

On the pilot's most recent medical application, she reported the use of doxycycline and dapsone for acne. The use of zolpidem was not reported.

TESTS AND RESEARCH

The airplane was equipped with a Garmin G1000 Integrated Flight Deck and a Heads Up Technologies recoverable data module (RDM) data recorder. Flight data recorded by these devices were downloaded by the National Transportation Safety Board's Vehicle Recorder Division in Washington, DC. Review of the data revealed that, at 1308:19, the airplane began to pitch nose up, while at 63 knots indicated airspeed (KIAS) and 102.8 ft mean sea level (msl). The airplane began climbing at 9-11ø nose up, while traveling at 66-74 KIAS with full flaps extended. According to ATC communications, at 1308:21 the pilot reported the go-around and the tower controller begin transmitting a clearance. At 1308:26, the airspeed was 74 KIAS, which was the highest airspeed that the airplane achieved during the climb out, and the airspeed then began to decrease. At 1308:36, the tower controller finished his clearance and began another part of the clearance at 1308:42 and continued transmitting past the last recorded point. At 1308:45, the airplane entered a left turn with the airspeed decreasing through 64 KIAS. At 1308:52, power was reduced from 94% to about 81%, with a corresponding reduction in engine parameters. The flaps were moved from full to half flaps at 1308:56, with the airplane at 13ø nose up, 18ø of left bank, and 62 KIAS. The flaps were fully retracted (0ø flaps) at 1309:02 with the airplane in a 26ø left bank and travelling at 58 KIAS. One second later, the airplane was in a 71ø left bank, the pitch dropped to 5ø nose low, and engine power increased to 90%. No further data were recorded.

ADDITIONAL INFORMATION

FAA Advisory Circular (AC) 61-98C, "Current Requirements and Guidance for the Flight Review and Instrument Proficiency Check," dated November 20, 2015, states, in part, that the intent of a flight review is a routine evaluation of the pilot's ability to conduct a safe flight. The AC further states that, regardless of the pilot's experience, the flight instructor should review at least those maneuvers considered critical to safe flight such as stabilized approaches to landings, slow flight, stall recognition, stalls, stall recovery, and spin recognition and avoidance.

FAA Safety Team AFS-850 16-08, "Fly the Aircraft First," dated August 2016, provides a reminder to pilots to maintain aircraft control at all times. It states, in part, "The top priority - always - is to aviate." It further states, "Rounding out those top priorities are figuring out where you're going (Navigate), and, as appropriate, talking to ATC or someone outside the airplane (Communicate). It seems simple to follow, but it's easy to forget when you get busy or distracted in the cockpit."

Accident Rpt# ERA16LA124	**03/05/2016 1508 EST**	**Regis# N295AR**	**Hauppauge, NY**	**Apt: N/a**
Acft Mk/Mdl CIRRUS DESIGN CORP SR22-NO SERIES		**Acft SN 0028**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR IO-550 SERIES		**Acft TT 1543**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: LOUIS OBERGH		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Summary

The commercial pilot was conducting a personal cross-country flight. The pilot reported that, during cruise flight, the engine "sputtered" twice and then lost total power. He switched the fuel selector from the left tank to the right tank, but the engine would not restart, so he chose to activate the airframe parachute system. The parachute deployed normally, and the airplane touched down in a lawn adjacent to an industrial complex.

An examination of the engine revealed that the camshaft gear had numerous missing or smeared teeth, and metal particles were found inside the oil filter element and oil sump. Additional metallurgical examination revealed that the first fractured tooth, located about 180ø from the timing mark, failed due to fatigue. Most of the remaining broken or missing teeth exhibited overload signatures. Camshaft gear hardness was measured, and it met the manufacturer's specifications.

In August 2005, the engine manufacturer issued a service bulletin (SB), which called for the replacement of the camshaft gear with an improved, wider gear design "at next engine overhaul or at camshaft gear replacement." The recommended overhaul time for this engine was 2,000 hours or 12 years, whichever occurred first. At the time of the accident, the engine was 15 years old, had accumulated 1,544 hours in service, and had never been overhauled. At the time of the accident, the SB had not been complied with and the improved camshaft gear had not been installed in the engine.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The total loss of engine power, which resulted from the failure of the camshaft gear due to fatigue. Contributing to the accident was the owner/operator's failure to comply with the engine manufacturer's recommended overhaul interval.

Events

1. Enroute-cruise - Loss of engine power (total)
2. Emergency descent - Off-field or emergency landing

Findings - Cause/Factor

1. Aircraft-Aircraft power plant-Engine (reciprocating)-Recip engine power section-Fatigue/wear/corrosion - C
2. Aircraft-Aircraft power plant-Engine (reciprocating)-Recip engine power section-Failure - C
3. Personnel issues-Task performance-Maintenance-Scheduled/routine maintenance-Owner/builder - F
4. Personnel issues-Task performance-Use of equip/info-Use of policy/procedure-Owner/builder - F

Narrative

On March 5, 2016, about 1508 eastern standard time, a Cirrus Design Corporation SR22, N295AR, was substantially damaged following a total loss of engine power and forced landing at Hauppauge, New York. The pilot and one passenger were not injured. The airplane was registered to Advance Wellness and was operated by the pilot under the provisions of Title 14 Code of Federal Regulations Part 91 as a personal flight. Day, visual meteorological conditions prevailed, and no flight plan was filed. The flight from Groton, Connecticut (GON) to Farmingdale, New York (FRG) originated about 1430.

According to the pilot, during cruise flight, at 2,200 feet mean sea level, the engine "sputtered" twice, then lost all power. The fuel selector was on the left tank, so he switched to the right tank and attempted a restart. The engine would not restart, so he elected to activate the Cirrus Airframe Parachute System (CAPS). The CAPS deployed normally and the airplane touched down in a lawn adjacent to an industrial complex near Hauppauge. The pilot and passenger exited the cockpit and first responders arrived to assist.

An inspector with the Federal Aviation Administration responded to the accident site and examined the wreckage. Structural damage to fuselage was evident. The wing fuel tanks contained fuel. An initial inspection of the engine with a borescope revealed physical evidence of valve strikes to the top surfaces of all six pistons.

The engine was removed from the airframe and sent to the manufacturer's facility for further examination. During the disassembly of the engine, the starter adapter was removed, and damage to the camshaft gear teeth was noted. The oil filter was removed and opened; metal particles were found inside the filter

element. Several metal particles were found in the oil sump after removal. The cylinders were removed; each piston head exhibited valve strike signatures. The camshaft was removed from the engine case. The camshaft was intact; however, about 50% of the camshaft gear teeth were smeared or missing.

Metallurgical examination of the failed camshaft gear teeth revealed that the first fractured tooth, located about 180§ from the timing mark, failed from fatigue. The fracture surface exhibited beach marks and multiple initiation areas at the surface of the tooth. From the direction of the crack growth indicated by the arrest lines, the tooth separated in the direction of loading from engine operation by the mating crankshaft gear. Most of the remaining broken or missing teeth exhibited overload signatures. Camshaft gear hardness was measured with a diamond slim profile penetrator and met the manufacturer's specifications.

The engine, model number IO-550-NB7, was built on February 25, 2001, and had accumulated 1,543.7 hours at the time of the accident. On August 9, 2005, Continental Motors Inc. issued Service Bulletin SB05-08, which called for the replacement of the camshaft gear with an improved gear, nominally 0.060" wider. The bulletin compliance time was, "At next engine overhaul or at camshaft gear replacement." The recommended overhaul time for this engine was 2,000 hours or 12 years, whichever occurred first. At the time of the accident, the service bulletin had not been complied with and the accident airplane's engine did not have the improved camshaft gear installed.

Accident Rpt# ERA14LA347	**07/19/2014 2000 EDT**	**Regis# N976TC**	**Clinton, MA**	**Apt: N/a**	
Acft Mk/Mdl COLT BALLOONS 160A		**Acft SN 1482US**	**Acft Dmg: MINOR**	**Rpt Status: Factual**	**Prob Caus: Pending**
		Acft TT 711	**Fatal 0 Ser Inj 3**	**Flt Conducted Under: FAR 091**	
Opr Name: YOUNG DERALD E		**Opr dba:**		**Aircraft Fire: NONE**	
				AW Cert: STB	

Summary

The commercial pilot departed on the hot air balloon tour flight with 6 passengers. After about 1 hour of flight, the balloon approached a town; with about 20 minutes of fuel remaining and about 30 minutes until sunset, the pilot descended the balloon to locate a landing site. He subsequently selected the yard of a residence near an intersection. The pilot initiated a descent, intermittently activating the balloon's burners to maintain the descent path. As the balloon approached the landing site, the envelope contacted powerlines, resulting in an electrical discharge, a shower of sparks, and portions of the powerlines falling onto the ground and a parked vehicle. The balloon sustained thermal damage to the basket, but continued a controlled descent to the intended landing site. Three of the passengers received serious electrical burns as a result of the balloon's contact with the powerlines. The pilot stated that there were no mechanical malfunctions or anomalies with the balloon that would have precluded normal operation. The pilot further stated that he was unfamiliar with the area and was navigating with the aid of a map application on his cell phone.

Although the pilot reported that the overflight of the town was the result of a sudden shift in wind direction, given the balloon's departure location and the accident site, the balloon maintained a predominately northerly heading throughout the flight; there was no indication of any variation in wind direction. Based on this information, the pilot should have been able to predict the balloon's flight path with reasonable accuracy both before and after reaching the town and plan a landing site accordingly. Review of satellite imagery for the surrounding area showed several suitable landing fields about 1 ¬ nautical miles north of the accident site.

The accident was one of 4 events involving the accident pilot, all of which occurred during low-level operation or confined area landings and resulted in property damage. The events displayed a pattern of poor decision-making which was also exhibited during the accident flight with the pilot's decision to land in a populated area confined by powerlines. Given this history, it is possible that, with a more robust system of oversight and surveillance of balloon operators, the Federal Aviation Administration would have identified the accident pilot as a potential safety risk and taken steps to mitigate this risk.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's inadequate preflight and inflight planning and improper landing site selection and approach path, which resulted in the balloon contacting powerlines during landing. Contributing to the accident was the Federal Aviation Administration's inadequate oversight of balloon tour operators.

Events

1. Prior to flight - Preflight or dispatch event
2. Enroute - Low altitude operation/event
3. Maneuvering-low-alt flying - Collision with terr/obj (non-CFIT)
4. Approach - Controlled flight into terr/obj (CFIT)
5. Approach - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Personnel issues-Task performance-Planning/preparation-Flight planning/navigation-Pilot - C
2. Personnel issues-Action/decision-Info processing/decision-Decision making/judgment-Pilot - C
3. Personnel issues-Action/decision-Action-Incorrect action performance-Pilot - C
4. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Altitude-Incorrect use/operation - C
5. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Altitude-Not attained/maintained - C
6. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Descent/approach/glide path-Not attained/maintained - C
7. Environmental issues-Physical environment-Object/animal/substance-Wire-Awareness of condition - C
8. Environmental issues-Physical environment-Object/animal/substance-Wire-Decision related to condition - C
9. Organizational issues-Support/oversight/monitoring-Oversight-Oversight of operation-FAA/Regulator - F

Narrative

HISTORY OF FLIGHT

On July 19, 2014, about 2000 eastern daylight time, a Colt Balloons 160A, N976TC, contacted powerlines in Clinton, Massachusetts. The balloon received

minor damage. The pilot and three passengers were uninjured, and three passengers were seriously injured. The local sightseeing flight was operated by Damn Yankee Balloons under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which departed from a field in Shrewsbury, Massachusetts, about 1845.

The pilot stated that the accident flight was the second flight that day. After meeting the passengers and ground crew at the departure location, he provided the passengers with a safety briefing that included all aspects of the flight, including the risks involved and the flight procedures and timeline. While the pilot conducted the safety briefing, his ground crew assembled the balloon. The pilot then performed a preflight inspection before inflating the envelope. The passengers boarded, and the pilot conducted a second preflight inspection before launching.

According to the pilot, after launch, the balloon climbed to about 1,000 ft above ground level (agl) and traveled 170ø-180ø (southbound) at a groundspeed of about 5 knots. About 1 hour into the flight, the balloon passed over a reservoir, then the wind "shifted" and the balloon began approaching the town of Clinton. Witness photographs captured images of the balloon as it traveled over the reservoir between 50 and 100 ft agl. One witness reported that the balloon's basket was "skimming the water." The pilot reported that he approached the town at an altitude of 100 ft agl in preparation for landing should an adequate landing site appear. Shortly thereafter, he saw a large side yard next to a house at an intersection. He initiated a descent using the balloon's burners intermittently to maintain the proper descent path. Photographs showed the balloon approaching the landing site about 50 feet agl.

According to the pilot, as the balloon approached the landing site, the basket skid (attached to the bottom of the basket), contacted the top wire of a set of electrical wires perpendicular to the balloon's flight path. The balloon continued forward, causing the top wire to contact another wire; a large arc and flash ensued. The balloon then continued its descent to the landing site, where it touched down normally.

Video footage of the accident showed that the pilot engaged the burner several times as the balloon approached the landing site. Subsequent footage showed the balloon descending toward the landing site. As it descended, the envelope contacted the three uppermost powerlines, resulting in an electrical discharge, a shower of sparks, and portions of the powerlines falling onto the ground and a parked vehicle. The balloon then continued in a controlled descent to the landing area. After the balloon landed, the ground crew and others who had stopped to render assistance helped the passengers egress from the basket. Three of the passengers received serious electrical burns as a result of the balloon's contact with the powerlines.

The pilot stated that he decided to land in the town because the balloon had about 20 minutes of fuel remaining, and that sunset would occur in about 30 minutes. He also stated that he was unfamiliar with the area, and reported to law enforcement personnel that he was navigating with the use of a map application on his cell phone. In his written statement to the NTSB, he suggested that the accident may have been prevented with a steeper approach to the landing site.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with a rating for lighter-than-air balloon, and private pilot privileges for airplane single-engine land. His most recent Federal Aviation Administration (FAA) third-class medical certificate was issued on September 14, 2012. He reported 4,388.9 total hours of flight experience, of which 2,708.2 hours were in lighter-than-air balloons.

AIRCRAFT INFORMATION

The balloon envelope and basket were manufactured in 1989. The balloon was powered by 2 propane burners, and had a basket capacity of 9 occupants. The balloon's most recent annual inspection was completed on May 28, 2014. At the time of the accident, the balloon had accrued about 711.1 total hours of operation.

METEOROLOGICAL INFORMATION

The 2052 recorded weather at Fitchburg Municipal Airport (FIT) Fitchburg, Massachusetts, located about 9 miles northwest of the accident site included wind from 090ø at 3 knots, visibility 10 statute miles, clear skies, temperature 22øC, dew point 17øC, and altimeter setting of 30.23 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

Examination of the balloon envelope and basket by an FAA inspector revealed that the outside of the wicker basket had been scorched on one side and that both burner support covers on that side of the basket displayed thermal damage.

ADDITIONAL INFORMATION

Balloon's Flight Path

Contrary to the pilot's statement, the departure location of the flight, and the accident site location were consistent with the balloon traveling on a predominantly northerly course throughout the 1 hour 15 minute, 7-nautical-mile (nm) flight. Review of satellite imagery of the area showed several fields about 1 ¬ nm north of the accident site located along the balloon's established route of flight.

Balloon Manufacturer's Guidance

According to the balloon manufacturer's flight manual, section 2.9, LANDING PROCEDURE, when choosing a landing site, the pilot should allow for possible variations in the wind at ground level, and choose a site:

(a) Free of obstructions, especially power lines;
(b) Overshoot area should also be clear;
(c) Field free of crops and animals;
(d) If possible, look for upwind shelter to reduce speed;
(e) If possible, choose a field with good accessibility for retrieve crew, and minimum inconvenience for the owner.

The manual also states:

Do not fly into power lines at any cost. If contact is inevitable descend as fast as possible so that the contact of the wires is with the envelope and not with the basket assembly. Shut down the fuel system and vent lines before contact. If the balloon is caught in the wires DO NOT TOUCH ANY METAL PAR'I'S. If possible, remain in the basket until the power is shut off. Never attempt to remove the balloon until the power authority has arrived. Do not allow crew members to make contact between the ground and the basket until the power is shut off.

Balloon Flying Handbook

The FAA Balloon Flying Handbook (FAA-H-8083-11A), 7-7, "Maneuvering," states, "The balloon is officially a nonsteerable aircraft." Although a hot air balloon has no direct controls for steering, a balloon's flightpath can be indirectly influenced using the burner and parachute valve. The handbook also states:

Being knowledgeable of the wind at various altitudes, both before launch and during flight, is the key factor for maneuvering. Maneuvering, or steering, comes indirectly from varying one's time at different altitudes and different wind directions.

To initiate a climb, a balloon pilot activates one or more of the balloon's propane fuel burners. Rate of climb is adjusted by the duration and/or frequency of burner activations. Level flight is achieved by executing a series of burns that minimizes changes in vertical velocity. Descent is achieved either by allowing the air in the envelope to cool or by opening the parachute valve to allow hot air to escape. The rate of descent can be increased by leaving the parachute valve open longer or reopening the valve. Rate of descent can be slowed or stopped by activating the burner(s).

The FAA Balloon Flying Handbook further states that when contour flying, or during an approach to a landing site, the potential of collision with trees, power lines, and other obstacles is increased. For balloons, landing accidents consistently account for over 90 percent of the total number of accidents in any given year. The most common causal factors for landing accidents include collision with obstructions in the intended landing area.

In addition, these accidents account for the majority of injuries to pilots and damage to balloons. Accidents are more likely during landing because the tolerance for error is greatly diminished and opportunities for pilots to overcome errors in judgment and decision-making become increasingly limited, particularly in high wind conditions.

Additional Incidents

Over the course of the investigation, the NTSB became aware of other incidents with the operator. In October 2004, one passenger received minor injuries when, during landing, the balloon encountered a downdraft. The pilot applied the burners to ascend and overshot the intended landing site. In an attempt to slow the balloon, the pilot brushed the basket through a tree, during which a branch cut the passenger's hand.

In October 2011, a witness observed the balloon flying low in the middle of Northborough, Massachusetts. During the flight, the pilot flew below the tops of the surrounding trees and the balloon passed between and struck two houses, which sustained soffit and gutter damage.

On September 30, 2013, the pilot landed in the parking lot of a Kmart store in Auburn, Maine. The eight passengers onboard were not injured. The pilot reported to a local media outlet that the flight was going according to plan when an unexpected breeze kicked in around sunset. During the approach to landing, the balloon contacted and damaged a light pole in the parking lot.

On September 22, 2015, about 14 months after the accident in Clinton, Massachusetts, the pilot and his six passengers were uninjured when he landed the balloon in the parking lot of a Massachusetts Bay Transportation Authority commuter rail station in Grafton, Massachusetts. The balloon had launched from Shrewsbury, Massachusetts earlier that morning. The pilot advised that, sometime during the flight, the wind conditions changed. He originally tried to land in an open field at Tufts University, but instead landed in the parking lot which was about 1,000 yards northwest of the field. During the balloon's descent, it contacted an overhead guide wire that stretched between two light poles, knocking one pole over and resulting in damage to 3 vehicles.

Articles published by local media in Portland, Maine, and Miramichi, New Brunswick, Canada, stated that the pilot's invitations to two separate balloon festivals were rescinded as a result of the open investigation into the Clinton, Massachusetts, accident.

NTSB Recommendations

On April 7, 2014, the NTSB issued recommendations to the FAA (A-14-11 and A-14-12) to address operational deficiencies in commercial sightseeing (air tour) balloon operations that have resulted in occupant injuries and a fatality. They were derived from the NTSB's investigations of several air tour balloon accidents. The accidents highlighted operational deficiencies in commercial air tour balloon operations, such as operating in unfavorable wind conditions and failure to follow flight manual procedures, that the NTSB considered a result of the lack of oversight relative to similar airplane and helicopter air tour operations.

In its recommendations, the NTSB stated that, depending on gondola capacity, balloons can carry more than 20 passengers per flight. Given the various safety deficiencies noted in the NTSB's investigations of the subject balloon accidents, the potential for a high number of fatalities in a single air tour balloon accident is of particular concern if air tour balloon operators continue to conduct operations under less stringent regulations and oversight. Although such an accident had yet to occur in the United States at the time of the issuance of the recommendations, a high-fatality accident occurred in Egypt on February 26, 2013, when a commercial air tour balloon carrying 21 occupants experienced a fire on board, resulting in 19 deaths.

On July 30, 2016, about 0742 central daylight time, a Bal¢ny Kub¡cek BB85Z hot air balloon, N2469L (NTSB Case No. DCA16MA204), crashed into a field after striking high voltage powerlines while landing near Lockhart, Texas. The 15 passengers and pilot onboard were fatally injured. The NTSB determined that the probable cause of this accident was the pilot's pattern of poor decision-making that led to the initial launch, continued flight in fog and above clouds, and descent near or through clouds that decreased the pilot's ability to see and avoid obstacles. Contributing to the accident were (1) the pilot's impairing medical conditions and medications and (2) the FAA's policy to not require a medical certificate for commercial balloon pilots.

The investigation further concluded that the FAA's primary method of oversight-sampling balloon operators at festivals and events-does not effectively target the operations that pose the most significant safety risks to members of the public who choose to participate in commercial balloon sightseeing activities. As a result of this investigation, the NTSB classified Safety Recommendations A-14-011 and -12 as "Closed-Unacceptable Action/Superseded," and made the following new safety recommendation to the FAA:

Analyze your current policies, procedures, and tools for conducting oversight of commercial balloon operations in accordance with your Integrated Oversight Philosophy, taking into account the findings of this accident; based on this analysis, develop and implement more effective ways to target oversight of the operators and operations that pose the most significant safety risks to the public.

Accident Rpt# GAA17CA578	**07/03/2017 1100 CDT**	**Regis# N711NN**	**Eagle Grove, IA**	**Apt: Eagle Grove Muni EAG**
Acft Mk/Mdl COLUMBIA AIRCRAFT MFG LC41		**Acft SN 41614**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
			Fatal 0 **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: RONALD SIEMENS		**Opr dba:**		**Aircraft Fire: NONE**

an airsafety.com e-product
Prepared From Official Records of the NTSB By:
Air Data Research
9865 Tower View, Helotes, Texas 78023
210-695-2204 - info@airsafety.com - www.airsafety.com

Accident Rpt# ERA16FA312B 09/07/2016 1048 EDT	**Regis# N85WP**	**Carrollton, GA**	**Apt: West Georgia Regional CTJ**
Acft Mk/Mdl DIAMOND AIRCRAFT IND INC DA20-C1	**Acft SN C0316**	**Acft Dmg: DESTROYED**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CONTINENTAL IO-240-B	**Acft TT 1990**	**Fatal 3 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: FALCON AVIATION ACADEMY LLC	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STN

Summary

The Diamond flight instructor and student pilot were in the traffic pattern at the non-towered airport practicing landings. The Beech pilot entered the traffic pattern on an extended left downwind leg with the intention of landing. Pilots of other airplanes in the pattern reported that the Diamond instructor was making standard traffic pattern callouts on the common traffic advisory frequency (CTAF); however, the Beech pilot was not transmitting on the CTAF. Witness observations, radar data, GPS data, and examination of the wreckage of the two airplanes revealed that, while both airplanes were on final approach for landing, the Beech overtook the Diamond from above and behind. The landing gear of the Beech struck the horizontal stabilizer and elevator of the Diamond, and then both airplanes abruptly descended into the terrain short of the runway. The Beech came to rest inverted and on top of the Diamond. An examination of wreckage of both airplanes did not reveal evidence of any preaccident anomalies or malfunctions.

Testing of the Beech's VHF communications radio revealed that it was set to an old CTAF frequency for the airport that had been changed about 5 years before the accident. A local airport frequency card dated 7 years before the accident that was found in the Beech's cockpit listed the old CTAF frequency that was set in the Beech's radio. Another pilot at a different airport heard the Beech pilot making pattern calls on the incorrect frequency about the time of the accident.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The failure of the Beech pilot to see and avoid the Diamond that was in front of and below his airplane on final approach and his use of an incorrect radio communication frequency for the airport.

Events

1. Approach-VFR pattern final - Midair collision
2. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft systems-Communications system-VHF communication system-Incorrect use/operation - C
2. Personnel issues-Task performance-Use of equip/info-Use of equip/system-Pilot of other aircraft - C
3. Personnel issues-Task performance-Use of equip/info-Use of policy/procedure-Pilot of other aircraft - C
4. Personnel issues-Psychological-Attention/monitoring-Monitoring other aircraft-Pilot of other aircraft - C

Narrative

HISTORY OF FLIGHT

On September 7, 2016, at 1048 eastern daylight time, a Beech F33A, N6027K, and a Diamond Aircraft Industries DA20-C1, N85WP, collided in midair on the final approach leg of the traffic pattern to runway 35 at West Georgia Regional Airport (CTJ), Carrollton, Georgia. The Beech was substantially damaged, and the private pilot was fatally injured. The Diamond was destroyed, and the flight instructor and the student pilot were fatally injured. The Beech was registered to and operated by the private pilot. The Diamond was registered to and operated by Falcon Aviation Academy LLC. Both flights were conducted under the provisions of 14 Code of Federal Regulations (CFR) Part 91; the Beech pilot was conducting a personal flight, and the Diamond pilots were conducting an instructional flight. Visual meteorological conditions prevailed, and no flight plans were filed for either flight. The Beech departed from Fulton County Airport (FTY), Atlanta, Georgia, about 0915, and the Diamond departed from Newnan Coweta County Airport (CCO), Newnan, Georgia, about 1000.

According to personnel from Falcon Aviation Academy, the pilots of the Diamond were practicing traffic pattern operations and landings at CTJ. The Diamond entered the traffic pattern, followed a few minutes later by N263CF and then by N169PS, both Falcon Aviation Academy DA20s. The flight instructor and student pilot on board N263CF saw the Beech on the downwind leg of the traffic pattern. Moments later, the flight instructor and student pilot on board N169PS entered the traffic pattern from the east. They looked down and to the left, in the direction of the final approach path for runway 35, and saw two airplanes collide. The instructors and the students on board both trailing DA20s reported that they did not hear the Beech pilot broadcasting his intentions on the CTJ common traffic advisory frequency (CTAF) but they heard the accident Diamond making position calls in the traffic pattern before the collision, with the last call being made on the final approach.

Another flight instructor employed by Falcon Aviation Academy reported that he was familiar with the Beech pilot and his airplane. He had just completed a

flight at CCO and heard the Beech pilot broadcasting traffic pattern calls for CTJ about the time of the accident; however, the Beech pilot was broadcasting over the CCO CTAF of 122.7 MHz. The flight instructor reported that the Beech pilot was not in the traffic pattern at CCO at the time of the transmissions.

Radar data provided by Federal Aviation Administration (FAA) air traffic control personnel indicated that the Beech pilot entered an extended left downwind for CTJ from the north, above and behind the accident Diamond, which was on the downwind leg of the traffic pattern. The ground speed of the Beech was about 50 knots greater than the ground speed of the Diamond. The last radar returns were on the downwind leg, about 2,000 ft above mean sea level, or about 850 ft above the ground. The locations of the last radar returns showed the airplanes approaching the base leg for runway 35.

The Diamond was not equipped with GPS data recording capability. A portable GPS receiver recovered from the Beech recorded the accident flight. The recording indicated that the Beech was established on the downwind leg for runway 35, about 2,500 ft GPS altitude and 150 knots groundspeed. The CTJ airport elevation was 1,164 ft. The Beech descended toward the base leg, turning base about 2,200 ft and 122 knots. The Beech turned onto final about 1,450 ft and 79 knots. The last recorded data point was at 1048:00, with the Beech at 1,201 ft and 76 knots, about 607 ft south of the runway 35 threshold.

PERSONNEL INFORMATION

The Beech Pilot

The pilot of the Beech, age 79, held an FAA private pilot certificate with airplane single-engine land and instrument airplane ratings. He held an FAA third-class medical certificate with a restriction to have glasses available for near vision. He reported 2,500 total hours of flying experience on his FAA third-class medical certificate application that was dated October 5, 2015. His personal pilot logbook was not located.

According to the owner's representative (insurance adjuster), the Beech pilot reported that he completed a Beechcraft Pilot Proficiency Program on October 30, 2015, at Blairsville, Georgia. This was confirmed verbally and accepted as a current flight review by the insurance company.

The Diamond Flight Instructor

The flight instructor in the Diamond, age 24, held an FAA commercial pilot certificate with ratings for airplane multi-engine land, airplane single-engine land, and instrument airplane. She held an FAA flight instructor certificate with a rating for airplane single-engine, and she held an FAA first-class medical certificate with a restriction to wear glasses. She was seated in the right cockpit seat. She reported 600 total hours of flying experience on her FAA first-class medical certificate application that was dated March 16, 2016. A review of her pilot logbook revealed about 850 hours total time, including 721 hours in single-engine airplanes and 366 hours as a flight instructor.

The Diamond Student Pilot

The student pilot in the Diamond, age 20, held an FAA student pilot certificate. He held an FAA second-class medical certificate with no restrictions. He was seated in the left cockpit seat. He enrolled in the ab initio training program at Falcon Aviation Academy on August 4, 2016, and had logged about 22 hours of flight time.

AIRCRAFT INFORMATION

Beech

The off-white- and blue/gold-colored Beech F33A was a single-engine, low-wing airplane with a conventional tail. A review of the airplane's maintenance and airworthiness records revealed that an enhanced Whelen light-emitting diode (LED) wingtip position and anti-collision light system, model OR6502GE/OR6502RE, and a Whelen LED tail position and anti-collision light system, model OR5002V, were installed on the airplane per FAA Supplemental Type Certificate, dated November 10, 2014. The airplane was equipped with landing and taxi lights. The airplane was not equipped with a traffic advisory system (TAS), traffic alert and collision avoidance system (TCAS), or automatic dependent surveillance-broadcast (ADS-B) equipment or displays. The Beech's avionics suite included a King KX 155 VHF communication/navigation transceiver and a Garmin GNS 530 GPS/communication/navigation all-in-one

unit.

According to information provided by the owner's representative, the Beech's most recent annual inspection was completed on or about July 13, 2016. At the time of the inspection, the airframe had accumulated about 4,549 total hours of operation.

Diamond

The white- and blue-colored Diamond DA20 was a single-engine, low-wing airplane with a T-tail configuration. It was equipped with wingtip-mounted anti-collision strobe lights and navigation position lights, and a landing and taxi light. The airplane was not equipped with a TAS, TCAS, ADS-B equipment or displays. The Diamond's avionics suite included an iCOM AC-A200 VHF air band transceiver and a Garmin GNS 430 GPS/communication/navigation all-in-one unit.

The Diamond's most recent annual inspection was completed on August 9, 2016. At the time of the inspection, the airframe had accumulated about 1,990 total hours of operation.

METEOROLOGICAL INFORMATION

The CTJ 1055 weather observation included wind calm, visibility 10 statute miles, scattered clouds at 8,500 ft, temperature 30øC, dew point 19øC, and an altimeter setting 30.30 inches of mercury.

AIRPORT INFORMATION

CTJ was a public, non-towered, uncontrolled airport with a single runway, designated 17/35. The runway was 5,503 ft long and 100 ft wide. The published traffic pattern direction for runway 35 was to the left. Falcon Aviation Academy personnel reported that their pilots frequently used CTJ for training purposes.

The CTAF/UNICOM frequency for CTJ at the time of the accident was 122.975 MHz. CTAF communications were not recorded. The airport manager reported that the CTJ CTAF frequency was changed from 122.7 MHz to 122.975 MHz in 2011.

WRECKAGE AND IMPACT INFORMATION

General

The main wreckage of both airplanes came to rest in a grass field, about 408 ft south of the approach end of runway 35, on the extended centerline of the runway. The Diamond came to rest in an upright position. The Beech came to rest inverted and on top of the Diamond wreckage. The wreckage debris field was about 350 ft long and about 80 ft wide, oriented on a heading of 350§. All major structural components of both airplanes were accounted for within the wreckage debris field.

Beech

The wreckage of the Beech was generally intact; the wings and empennage remained attached to the fuselage. Flight control cable continuity was established from the cockpit controls to the flight control surfaces. The ailerons, elevator, and rudder remained attached in their respective positions on the wings, horizontal stabilizer, and rudder. Blue-colored paint transfer marks were found on the lower surface of the right wing, near wing station 108. Impact damage with paint transfer was found on the top of the fuselage around station 131.

The nose gear separated from the airplane during the impact sequence. White paint transfer markings were observed on the nose gear tire. The left and right main landing gear were found in the extended positions. White paint transfer markings were observed on the left, main gear tire. The wing flaps were extended 20§.

The master and avionics switches were found in the "on" positions. The strobe light switch was found in the "on" position. The taxi light switch was found in the "on" position, and the landing light was found in the "off" position; however, both switches had impact damage. The position of the navigation light switch could not be determined because of impact damage.

The engine remained attached to the firewall. External examination of the engine did not reveal physical evidence of a mechanical malfunction or anomaly. The propeller assembly separated from the engine at the crankshaft/propeller flange junction. The fracture surfaces exhibited features consistent with overload. The propeller blades remained attached to the hub and displayed chordwise scratches, blade twisting, leading edge gouging, and surface polishing.

A laminated card titled "LOCAL AREA FREQ" and dated April 27, 2009, was found in the Beech's cockpit. The card, which listed the frequencies for multiple airports in the area, listed the frequency for the CTAF at CTJ as 122.7 MHz.

Diamond

The Diamond came to rest upright, under the wreckage of the Beech. Flight control continuity was confirmed from the elevator and rudder to the cockpit controls. Aileron control continuity was confirmed from the right aileron to the cockpit controls. The left wing separated from the fuselage during the impact sequence. The left aileron control tubes had multiple fractures that exhibited overload signatures. The empennage separated from the fuselage about 14 inches forward of the vertical stabilizer root leading edge.

Blue paint transfer marks were observed on the leading edge of the Diamond's right wing. The marks were about 8 inches long and 12 inches from the wing root. The Diamond's landing, taxi, strobe, and position light switches were impact-damaged, and their preimpact positions could not be determined.

Lightweight pieces of the Diamond were found on a northerly path, beginning 340 ft south of the main wreckage. One of the most southerly pieces of wreckage debris was the right half of the Diamond's elevator. Closer examination revealed black transfer markings on the upper surface of the elevator that were consistent in color and tread pattern with the right main landing gear tire of the Beech. Examination of the Diamond's horizontal stabilizer revealed similar transfer markings on its upper surface. The other small pieces of debris located south of the main wreckage were identified as sections of the Diamond's canopy and wing root/fuselage skin.

MEDICAL AND PATHOLOGICAL INFORMATION

The Beech Pilot

The Georgia Bureau of Investigation Division of Forensic Sciences performed an autopsy of the Beech pilot and the cause of death was blunt trauma of the head and chest, and the manner of death was accident.

The FAA's Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing and identified doxazosin and losartan in the pilot's blood, and doxazosin, dextromethorphan, and its metabolite dextrorphan in urine. Doxazosin and losartan are blood pressure medications also named Cardura and Cozaar, respectively. The pilot reported the use of doxazosin and losartan to the FAA during his most recent FAA third-class physical. Dextromethorphan is an over-the-counter cough suppressant available in a number of products.

The Diamond Flight Instructor

The Georgia Bureau of Investigation Division of Forensic Sciences performed an autopsy of the Diamond flight instructor and the cause of death was blunt head trauma, and the manner of death was accident.

The FAA's Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing of the flight instructor. The specimens tested negative for carbon monoxide, ethanol, and a wide range of drugs, including major drugs of abuse.

The Diamond Student Pilot

The Georgia Bureau of Investigation Division of Forensic Sciences performed an autopsy of the Diamond student pilot and the cause of death was blunt trauma of the head and torso, and the manner of death was accident.

The FAA's Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing of the student pilot. The specimens tested negative for carbon monoxide, ethanol, and a wide range of drugs, including major drugs of abuse.

TESTS AND RESEARCH

The King KX 155 VHF transceiver and the Garmin GNS 530 all-in-one unit from the Beech were sent to the NTSB Vehicle Recorders Laboratory to determine the frequencies in use at the time of the accident. The examination revealed that the KX 155 communication frequencies were set to 118.17 MHz (active) and 126.22 MHz (standby). The GNS 530 communication frequencies were set to 122.7 MHz (active) and 124.050 MHz (standby). The waypoint communications information page for CTJ was accessed during the examination even though the installed GNS 530 aviation database expired as of November 12, 2015. The CTAF/UNICOM on the displayed page showed the correct frequency of 122.975 MHz.

ADDITIONAL INFORMATION

FAA Rules, Regulations, and Guidance to Pilots

Title 14 CFR 91.113 addresses aircraft right-of-way rules and states, in part, the following:

(b) General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

(f) Overtaking. Each aircraft that is being overtaken has the right-of-way and each pilot of an overtaking aircraft shall alter course to the right to pass well clear.

(g) Landing. Aircraft, while on final approach to land or while landing, have the right-of-way over other aircraft in flight or operating on the surface, except that they shall not take advantage of this rule to force an aircraft off the runway surface which has already landed and is attempting to make way for an aircraft on final approach. When two or more aircraft are approaching an airport to landing, the aircraft at the lower altitude has the right-of-way, but it shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft.

The FAA's Aeronautical Information Manual (AIM), dated December 10, 2015, paragraph 5-5-8, includes pilot procedures for see-and-avoid while in flight and states, "When meteorological conditions permit, regardless of type of flight plan or whether or not under control of a radar facility, the pilot is responsible to see and avoid other traffic, terrain, or obstacles."

The AIM, paragraph 4-1-9, also describes operations to/from airports without an operating control tower and the use of a CTAF and states, in part, the following:

a. Airport Operations Without Operating Control Tower

1. There is no substitute for alertness while in the vicinity of an airport. It is essential that pilots be alert and look for other traffic and exchange traffic information when approaching or departing an airport without an operating control tower.To achieve the greatest degree of safety, it is essential that all radio-equipped aircraft transmit/receive on a common frequency identified for the purpose of airport advisories.

b. Communicating on a Common Frequency

The key to communicating at an airport without an operating control tower is selection of the correct common frequency.A CTAF is a frequency designated for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating control tower.

The AIM describes the recommended communication procedures regarding departure aircraft on the CTAF and states, "Pilots of inbound traffic should monitor and communicate as appropriate on the designated CTAF from 10 miles to landing. Pilots of departing aircraft should monitor/communicate on the appropriate frequency from start-up, during taxi, and until 10 miles from the airport unless the CFRs or local procedures require otherwise."

The Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-24A), section 13, addresses scanning procedures for visually acquiring traffic:

The pilot can contribute to collision avoidance by being alert and scanning for other aircraft. This is particularly important in the vicinity of an airport.

The See-and-Avoid Concept

The FAA issued AC 90-48D, "Pilots' Role in Collision Avoidance," in April, 2016 to alert all pilots ".to the potential hazards of midair collisions and near midair collisions (NMAC), and to emphasize those basic problem areas related to the human causal factors where improvements in pilot education, operating practices, procedures, and improved scanning techniques are needed to reduce midair conflicts."

AC 90-48D stated that each person operating an aircraft, regardless of whether the operation was conducted under IFR or VFR, shall maintain a vigilant lookout for other aircraft at all times. Regarding visual scanning, the AC specifically stated that "Pilots should remain constantly alert to all traffic movement within their field of vision, as well as periodically scanning the entire visual field outside of their aircraft to ensure detection of conflicting traffic.". AC 90-48D also described several specific methods that pilots could use to visually acquire other traffic.

Incident Rpt# DCA17IA202A	**09/21/2017 1920 EDT**	**Regis# NONE**	**Hoffman Island, NY**	**Apt: N/a**
Acft Mk/Mdl DJI PHANTOM-4		**Acft SN**	**Acft Dmg: DESTROYED**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl DJI			**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 107**
Opr Name: VYACHESLAV TANTASHOV		**Opr dba:**		**Aircraft Fire: UNK**

Summary

The United States Army UH-60M helicopter was operating under visual flight rules within Class G airspace about 300 ft above mean sea level (msl) when it collided with a privately owned and operated DJI Phantom 4 small unmanned aircraft system (sUAS). The helicopter sustained minor damage and landed uneventfully; the sUAS was destroyed. Although the pilot flying the helicopter saw the sUAS before impact and immediately applied flight control inputs, there was insufficient time to avoid the collision.

The sUAS pilot was operating the aircraft recreationally and did not hold a Federal Aviation Administration (FAA) Remote Pilot certificate. Hobby and recreational pilots are expected to operate their aircraft in accordance with Title 14 Code of Federal Regulations Part 101, which includes maintaining visual contact with the aircraft at all times and not interfering with any manned aircraft. There are no training or certification requirements for model aircraft pilots.

During the incident flight, the pilot of the sUAS intentionally flew the aircraft 2.5 miles away, well beyond visual line of sight and was just referencing the map on his tablet; therefore, he was not aware that the helicopter was in close proximity to the sUAS. Although the pilot stated that he knew that the sUAS should be operated at an altitude below 400 ft, flight logs revealed that he had conducted a flight earlier on the evening of the incident, in which he exceeded 547 ft altitude at a distance of 1.8 miles, which was unlikely to be within visual line of sight. In addition, even though the sUAS pilot indicated that he knew there were frequently helicopters in the area, he still elected to fly his sUAS beyond visual line of sight, demonstrating his lack of understanding of the potential hazard of collision with other aircraft. In his interview, the sUAS pilot indicated that he was not concerned with flying beyond visual line of sight, and he expressed only a general cursory awareness of regulations and good operating practices.

A Temporary Flight Restriction (TFR) was in effect for the area of the flight; the helicopter was authorized for flight within this area. The helicopter was operating over water and not in the vicinity of any vessels; therefore, its operating altitude was in accordance with FAA regulations and Army guidance. The sUAS pilot was unaware of the active TFRs in the area that specifically prohibited both model aircraft and UAS flight. Further, the sUAS pilot relied only on the DJI GO4 app for airspace awareness. Although the TFR airspace awareness functionality in the DJI app (GEO) was not active at the time of the incident, this feature is intended for advisory use only, and sUAS pilots are responsible at all times to comply with FAA airspace restrictions. Sole reliance on advisory functions of a non-certified app is not sufficient to ensure that correct airspace information is obtained. Had the functionality been active, the sUAS pilot would still have needed to connect his tablet to the internet before the flight in order to receive the TFR information. Since the sUAS pilot's tablet did not have cellular connection capability, it is unlikely that he would have been able to obtain TFR information at the time of the flight. Because the pilot solely relied on the app to provide airspace restriction information; he was unaware of other, more reliable methods to maintain awareness.

The collision occurred 2 minutes before the end of civil twilight. Although modeler (recreational) sUAS pilots may fly at night under certain conditions, when asked about night flight, the incident pilot only stated that he had built-in position lights; thus he was likely unaware of any guidelines or practices for night operations.

There was no evidence of any mechanical or software problems with the sUAS relevant to the flight. The pilot did not report any anomalies, and stated the recorded information on the flight logs accurately reflected the incident flight. The sUAS operated as expected at all times. Although the recorded data showed a 9-second gap in telemetry, this was likely due to distance from the remote controller.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: the failure of the sUAS pilot to see and avoid the helicopter due to his intentional flight beyond visual line of sight. Contributing to the incident was the sUAS pilot's incomplete knowledge of the regulations and safe operating practices.

Events

1. Enroute - Midair collision

Findings - Cause/Factor

1. Personnel issues-Psychological-Attention/monitoring-Monitoring other aircraft-Pilot - C
2. Personnel issues-Task performance-Use of equip/info-Use of policy/procedure-Pilot - C

Narrative

HISTORY OF FLIGHT

On September 21, 2017, at 1920 eastern daylight time, a Sikorsky UH-60M Black Hawk helicopter, R20087, operated by the U.S. Army as CAVM087 ("Caveman 87"), collided with a privately owned and operated D…-Jiang Innovations (DJI) Phantom 4 small unmanned aircraft system (sUAS). The collision occurred about 300 ft above mean sea level (msl) and 1 mile east of Midland Beach, Staten Island, New York, in the vicinity of Hoffman Island. The helicopter received minor damage, and the sUAS was destroyed. There were no injuries or ground damage.

The incident helicopter was the lead aircraft of a flight of two, and was operating as a local orientation flight for the Hudson Class B Airspace Exclusion and the United Nations General Assembly Temporary Flight Restriction (TFR) operations. The flight had flown south along the Hudson River, then turned east at the Verrazano-Narrows Bridge toward Coney Island, New York. The crew then decided to make a right turn toward the west and return to their base at Linden Airport (LDJ), Linden, New Jersey. Air traffic control (ATC) radar obtained from the Federal Aviation Administration (FAA) showed the flight heading toward LDJ between 200 and 300 ft msl. The crew reported that the flight had just passed Hoffman Island when the lead helicopter made contact with what appeared to be a sUAS. Recorded data from the helicopter indicated that it was flying at an altitude of 274 ft msl at the time of the collision.

The helicopter co-pilot was the pilot flying when the collision occurred. He reported that he immediately and rapidly reduced the collective as the sUAS suddenly came into his view in close proximity to the helicopter. The pilot-in-command took the controls and recommended that they return to LDJ. Radar data indicated that the flight proceeded to LDJ, climbing to about 800 ft as it passed over the shore and overflew more populated areas. The flight landed uneventfully, and the air mission commander subsequently reported the collision to the air traffic control tower at Newark Liberty International Airport.

The sUAS pilot was unaware that a collision had taken place until he was contacted by the NTSB. The pilot reported that he initiated the pleasure flight from the shore adjacent to Dyker Beach Park, southeast of the Verrazano-Narrows Bridge, in the Fort Hamilton neighborhood of Brooklyn, New York, and that he intended to fly "over the ocean." Data logs from the control tablet provided by the pilot indicated that the sUAS took off at 1911:34 and, after takeoff, climbed to a recorded altitude of 89 meters (292 ft). The sUAS altitude is based on height above the takeoff point ("home point"); the elevation of the park is about 7 ft msl.

The sUAS then proceeded on a straight, southwesterly course toward Hoffman Island, about 2.5 miles from the takeoff location. The data log showed the aircraft briefly paused over the ship channel and completed some yawing turn maneuvers, consistent with the pilot looking through the camera view at points of interest, then resumed the straight course toward the island.

At 1914:30, ATC radar indicated the flight of helicopters was travelling south-southeasterly from the Verrazano-Narrows Bridge toward Coney Island at 400 ft (Figure 1). The helicopters passed the sUAS pilot's position from his right to left about 1 mile from his location. The sUAS was about 1 1/2 miles from the sUAS pilot at that time and along a common line of sight. Shortly afterward, at 1915:30, data logs indicated the sUAS paused and hovered northeast of Hoffman Island for about 2 minutes before resuming a southwesterly track toward the island. During this time, the helicopters were flying east along the Coney Island shoreline about 300 ft msl.

Figure 1: Approximate route of flight of the UH-60 and sUAS

At 1919:15, the sUAS pilot pressed the return-to-home (RTH) button on the control tablet, and the aircraft turned around and began tracking northeast toward the home point. The helicopters had completed a turn toward LDJ, and were just west of Coney Island at 300 ft. At 1919:51, the sUAS battery endurance warning activated, indicating that only enough charge remained to return directly to the home point. The pilot did not have visual contact with the sUAS or the helicopters at that time. As the sUAS was tracking northeast, telemetry data dropped out for about 9 seconds but returned just before the collision. The position of the aircraft was near the maximum range of the remote controller. At 1920:17.6, the data logs ended. The last position and altitude logged correlated with the position and altitude of the incident helicopter's recorded data and ATC radar information; about 300 ft west of Hoffman Island. The sUAS pilot reported that he lost signal with the aircraft and assumed it would return home as programmed. After waiting about 30 minutes, he assumed it had experienced a malfunction and crashed in the water.

The airspace in the area of the flight is Class G, underlying a shelf of the New York Class B airspace. A Notice to Airmen (NOTAM 7/4755), issued by the FAA Flight Data Center, was in effect at the time of the incident flight. The NOTAM established a Temporary Flight Restriction (TFR)due to the United Nations General Assembly meeting. The TFR restricted operations within the lateral limits of the New York Class B airspace from the surface up to 17,999 ft msl, and included a prohibition on model aircraft and unmanned aerial systems (UAS).

Additionally, another NOTAM (7/8423) was in effect establishing a VIP Presidential TFR within 30 nautical miles (nm) of Bedminster, New Jersey, from the surface up to 17,999 ft msl, which also included a prohibition on model aircraft and unmanned aerial systems (UAS). The incident sUAS launch point was 30.35 nm from the center of that TFR; Hoffman Island was 29.22 nm from the center point.

DAMAGE TO AIRCRAFT

A 1 1/2-inch dent was found on the leading edge of one of the UH-60's main rotor blades, surrounded by various scratches and material transfer. Some cracks were observed in the composite fairing and window frame material.

The Phantom 4 sUAS was destroyed and several components were lodged in the helicopter.

PERSONNEL INFORMATION

The helicopter flight crew comprised two pilots and two crew chiefs. The pilot-in-command had 1,570 hours of experience in the UH-60, and the co-pilot had 184 hours. The crew reported that they had no previous encounters with sUAS in flight and no outside knowledge or experience with sUAS.

The sUAS pilot stated he was a recreational operator, and that he flew only for enjoyment. He did not hold an FAA Remote Pilot certificate or a manned aircraft pilot certificate. He flew only DJI products, and he did not have experience with conventional radio-control airplanes. He said he had "a lot" of experience with sUAS; the data logs provided by him indicated that he had flown 38 flights in the previous 30 days. He had owned the incident sUAS for about one year and owned a Phantom 3 and another Phantom 4 before purchasing the incident sUAS. Five days after the collision, he purchased a Phantom 4 Pro. He had registered with the FAA as a model aircraft operator during the time period that the registration requirement was in effect. He had taken no specific sUAS training other than the tutorials that are included in the DJI GO4 operating application (app). At the time of the collision, there were no training or certification requirements for hobbyist or modeler pilots.

The pilot said that he was familiar with the area and had flown there many times before. He said that he had flown at night before, and that his sUAS did not have any extra lighting, stating that, "it has four lights."

When asked about specific regulations or guidance for sUAS flights, he stated that he knew to stay away from airports, and was aware there was Class B airspace nearby. He said that he relied on "the app" to tell him if it was OK to fly. He stated he knew that the aircraft should be operated below 400 ft. When asked about TFRs, he said he did not know about them; he would rely on the app, and it did not give any warnings on the evening of the collision. He said he was not familiar with the TFRs for the United Nations meeting and Presidential movement.

When asked, he did not indicate that he was aware of the significance of flying beyond line of sight and again stated that he relied on the app display. He said he did not see or hear the flight of helicopters involved in the collision but said that helicopters fly in the area all the time.

AIRCRAFT INFORMATION

The UH-60M is a four-bladed, twin-engine, medium utility helicopter manufactured by Sikorsky Aircraft. It is widely used by the US military for many missions.

The Phantom 4 is a small unmanned aircraft system of quadcopter configuration, about 13 inches in diameter. It is powered by four electric, brushless motors and a 4-cell, 15.2-volt lithium-polymer battery. The maximum takeoff weight is 3 pounds; maximum altitude is about 19,685 ft msl. Maximum endurance is 28 minutes. Specified maximum range of the remote controller is 3.1 miles. The aircraft is equipped with a GPS/GLONASS navigation system and a flight controller enabling various automated functions. The aircraft is equipped with a 12-megapixel digital camera capable of still or video recording and first-person view display. Aircraft telemetry and video is transmitted to the remote controller in the 2.4 gHz band and displayed on a smartphone or tablet of the pilot's

choice using an app supplied by the manufacturer or various third-party app developers. The pilot used a Samsung tablet with wi-fi but no cellular data capability. He did not use any third-party apps to control the aircraft.

The Phantom 4 includes a feature called Geospatial Environment Online (GEO), which is designed to aid pilots in avoiding certain types of airspace. When available, the pilot receives a message on the control smartphone or tablet advising of the type of airspace and other information. According to DJI:

"GEO provides pilots with up-to-date guidance on areas where flight may be limited by regulation or raise safety concerns. In addition to airport location information, flyers will have real-time access to live information on temporary flight restrictions [and] locations such as prisons, nuclear power plants and other sensitive areas where flying may raise non-aviation security concerns. The GEO system is advisory only. Each user is responsible for checking official sources and determining what laws or regulations might apply to his or her flight."

The GEO system categorizes features into one of four zones: Warning, Enhanced Warning, Authorization, and Restricted zones. Temporary Flight Restrictions are typically coded as Authorization Zones, which appear yellow in the DJI GO4 map. Users will be prompted with a warning and flight is limited by default. A user with appropriate authorization may unlock the Authorization Zone by using a DJI-verified account. This is called "self-unlocking" and can be accomplished before the flight via DJI's website for a period of up to three days, or at the time of flight if the user has an internet connection in the field.

The incident pilot's tablet did not have a cellular data connection, so the GEO system information regarding the TFRs would not download in real time at the takeoff location. In order for the system to have warned the pilot, he would have had to connect to the internet at some point while the TFR was active; however, at the time of the incident, the TFR system within DJI GEO and displayed to customers through DJI GO4 was not active. During August 2017, an issue was identified with the GEO function that inadvertently and intermittently rendered the self-unlock feature for certain TFRs ineffective for some users. After a significant number of complaints about the problem, DJI decided to temporarily disable the TFR functionality in GEO until the feature was investigated and confirmed to be working properly. Therefore, at the time of the incident, no TFR information was available in GEO. Since GEO is meant to be an advisory system to pilots, DJI decided it was better to disable this feature until the problem could be corrected to enable authorized users to support recovery efforts and other authorized missions across the country, including firefighting response and demonstrations at air shows. There was no notice or advisory to users that this advisory function had been disabled. The TFR functionality in GEO was restored in October 2017.

METEOROLOGICAL INFORMATION

The LDJ surface observation at 1915 reported clear skies, 10 miles visibility and light northeasterly winds. Sunset was at 1855 and the end of civil twilight occurred at 1922.

FLIGHT DATA

Flight data was extracted from the incident helicopter's Health and Usage Management System (HUMS) by the Army Combat Readiness Center and provided to the investigation. Altitude and other flight data is cited in the History of Flight section of this report.

The Phantom 4 records full flight parameters on non-volatile memory on board the aircraft. This data was not available to the investigation, as the aircraft flight controller circuit boards were not located, presumably destroyed and in the water. The DJI GO4 app records select telemetry parameters to the pilot's display tablet. The sUAS pilot provided his data logs to the investigation for analysis. Data from the incident flight is cited in the History of Flight section of this report. The logs also included a flight the sUAS pilot made earlier on the evening of the incident, and indicated that he flew toward the Seagate area of western Coney Island, about 1.8 miles from the takeoff point, up to an altitude of 547 ft above takeoff elevation.

WRECKAGE INFORMATION

One motor and a portion of an arm of the sUAS was recovered from the helicopter. Debris was found in the engine oil cooler fan by Army maintenance personnel. The components were transferred by the US Army to a representative of the FAA Teterboro, New Jersey, Flight Standards District Office, then to the NTSB. Manufacturing serial number information inscribed on the motor enabled sales records provided by the manufacturer to aid in identifying the pilot, as the sUAS was purchased directly from the manufacturer. The remainder of the sUAS was not recovered.

ADDITIONAL INFORMATION

The investigation reviewed pertinent regulations and guidance regarding helicopter and sUAS operation.

Helicopter Operating Altitude

14 Code of Federal Regulations (CFR) Part 91.119 states in part:

Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

(c) Over other than congested areas.An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure..(d) Helicopters,. If the operation is conducted without hazard to persons or property on the surface - (1) A helicopter may be operated at less than the minimums prescribed in paragraph (b) or (c).

Statutes, Regulations, and Guidelines applicable to sUAS

Public Law 112-95 section 336(c) (Feb. 14, 2012) defines "model aircraft" as an unmanned aircraft that is:

(1) Capable of sustained flight in the atmosphere;

(2) Flown within visual line of sight of the person operating the aircraft; and

(3) Flown for hobby or recreational purposes.

14 CFR 1.1 (and 101.1) state in part:

Model aircraft means an unmanned aircraft that is:

(2) Flown within visual line of sight of the person operating the aircraft; and

(3) Flown for hobby or recreational purposes.

14 CFR 101.41 states in part:

Applicability.

This subpart prescribes rules governing the operation of a model aircraft that meets all of the following conditions .

(a) The aircraft is flown strictly for hobby or recreational use;

(b) The aircraft is operated in accordance with a community-based set of safety guidelines;.

(d) The aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft.

The Academy of Model Aeronautics (AMA) publishes such safety guidelines. The AMA Safety Code states in part:

9. The pilot of an RC model aircraft shall:

(a) Maintain control during the entire flight, maintaining visual contact without enhancement other than by corrective lenses prescribed for the pilot.

Temporary Flight Restrictions

According to the FAA, TFRs are tools used by the FAA to restrict aircraft operations within designated areas. [In recent] years, TFRs, along with Air Defense Identification Zones and Flight Restriction Zones, have been widely used to restrict overflights through certain airspace for reasons of national security. Two TFRs were in effect in the area and time of the incident, as noted in the History of Flight section above.

Accident Rpt# GAA17CA260	**05/02/2017 1830 CDT**	**Regis# N7118U**	**Olathe, KS**	**Apt: Johnson County Executive OJC**
Acft Mk/Mdl MOONEY M20-E		**Acft SN 360**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING IO360 SER			**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: SMOOTH BLUE INC.		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

1. Takeoff - Fuel starvation

Narrative

The pilot reported that, during the initial climb, about 1000 ft above the ground, he "saw the engine power winding down". He added that he "turned on" the boost pump, checked the magnetos and fuel mixture, and then switched the fuel selector to the other fuel tank. The engine experienced a total loss of power, and subsequently, impacted the ground.

The airplane sustained substantial damage to the fuselage.

The Federal Aviation Administration inspector reported that he traveled to the accident, and while on-site, he observed that the fuel selector knob set screw was loose and the knob was turning freely on the shaft.

The pilot did not submit the NTSB Form 6120.1 Pilot/ Operator Aircraft Accident/ Incident Report.

Accident Rpt# ERA16FA150 04/09/2016 850 EDT	**Regis# N96398**	**Ocala, FL**	**Apt: Ocala Intl-jim Taylor Field OCF**	
Acft Mk/Mdl MOONEY M20K	**Acft SN 25-0531**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR TSIO-360 SER	**Acft TT 2435**	**Fatal 1 Ser Inj 1**	**Flt Conducted Under: FAR 091**	
Opr Name: ROSS A. GRAND	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: STN	

Summary

The commercial pilot and one passenger were departing on runway 36 when the airplane experienced a total loss of engine power about 200 ft above the runway. The pilot announced over the control tower frequency that the engine had lost power and that he intended to land the airplane on runway 26, which was located at the end of and perpendicular to the takeoff runway. According to the passenger and witnesses, the airplane completed a left turn to align with runway 26 before the wings rocked, and it rolled into a 90ø left bank and collided with terrain. The passenger and witness observations were consistent with the pilot failing to maintain sufficient airspeed, which resulted in the airplane's wing exceeding its critical angle of attack and an aerodynamic stall.

Data downloaded from a panel-mounted engine monitoring system revealed parameters consistent with engine idle, run-up, taxi, and full takeoff power application. A sudden decrease in engine rpm and manifold pressure from takeoff power was preceded by a rapid decrease in fuel flow. Examination of the wreckage revealed that both the left and right wing fuel tanks contained fuel and that the fuel selector handle was between the "Left Tank" and "Off" placard positions. The engine was placed in a test cell where it started immediately, accelerated smoothly, and ran continuously without interruption.

Computerized axial tomography imagery revealed that the fuel selector valve was positioned between the "Left Tank" and "Right Tank" detent positions and that all three valve ports were open to each other. The difference between the handle's position according to the placard and its actual position indicated that the placard had been displaced relative to the handle, which likely occurred during the impact. Bench flow testing of the fuel selector valve and dynamic engine run testing revealed that the valve would supply adequate fuel for normal engine in the as-found intermediate position.

The computerized axial tomography imagery, engine data, and testing of the engine and the fuel selector valve revealed no evidence of preimpact anomalies and demonstrated that the system components still functioned as designed after the accident. The fuel flow interruption and the loss of engine power shortly after takeoff were likely due to the pilot inadvertently placing the fuel selector in the "Off" position, which likely occurred when he completed the step in the Before Takeoff checklist that called for the fuel selector to be placed on the fullest tank. It is possible that the pilot inadvertently moved the fuel selector from the "Left Tank" position to the "Off" position instead of moving it from the "Right Tank" position to the "Left Tank" position. After the power loss, the pilot likely moved the fuel selector from "Off" to its intermediate as-found position in an attempt to restore engine power.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's failure to maintain sufficient airspeed following a loss of engine power, which resulted in the airplane exceeding its critical angle of attack and an aerodynamic stall. Contributing to the accident was the pilot's inadvertent placement of the fuel selector in the "Off" position before takeoff, which resulted in fuel starvation and a total loss of engine power.

Events

1. Initial climb - Loss of engine power (total)
2. Emergency descent - Aerodynamic stall/spin
3. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

3. Personnel issues-Action/decision-Action-Incorrect action selection-Pilot - F
4. Aircraft-Fluids/misc hardware-Fluids-Fuel-Fluid management - F

Narrative

HISTORY OF FLIGHT

On April 9, 2016, about 0850 eastern daylight time, a Mooney M20K, N96398, was substantially damaged during a forced landing following a total loss of engine power after takeoff from Ocala International Airport (OCF), Ocala, Florida. The commercial pilot was fatally injured, and the passenger was seriously injured. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which had an intended destination of Lakeland Regional Airport, Lakeland, Florida.

Information from the OCF air traffic control tower revealed that the airplane was cleared for takeoff and began its takeoff roll from runway 36 with about 7,000 ft

of runway available. About 1 minute after the airplane was cleared for takeoff, the pilot announced, "I'm losing my engine. I'm going down on [runway] 26." Runway 26 was located at the end of and perpendicular to the takeoff runway.

The OCF ground controller (GC) was receiving a clearance by telephone when he overheard the pilot's radio call. He estimated that the airplane was north of the tower about 200 to 300 ft above the runway before it turned west. According to the GC, "The wings rocked a little in the turn, but when he lined up with the runway [26] he looked clean. He still looked high, like he might touchdown past midfield and go off the departure end. He looked stable, but then he turned left. The more he turned the steeper the turn got, and then when the wingtip hit the ground the airplane was 90 degrees."

The passenger was interviewed the day after the accident. She stated that she was not a pilot but had flown in the airplane several times. After landing at OCF the day before the accident, the pilot requested a fuel service of 10 gallons per wing, and they then spent the night with family. On the morning of the accident, they boarded the airplane for a flight to the Sun-n-Fun fly-in event. According to the passenger, engine start, taxi, run-up, acceleration, takeoff, and initial climb from runway 36 were "normal."

The passenger said she heard a sudden noise "like a click," and the engine stopped producing power. The pilot announced the loss of power and his plan for the forced landing over the radio. The airplane was north of both runways, and the left turn westbound was "steady" until the airplane was about over runway 26. The wings began "rocking," and the turn continued to the left until the bank angle was 90ø and the left wing struck the ground.

An airport employee said that his attention was drawn to the airplane by a "sputter-cough" sound. Demonstrating what he observed with a model of an airplane, he described a straight-ahead descent, followed by a left turn over runway 26, two "dips" that resembled a porpoising motion, and then a sharp, 90ø left turn to ground contact.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with ratings for airplane single-engine land, rotorcraft-helicopter, and instrument airplane. His most recent Federal Aviation Administration (FAA) third-class medical certificate was issued on February 7, 2014. He reported 1,670 total hours of flight experience on that date.

AIRCRAFT INFORMATION

According to FAA records, the airplane was manufactured in 1981. The maintenance records were not recovered, but a copy of the airplane's most recent annual inspection showed that it was performed on June 10, 2015, at 2,435.2 total aircraft hours.

METEOROLOGICAL INFORMATION

Weather reported at the time of the accident included wind from 010ø at 9 knots, 10 statute miles visibility, clear skies, temperature 14øC, dew point 3øC, and an altimeter setting of 30.15 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane came to rest on the flat, grass surface of the airport infield, and all major components were accounted for at the scene. The wreckage path was oriented 212ø and was about 300 ft long. The airplane came to rest upright. The engine and its mount were separated from the airframe but remained attached by cables and wires. The propeller was separated and located 45 ft down the wreckage path from the first ground scar.

The firewall, instrument panel, and center console were crushed aft in compression and canted about 45ø to the airplane's left. The windshield was destroyed, and the cabin roof was torn spanwise from the door opening to about mid-cabin. The inboard sections of both wings were intact and remained attached to the fuselage. The left wing outboard of the flap was separated by impact. The leading edge of the right wing was crushed aft in compression. Both wing fuel tanks contained fuel.

Control continuity could not be immediately established due to impact damage and the airplane's resting position. As the wreckage was sectioned for recovery, control continuity was established from the cockpit through impact breaks and saw cuts to the flight control surfaces.

The fuel selector handle was found between the "Left Tank" and the "Off" placard positions. Crushed airplane structure surrounded the selector handle and preserved its position at the time of impact.

The engine was rotated by hand through the vacuum pump drive pad. Continuity was established from the accessory section to the valvetrain and powertrain. Compression was confirmed using the thumb method. The turbocharger impeller moved freely when rotated.

MEDICAL AND PATHOLOGICAL INFORMATION

The Medical Examiner for District 5, Leesburg, Florida, performed the autopsy on the pilot and determined the cause of death was blunt chest trauma. The FAA Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing on specimens from the pilot; the testing was negative for alcohol and drugs.

TESTS AND RESEARCH

Engine-Monitoring Instrument Data Download

The airplane was equipped with an Electronics International CGR-30P, panel-mounted instrument that monitored and recorded up to 66 parameters related to engine operations. The device was downloaded in the NTSB Recorders Laboratory.

The data began at 0741:04, at a point consistent with the engine at idle at device power-up, and the parameters continued through what was consistent with taxi, run-up, and eventually takeoff power application at 0751:04. At 0751:28, there was a rapid decrease in fuel flow, and, at 0751:42, there was a decrease in engine rpm and manifold pressure. Subsequently, manifold pressure and rpm stabilized around 14 inches and 1,300, respectively, and remained at these values until the end of the recording.

Engine Examination/Test Run

The engine was examined and test run in Mobile, Alabama, between May 31 and June 2, 2016. During examination and preparation, the crankshaft was sleeved, and the fractured propeller flange was welded back onto the crankshaft. The aft left oil cooler mount/mount leg and the magneto ignition harnesses were replaced due to impact damage. The magnetos remained secured in their mounts, and timing was confirmed at 20ø before top dead center.

The engine starter, Nos. 3 and 5 cylinder intake tubes, and the entire exhaust system were replaced due to impact damage and for compatibility with the engine test cell equipment. The engine's turbocharger and waste gate were intact and installed for the engine test run without modification.

The engine started immediately, accelerated smoothly, and ran continuously without interruption. The engine was run through the manufacturer's entire test run protocol with no anomalies noted. After completion of the test protocols, the engine was accelerated and decelerated rapidly several times between idle and full power. During the accelerations and decelerations, the engine ran smoothly and without interruption.

Fuel Selector Valve Tests

The 3-position fuel selector valve had detents corresponding to "Right Tank," "Left Tank," and "Off." When viewed relative to a clock face, the detents for "Right Tank," "Left Tank," and "Off" were positioned at 2 o'clock, 10 o'clock, and 8 o'clock, respectively.

As previously mentioned, the fuel selector valve handle was found in an intermediate position between the "Off" and "Left Tank" placard positions. Computerized axial tomography scan imagery revealed that the valve handle was positioned between the "Left Tank" and "Right Tank" detent positions and that all three valve ports were open to each other. The difference between the handle's position according to the placard and its actual position was consistent with the valve placard having been displaced relative to the handle.

The valve was placed on a flow bench in its as-found condition. When fuel was drawn through the selector valve at the engine port, fuel was drawn from both the left and the right tank ports simultaneously.

An exemplar Continental TSIO-360GB engine was placed in a test cell, and the engine fuel system was set up and adjusted to factory specifications of unmetered fuel pressure of 45 to 49.5 pounds per square inch (psi). The engine was then stopped, and the test stand fuel system was disconnected.

Fuel was then provided to the engine from an external fuel tank and a fuel system mockup (left tank, right tank, left and right vapor return, engine supply and return lines) through the accident fuel selector valve. The accident fuel selector valve was tested in the as-found position between the left tank and the right tank detent positions.

The engine was primed using the test cell's fuel system, but it was started and run on an external fuel tank that was positioned about wing level. The engine started immediately and ran continuously without interruption to full power of 2,700 rpm and 40 inches of manifold pressure. During the full-power portion of the run, which was between 8 and 10 minutes, the unmetered fuel pressure maintained 49 psi. Engine power was reduced to idle and the engine continued to run normally.

ADDITIONAL INFORMATION

Step two in the Before Takeoff checklist found in the manufacturer's Pilot's Operating Handbook was: "Fuel Selector . FULLEST TANK."

Accident Rpt# GAA17CA352 06/18/2017 830 PDT	**Regis# N4420Z**	**Red Bluff, CA**	**Apt: N/a**	
Acft Mk/Mdl PIPER PA 18-150	**Acft SN 18-8756**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-320-A2B	**Acft TT 2058**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: JASON C. BUNTING, ROSE BUNTING	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: STN	

Events

2. Landing - Loss of control on ground

Narrative

The pilot of the tailwheel-equipped airplane reported that, during the landing roll on a gravel bar in gusting wind, the "tail seemed to pickup from the wind". Subsequently the airplane nosed over.

The airplane sustained substantial damage to the empennage.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

The automated weather observation station located about 6 nautical miles west from the accident site reported that, about 36 minutes before the accident, the wind was from 340ø at 14 knots, gusting 22 knots. The same weather observation station reported that, about 24 minutes after the accident, the wind was from 360ø at 19 knots, gusting 26 knots. The airplane was landing to the north.

Accident Rpt# WPR16FA126	**06/19/2016 1149 PDT**	**Regis# N1270P**	**Hayward, CA**	**Apt: Hayward Executive HWD**
Acft Mk/Mdl PIPER PA 23-150		**Acft SN 23-300**	**Acft Dmg: DESTROYED**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-320 SERIES		**Acft TT 4076**	**Fatal 1 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: PURSEL ROBERT E JR		**Opr dba:**		**Aircraft Fire: GRD**

Summary

After multiple taxi tests of the twin-engine airplane, the airline transport pilot departed on a local personal flight. About 70 minutes later, the airplane was about 10.5 nautical miles southeast of the airport, and the pilot requested a landing clearance. Witnesses heard one of the airplane's engines "backfiring" as the airplane proceeded northwest towards the airport, and the pilot reported to an air traffic controller that he was having trouble with his left engine and could not maintain altitude. The pilot told the controller that he was going to land in a field next to a railroad track, and the airplane then turned about 45ø to the left. A witness about 1/2 mile from the accident site saw the airplane in a wings-level descent for a few seconds before it suddenly rolled into a steep left bank. Security cameras showed the airplane descending with a rapidly increasing left bank angle until it impacted a building, and a postcrash fire erupted.

Postaccident examination of the airplane revealed that the left engine's propeller was feathered, and the left engine-driven fuel pump and carburetor contained trace amounts of water and displayed a white powdery residue, consistent with long term exposure to water contamination. The left wing's inboard and outboard fuel tank caps displayed rust around their circumferences, and the caps did not form a seal when inserted into the fueling portholes, which indicated that both fuel tanks were susceptible to contamination from rain water. Examination of the right engine showed that all four intake camlobes were worn nearly concentric in shape, and the corresponding tappet faces displayed spalling. Worn camlobes can lead to a degradation in engine performance.

The failure of the left wing's fuel cap seals, evidence of water contamination in the fuel system, and the feathered left engine indicate that it is likely the pilot feathered the left engine in response to a power loss resulting from water contamination. Although a witness reported heavy rainfall in the winter that preceded the accident at the airport where the airplane was based, the investigation could not determine when or how water was introduced into the fuel system. The high speed taxi tests conducted by the pilot before the accident flight suggest he may have been aware of a problem with the airplane before departure, but the reason he conducted the taxi tests is unknown.

According to the pilot's logbook, since purchasing the airplane about 10 months before the accident, he had accumulated about 19 hours of flight time in the airplane of which 1.4 hours were in the 90 days preceding the accident. Additionally, the majority of his recent flight experience involved single-engine airplanes, thus the pilot's lack of total and recent experience in the airplane make and model suggest that he may not have been prepared to manage an inflight loss of power in a twin-engine airplane.

Factoring in the reported 11-knot surface wind, radar data indicated that the airplane's airspeed dropped below the airplane's minimum control airspeed with an engine inoperative (Vmc) after it turned into the inoperative engine near the end of the flight and remained there for the remainder of the descent. Therefore, it is likely that the airspeed decayed to the point where the pilot was unable to counteract the asymmetrical thrust produced by the right engine, which led to the rapid left roll seen in the security camera images, further loss of altitude, and impact with the building.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The failure of the left engine due to water contamination and the pilot's subsequent failure to maintain single-engine minimum control airspeed, which resulted in an uncontrolled descent. Contributing to the accident was the pilot's lack of total and recent flight experience in the accident airplane make and model, which reduced his capacity to manage an inflight loss of power.

Events

1. Enroute-descent - Fuel contamination
2. Enroute-descent - Fuel related
3. Enroute-descent - Loss of control in flight
4. Uncontrolled descent - Collision with terr/obj (non-CFIT)
5. Enroute-descent - Loss of engine power (partial)

Findings - Cause/Factor

1. Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
2. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Engine out control-Not attained/maintained - C
3. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Airspeed-Not attained/maintained - C

Narrative

This report was modified on 12/11/17. Please see the docket for this accident to view the original report.

HISTORY OF FLIGHT

On June 19, 2016, about 1149 Pacific daylight time, a Piper PA-23-150, N1270P, was destroyed when it collided with a building following a loss of engine power during an approach to land at Hayward Executive Airport (HWD), Hayward, California. The airline transport pilot was fatally injured. The airplane was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations (CFR) Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the local personal flight that departed HWD about 1035.

Federal Aviation Administration (FAA) air traffic control (ATC) audio captured multiple communications between ATC and the pilot who continuously requested taxi tests on runway 28L over a time span of approximately 2 hours. He did not report any anomalies to the air traffic controller.

FAA radar data showed that the airplane departed HWD to the south, turned east, crossed over a mountain range, and turned north. The airplane maneuvered over the north end of San Francisco Bay, and then flew a reverse course back toward HWD. At 1145:06, when the airplane was about 10.5 nautical miles (nm) southeast of the airport, the pilot contacted the HWD air traffic control tower for a landing clearance. The local controller instructed the pilot to enter a straight in approach for runway 28L and to advise when he was 3 miles from the airport.

At 1147:30, when the airplane was about 6.5 nm from the airport and approaching several grass fields to the right of its flight path, the pilot notified the controller that he was experiencing "difficulty" with his left engine and could not maintain altitude. At the request of the controller, the pilot reported that he was the only person onboard and had about 60 gallons of fuel remaining. Seconds later, the pilot informed the controller that he would "not be able to make it to the airport." The controller then asked the pilot if he saw any landing sites around him. At 1148:51, the pilot informed the controller that he could see a field near a set of Bay Area Rapid Transit (BART) commuter train tracks and would attempt to land there. According to radar and map data, the airplane passed the grass fields to the right of its flight path at about 1148:33, and, seconds later, it turned about 45ø left. As the airplane began its left turn near the end of the flight, the airplane's groundspeed was recorded at 59 knots (about 68 mph) at an altitude of 375 ft mean sea level (msl). The airplane never exceeded this groundspeed during its subsequent descent to impact. Additionally, about 20 seconds before the last radar return, the airplane's groundspeed reached a minimum of 52 knots (60 mph) at an altitude of about 225 ft msl (about 173 ft above ground level).

Three witnesses were interviewed: two who saw the airplane flying inbound to land (witnesses 1 and 2) and one who saw the airplane moments before it impacted the building in the rail yard (witness 3). As shown in Figure 1, Witness 1 was located near the airplane's inbound leg, about 9 nm southeast of HWD. Witness 1 reported that she heard an abnormal sound from inside her home. She went outside and saw an airplane approaching her house from a group of hills located to the east. The airplane appeared to be losing altitude, and the engine made a "sputtering sound," which she also described as "cutting out." The sound repeated when the airplane flew above her property and again seconds later after it passed her home.

Witness 2 was located about 10 miles southeast of HWD near the airplane's outbound leg and about 1 mile south of the airplane's inbound leg. Witness 2 stated that he was working in his yard all morning and initially saw a red and white airplane on a southeast heading about 1,750 ft. He never saw any smoke but heard a sound that resembled an engine "backfiring." The airplane subsequently made a left turn, proceeded eastbound, and disappeared behind a group of hills. About 30 minutes later, he saw the same airplane northeast of his house flying toward the airport. The witness reported hearing sounds like an engine "popping" and "backfiring." He added that he did not see any smoke, foreign object debris, or fluids coming from the airplane, and he further said that the engine "backfiring" sounds were much louder than those he heard during the airplane's outbound leg.

Witness 3 was located about 1/2 mile from the accident site. He saw the airplane flying abnormally low over a group of houses. He reported that the airplane was in a wings level descent for a few seconds before it suddenly entered a steep left turn, with the right wing about 70 degrees to the horizon. The airplane then disappeared behind a residential area. About 10 seconds later he heard a loud impact sound, and, shortly thereafter, plumes of smoke came from the airplane's direction.

Figure 1 - Witness Locations

BART surveillance video showed the airplane in a slight left-wing-low attitude, which gradually increased as the airplane flew across a set of railroad tracks. The forward fuselage and right wing impacted the east wall of a small building. A mist covered the right wing, empennage, and tail as they fell to the ground, and a postcrash fire ensued.

PERSONNEL INFORMATION

The pilot held an airline transport certificate with ratings for airplane multi-engine land and a flight instructor certificate for airplane single-engine land. He held a first-class medical certificate issued on January 13, 2016, at which time he reported 2,161 total flight hours. The medical certificate included one restriction: "must have available glasses for near vision."

According to the pilot's logbook, he had accumulated about 19 hours of total flight time in the accident airplane of which 1.4 hours were in the 90 days preceding the accident. His first flight in the accident airplane took place in August 2015 when he ferried the airplane to California. After the ferry flight, the pilot accrued a total of about 27 additional flight hours in other airplanes and performing flight instruction.

The flight instructor who administered the pilot's most recent flight review reported that the flight review was conducted in March 2015 in the pilot's BE60 airplane and included two simulated left engine failures. The first simulated engine failure took place during an instrument landing system approach, and the pilot completed the engine out procedure and continued the approach successfully. The instructor noted that, during the simulated engine failure, the pilot's yaw control was "good" and that the airplane's descent was "smooth and right on." A subsequent simulated engine failure took place at 5,000 ft when the flight instructor reduced the left engine manifold pressure to 13 inches. He then asked the pilot to complete a 45ø turn and hold his altitude, but the airplane was unable to maintain altitude due to the combination of a low power setting and a higher-than-standard rate turn. During both simulated engine failures, the pilot successfully kept the airspeed above the airplane's minimum controllable airspeed (Vmc).

AIRCRAFT INFORMATION

According to FAA records, the airplane was manufactured in 1955 and registered to the pilot on September 2, 2015. The airplane was powered by two Lycoming O-320-A, normally-aspirated, direct-drive, air-cooled, 150-horsepower engines. The pilot's family furnished the original aircraft logbooks, which included service information from May 1986 to July 2015. A review of the logbooks revealed that the airplane's most recent 100-hour inspection was completed on July 15, 2015, at which time the left engine tachometer read 4,051 flight hours, and the right engine tachometer read 4,059 flight hours.

According to the logbooks, at the time of the most recent 100-hour inspection, the left and right engines had accumulated about 1,955 hours and 1,957 hours, respectively, since their most recent major overhauls. Records of the left and right engine overhauls could not be located in the available aircraft records, and the dates of the overhauls could not be determined.

The airplane total time at the time of the accident was estimated using the right engine tachometer time as the airplane's recording hour meter was not recovered. Based on the pilot's approximate 19 hours of accumulated time in the airplane make and model, the airplane's total time at the time of the accident was estimated to be about 4,077 hours.

Records furnished by a fixed base operator at HWD indicated that the pilot had purchased fuel from their self-service facility 11 times in the previous 10 months. The records showed that the pilot did not purchase fuel at HWD on the day of the accident; they showed that he last purchased fuel for the airplane at HWD in September 2015.

The pilot's logbook showed that he flew the airplane to Nut Tree Airport (VCB), Vacaville, California on May 1, 2016. VCB refueling records indicated that the pilot purchased about 15 gallons of 100LL gasoline that day. Before that, the pilot had purchased about 28 gallons of 100LL gasoline at VCB on September 27, 2015.

A procedure to feather the propeller of an inoperative engine was included in the airplane's aeronautical flight manual (AFM). According to the AFM, the procedure included the following steps:

1. Throttle "CLOSED".

2. Prop Control "FEATHERED". PROP CANNOT BE FEATHERED UNDER 700 RPM.

3. Mixture control "IDLE CUT-OFF".

4. Ignition switches "OFF".

5. Electric fuel pump (if in use) "OFF".

6. Main valve "OFF".

The manufacturer's published Vmc for the airplane is 85 mph.

METEOROLOGICAL INFORMATION

The 1152 recorded weather observation at HWD included wind 280ø true at 11 knots, visibility 10 statute miles, clear skies, temperature 27øC, dew point 8øC, and an altimeter setting of 30.06 inches of mercury.

According to an employee of a fixed base operator at HWD, the airport received significant levels of rain during the winter of 2016 that resulted in an overflow of the airport's drainage ditch. However, the investigation was unable to determine whether the airplane was parked outside during the winter of 2016.

WRECKAGE AND IMPACT INFORMATION

Initial examination of the accident site by the National Transportation Safety Board investigator-in-charge revealed that the airplane came to rest at the base of a fiberglass railroad car wash building, about 5 nm southeast of HWD. All major structural components of the airplane were accounted for at the accident site, which was contained within an area about 35 ft long and 25 ft wide. The fuselage came to rest inverted on a heading of 095ø magnetic and was destroyed by fire. With the exception of some thermal damage, the empennage was intact and remained connected to the fuselage by the airplane's rudder control cables. The right wing was destroyed by fire, and its corresponding engine was inverted and covered in soot. The left wing was co-located with the main wreckage in a near vertical position, at rest against the southeastern end of the building, and exhibited an odor of fuel near the left wingtip. Both sets of propeller blades remained attached to their respective hubs; the left engine propeller blades were in the feathered position and did not display any damage. The right engine propeller blades were in a low pitch position and displayed nicks, gouges, and tip curling.

Left aileron control continuity was confirmed from the left aileron bell crank to the wing root where the cables had been cut by recovery personnel. The rubber seal to the inboard left tank fuel cap was rusted, and the cap did not form a seal inside the fuel tank ring when installed. The fuel cap rubber seal to the left outboard tank displayed some corrosion and did not form a seal when installed in the fuel tank ring. The left fuel selector valve displayed 3/4 inches of space between the lever and the valve. According to the manufacturer, this position was consistent with an auxiliary tank setting. A trace amount of fuel was drained from the left engine gascolator into a plastic container that had been cleaned and dried. The fuel odor and appearance resembled 100LL aviation grade gasoline; however, a SAR-GEL fuel purity test indicated that the fuel was contaminated with water. The left electric fuel boost pump was not recovered.

The right wing aileron bell crank was damaged by fire but remained intact and attached to the primary aileron and balance cables. The right aileron cable was continuous from the bell crank to the chain, which had fracture signatures consistent with overload separation.

The right electric fuel boost pump was disassembled, and the gasket and internal components displayed carbon coloring consistent with exposure to fire. The pump was void of fuel, and the fuel screen was found free of debris.

One arm from the control T-bar assembly separated at the T-section, and the assembly was damaged by fire; however, the remaining three sprockets were

intact. A portion of elevator control tube remained attached to the tube stem.

Continuity of the rudder assembly was traced from the rudder torque tube through a control cable located on the right side of the airplane to the rudder flight control surface. A rudder control cable on the opposing side was traced from the rudder to the cockpit; however, the cable had separated from the torque tube arm, which had separated from the torque tube.

The flap actuator measured about 20 inches, which was consistent with partial deployment of the flaps. According to the airplane manufacturer, an actuator measurement of 18.35 inches corresponds to a full flap extended position and 25.50 inches corresponds to a full flap retracted position. While the flap actuator rod displayed significant fire damage on the fore and aft ends, the intermediate section was shiny in appearance with only some blue discoloration.

Elevator continuity was traced from the elevators to a fractured control tube near the aft fuselage.

The rudder trim jackscrew displayed about 1 inch of exposed threads. According to the manufacturer, this measurement was consistent with a neutral trim position.

The elevator trim displayed about 17 threads, which correlated to a near full nose-up trim position. However, the elevator trim cables were loosely fixed to the trim drum, which indicated that the trim jackscrew may have moved during the accident sequence.

Left Engine

Mechanical continuity of the left engine was confirmed from the propeller throughout the valve train to the accessory section when the propeller was rotated by hand. Thumb compression and suction were established on each of the engine's four cylinders, and the valve train moved in the proper firing order. An examination of each cylinder's internal combustion chamber revealed no evidence of foreign object ingestion or detonation.

A magneto synchronizer confirmed the magneto breaker points opened at 25ø below top dead center. Both the left and right magnetos were timed within 1ø of each other. The magnetos were then removed from their respective mounting pads to facilitate a magneto examination. Hand rotation of each drive produced spark at each of the four plug leads.

The top and bottom spark plugs were secured in their respective positions and undamaged. The plugs were oil-soaked, but displayed coloration consistent with normal operation as shown on the Champion Spark Plug "Check-A-Plug" chart AV-27. The static oil soaking of the spark plugs was attributed to the engine positioning at the mishap site and post recovery.

The carburetor was attached to the engine accessory case at the mounting flange, and the throttle/mixture controls were secured to their respective controls arms at the carburetor. The carburetor fuel screen was free of debris, and the carburetor floats were intact. Trace amounts of residual fuel were discovered in the carburetor fuel bowl and in the accelerator pump. A subsequent SAR-GEL water indicating paste test confirmed the presence of water contamination in both cavities. A white powdery residue was observed on the accelerator pump plunger, consistent with corrosion.

Disassembly of the left engine-driven fuel pump revealed trace amounts of residual fuel, which exhibited an odor and appearance that resembled 100LL aviation gasoline. A subsequent SAR-GEL test indicated that the pump had been contaminated by water. The internal chambers to the fuel pump exhibited significant corrosion signatures consistent with long term exposure to water. Additionally, the pump valves and backing plate displayed a white powdery substance consistent with corrosion.

Right Engine

The right engine and accessories displayed significant fire damage. Mechanical continuity of the engine was established from the crankshaft through the valve train to the accessory section when the propeller was rotated by hand. Thumb compression and suction was achieved for each cylinder; however, a borescope inspection revealed that the intake valve rocker arm for each cylinder displayed little movement as the valve train was rotated. The exhaust rocker arms moved normally, and the pushrods did not exhibit any bending.

An internal examination was achieved by drilling holes through the top of the engine case material in-line with the rotational plane of each connecting rod.

Subsequent inspection of the camshaft with a lighted borescope revealed that the intake camlobes for cylinder Nos. 3 and 4 were concentric in shape, consistent with long term wear. The intake camlobes for cylinder Nos. 1 and 2 were worn down about 90% and formed nearly concentric shapes. The corresponding tappet faces displayed significant spalling. Lycoming Engines Mandatory Service Bulletin SB301B provides guidance for maintenance and service limitations for valves. In particular Paragraph 1(b) states "Rotate the engine by hand and check to determine that all cylinders have normal lift and that rockers arms operate normally" a 400 hour inspection interval. The logbooks did not contain any record of a camshaft lobe inspection, camshaft replacement or compliance with this MSB.

Lycoming Engines Mandatory Service Bulletin SB480E provides guidance when inspecting oil system screens and filters for contamination during inspection cycles.

Both magnetos remained attached to their respective mounting pads. Due to thermal damage, magneto-to-engine timing could not be established, and the magnetos could not be functionally tested.

The top spark plugs were secured in their respective positions and had been thermally damaged. Ground electrode wear could not be determined as each plug displayed a varying amount of coloration due to the thermal effects of the postimpact fire.

MEDICAL AND PATHOLOGICAL INFORMATION

The Alameda County Sheriff's Office, Oakland, California performed an autopsy on the pilot. The autopsy report indicated the cause of death was "extensive blunt trauma."

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens recovered from the pilot. A carboxyhemoglobin saturation test revealed no evidence of carbon monoxide in the pilot's cavity blood. The pilot's toxicology results were negative for ethanol and positive for ibuprofen in his urine.

ADDITIONAL INFORMATION

According to the FAA's Airplane Flying Handbook, Vmc is defined as the "minimum control speed with the critical engine inoperative" and is marked with a red radial line on most airspeed indicators. It is the minimum speed at which directional control can be maintained under a specific set of circumstances outlined in 14 CFR Part 23, Airworthiness Standards.

The handbook explains that engine inoperative flight with wings level and ball centered requires large rudder input towards the operative engine. The result is a moderate sideslip towards the inoperative engine, which reduces climb performance. With wings level, Vmc will be significantly higher than published as there is no horizontal component of lift available to help the rudder combat asymmetrical thrust. The handbook further remarks that a single engine failure in a twin-engine airplane will result in "high drag, large control surface deflections required, and rudder and fin opposition due to sideslip."

Accident Rpt# CEN16FA212	**06/09/2016 1521 CDT**	**Regis# N6223W**	**Wishek, ND**	**Apt: Wishek Muni 6L5**
Acft Mk/Mdl PIPER PA 28-140		**Acft SN 28-20264**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-320 SERIES		**Acft TT 3459**	**Fatal 3 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: CHEROKEE FLYING CLUB		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

1. Initial climb - Loss of control in flight

Narrative

HISTORY OF FLIGHT

On June 9, 2016, about 1521 central daylight time, a Piper PA-28-140 airplane, N6223W, impacted a lake while departing from Wishek Municipal Airport (6L5), Wishek, North Dakota. The pilot and two passengers were fatally injured, and the airplane was substantially damaged. The airplane was registered to the Cherokee Flying Club and operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Day visual meteorological conditions existed at the time of the accident. The personal flight departed without a flight plan and was destined for Bismarck Municipal Airport (BIS), Bismarck, North Dakota.

According to the pilot's parents, the pilot was flying his aunt and cousin to Bismarck so that his cousin could receive urgent dental care. The pilot was a member of the flying club that owned the airplane. Another member of the club, who spoke with the pilot about 10 minutes before the airplane's departure, reported that he thought that the pilot and passengers were rushing as they prepared to leave. A witness located on the airport ramp saw the airplane depart on runway 14 and climb out with a nose-high attitude. According to the witness, after entering a right turn, the airplane rapidly pitched down to a nose-low attitude.

Downloaded data from a portable GPS navigation device found in the airplane revealed that the airplane made a right turn after takeoff at 160 ft above ground level and 48 knots groundspeed. The right turn continued for the next 20 seconds during which time the airplane climbed about 30 ft and its groundspeed was between 53 and 59 knots. During the next 8 seconds, the airplane rapidly descended about 200 ft and impacted a lake about 1/2 mile southwest of the airport.

PERSONNEL INFORMATION

The pilot, age 20, held a private pilot certificate with an airplane single-engine land rating, which was issued on November 9, 2015. On July 22, 2015, the pilot was issued a third class medical certificate with no restrictions. According to an insurance application dated January 12, 2016, the pilot had accumulated 55 total flight hours of which 17 hours were in the accident airplane. The flying club member who spoke with the pilot before the flight stated that the pilot had flown the airplane a few times since returning from college in mid-May, including a flight on the evening before the accident. The pilot's logbook was not available for review.

AIRCRAFT INFORMATION

The airplane was manufactured in 1964 and was equipped with a Lycoming O-320-E3D engine and a Sensenich two-blade, all-metal propeller. On April 1, 2016, the airplane underwent an annual inspection at an airframe total time of 3,459 hours and 1,235 hours since the engine had last been overhauled. The accident occurred about 21 hours after this inspection. The airplane was equipped with a red stall warning light on the instrument panel but was not equipped with a stall warning horn.

The flaps-retracted stall speeds listed in the airplane's flight manual were 64 mph (calibrated airspeed) at 0ø of bank and 73 mph (calibrated airspeed) at 40ø of bank, which equates to 56 knots at 0ø of bank and 64 knots at 40ø of bank. These stall speeds were based on a maximum gross weight of 2,150 pounds. At the time of the accident, the airplane's weight was estimated to be about 300 pounds less than maximum gross weight.

WEATHER INFORMATION

At 1552, the weather observation station at BIS, located about 60 miles northwest of the accident site, reported the following conditions: wind 160ø at 6 knots, 10 miles visibility, clear skies, temperature 33øC, dew point 15øC, and altimeter setting 29.67 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

Examination of the airplane at the accident site revealed that the airplane came to rest in a nose-down attitude in about 4 ft of water. The damage to the airplane was consistent with a near-vertical descent with a low forward velocity at impact. Following recovery from the lake, the airplane and engine were examined in a nearby hangar. Both wings were intact and remained attached to the fuselage by the main wing spars. The main landing gear assemblies were attached to their respective wings, and both wing flaps were retracted.

The flight control surfaces remained attached to their respective airframe surfaces. No anomalies were noted with the flight control system. Stabilator and aileron control continuity were established from the respective controls to the "T" bar chain. Stabilator trim continuity was established from the trim tab to the trim crank handle in the overhead panel, and the stabilator trim barrel indicated a neutral trim setting. Rudder control continuity was established from the rudder to the rudder pedal assembly.

Both fuel tank caps were installed, and both fuel tank vents were found clear of debris. The fuel selector valve was in the right-wing fuel tank position. A functional check of the fuel selector valve, using low pressure air, revealed that the valve was functional. The fuel pump operated normally when hand rotated, and the carburetor was disassembled and no anomalies were noted.

The propeller remained attached to the engine, and the spinner was attached to the spinner bulkhead and crushed aft. The propeller blades were minimally damaged with one blade having minor abrasions on the leading edge of its tip.

The top Champion REM40E sparkplugs were removed from the cylinders. All displayed a normal worn condition when compared to the Champion Aviation Service Manual (AV6-R). After cleaning with compressed air and contact cleaner, both magnetos sparked normally at all leads during rotation.

The four cylinders remained attached to the crankcase. The rocker covers were removed, and no preaccident anomalies were noted with the rockers, rocker shafts, or valve springs. A borescope inspection of the four cylinders revealed no anomalies with the pistons, cylinder barrels, cylinder heads, valves, or valve seats.

The engine exhaust system was found impact damaged; however, the heat muff was intact with no significant cracks or exhaust erosion. Examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

MEDICAL AND PATHOLOGICAL INFORMATION

On June 10, 2016, the North Dakota Department of Health medical examiner in Bismarck, North Dakota performed an autopsy on the pilot. The cause of death was blunt force injuries with drowning. The FAA's Civil Aeromedical Institute in Oklahoma City, Oklahoma performed toxicology tests on the pilot. The results were negative for all tests conducted.

TESTS AND RESEARCH

The portable GPS navigation device found in the airplane, a Garmin Aera 560, was recovered from the accident site and evaluated by the NTSB Recorder Laboratory. For further details, see the GPS Factual Report in the public docket for this investigation.

Accident Rpt# ANC17FA010 12/07/2016 935 AKS	**Regis# N8648N**	**Port Alsworth, AK**	**Apt: Port Alsworth TPO**
Acft Mk/Mdl PIPER PA 28-180-180	**Acft SN 28-7105149**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-360-A4A	**Acft TT 2153**	**Fatal 4 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: KYLE LONGERBEAM	**Opr dba:**		**Aircraft Fire: UNK**

Summary

The non-instrument-rated private pilot and three passengers departed from an airport along a lakefront in an airplane not equipped or certified for flight into known icing conditions. A couple of minutes after the airplane departed, a pilot who was descending to land at the departure airport spoke with the accident pilot. The pilot of the descending airplane told the accident pilot that the tops of the clouds were about 2,000 ft. The accident pilot replied, "looking good under here, I'm gonna keep going." No further radio transmissions were received from the accident pilot. When the airplane failed to arrive at its intended destination, a search was launched. The day following the accident, airplane debris and personal items that were positively identified as belonging to the occupants of the airplane were found floating on the surface of the lake. The debris indicated that the airplane impacted the surface of the lake. Despite an extensive search, neither the occupants nor the airplane have been recovered, and, due to the depth of the lake, a recovery mission is unlikely.

Weather camera images, surface weather observations, and upper air observations indicated that the weather conditions at the time of the accident likely included freezing fog and mist, low visibilities and ceilings, and moderate or greater icing conditions in the clouds covering the accident area. Therefore, the accident flight likely encountered instrument meteorological conditions shortly after departure and rapidly began accumulating structural and/or induction icing. However, because the airplane was not available for examination by investigators, the possibility of mechanical failure or malfunction could not be ruled out.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: Undetermined due to a lack of physical evidence.

Events

1. Enroute - Unknown or undetermined

Findings - Cause/Factor

Narrative

HISTORY OF FLIGHT

On December 7, 2016, about 0935 Alaska standard time, a wheel-equipped Piper PA-28-180 airplane, N8648N, impacted the open waters of Lake Clark shortly after takeoff from the Port Alsworth Airport (PALJ), Port Alsworth, Alaska. The noninstrument-rated private pilot and three passengers are missing and presumed to have sustained fatal injuries. The airplane was not recovered and is presumed to have sustained substantial damage. The airplane was registered to a private individual in Port Alsworth, and the pilot had rented the airplane for the 14 Code of Federal Regulations Part 91 visual flight rules cross-country personal flight. Visual meteorological conditions prevailed at the airplane's point of departure, but instrument meteorological conditions were reported along the flight's anticipated route. The flight departed PALJ about 0930 with a destination of Merrill Field Airport (PAMR), Anchorage, Alaska. No flight plan was filed for the flight.

During a telephone conversation with a National Transportation Safety Board (NTSB) investigator on December 8, a friend of the pilot and passengers reported that the three passengers were part of a family traveling to Anchorage to meet up with other family members. They were originally scheduled to travel on a scheduled air carrier flight on the day of the accident, but canceled their reservations and elected to fly to Anchorage with the pilot instead. Another family member departed for Anchorage aboard the scheduled air carrier flight.

A pilot who was completing a flight from Anchorage to PALJ about the time of the accident reported speaking with the accident pilot a couple minutes after the accident airplane departed from PALJ. He told the accident pilot that the tops of the clouds were about 2,000 ft and that, from his perspective, it looked open at Miller Valley, which is located about 10 miles northeast of PALJ along the northern shore of Lake Clark. The accident pilot replied, "looking good under here, I'm gonna keep going." No further radio transmissions were received from the accident pilot.

When the airplane failed to arrive in Anchorage, family members and friends of the passengers reported the airplane overdue. An alert notice was issued by the Federal Aviation Administration (FAA) at 1501 on December 7, and an extensive search was launched. According to the airplane's owner, the airplane was equipped with a 406 MHz emergency transmitter locator, but no signal was received by search personnel.

On December 8, about 1530, searchers located personal items floating about 11 miles northeast of the airport in Lake Clark that were later positively identified as belonging to the occupants of the airplane. Also recovered were three airplane landing gear wheel assemblies, a co-pilot (right side) seat, and cargo from the airplane. The rest of the airplane was not located, and it is presumed to have sunk in Lake Clark.

The official search was suspended by the Lake Clark National Park and Preserve and the Alaska State Troopers on December 12, 2016. Family friends and volunteers continued to search for the missing airplane.

PERSONNEL INFORMATION

The pilot, age 25, held a private pilot certificate with an airplane single-engine land rating. His most recent third class medical certificate was issued on February 1, 2013, and contained the limitation, "must wear corrective lenses."

A logbook belonging to the pilot was recovered from the waters of Lake Clark during the search for the airplane. The last entry, dated November 9, 2016, was for a flight in the accident airplane. The total flight time listed in the logbook was 257.2 hours.

AIRCRAFT INFORMATION

The airplane was manufactured in 1971 and equipped with a Lycoming O-360 series engine. The airplane was not equipped or certified for flight into known icing conditions. No airframe or engine logbooks were located for the accident airplane.

METEOROLOGICAL INFORMATION

The closest official weather station was at PALJ, located about 8 miles southwest of the accident site. PALJ used Aviation Paid Weather Observers (A-Paid) who are individuals trained by the National Weather Service and/or the FAA and stationed in locations where the NWS has determined that it is necessary to take weather observations to help provide NWS forecast responsibilities. A-Paid observers are certified by the NWS to take surface observations (that is, hourly reports of temperature, dew point, estimated cloud cover, estimated visibility, pressure, weather, and wind direction and speed) using equipment provided by the NWS. These observers are compensated for their work on a per-observation basis. Between December 5 and December 7, there were a total of four observations taken by the A-Paid observer at PALJ. The only observation from the day of the accident was timestamped 1459 and stated in part: wind from 140ø at 5 knots, 7 miles visibility, overcast ceiling at 500 ft above ground level (agl), temperature 3øF, dew point 0øF, and altimeter setting 30.18 inches of mercury.

Iliamna Airport (PAIL), Iliamna, Alaska, was the next closest official weather station, located 40 miles southwest of the accident site. PAIL had an Automated Surface Observing System (ASOS); the reports were supplemented by air traffic controllers.

At 0911, a METAR from PAIL reported in part: wind from 360ø at 13 knots with gusts to 23 knots, 10 miles visibility, overcast ceiling at 1,100 ft agl, temperature of -3øC, dew point temperature of 1øF, and an altimeter setting of 30.17 inches of mercury.

At 0953, a METAR from PAIL reported in part: wind from 360ø at 16 knots with gusts to 22 knots, 10 miles visibility, overcast ceiling at 1,200 ft agl, temperature of -3øF, dew point temperature of 1øF, and an altimeter setting of 30.16 inches of mercury.

The FAA had a weather camera at Lake Clark Pass located about 8 miles east-northeast of the accident site that took images facing the accident location. The reference image provided by the FAA for interpreting the weather camera's images is shown in Figure 1.

The image shown in Figure 2 was taken at 0941. Although slightly dark due to the sun not rising until 1007 (about 32 minutes after the accident occurred), the visibility can still be distinguished as limited.

The image shown in Figure 3 was taken at 0951 and more clearly shows the limited visibility.

The closest official upper air sounding to the accident site was from King Salmon, Alaska, (PAKN), located 124 miles southwest of the accident site at an elevation of 46 feet.

The 0300 PAKN sounding indicated a conditionally unstable layer between the surface and 750 feet with a stable layer from 750 feet through 3,250 feet. An inversion (increase in temperature with height) was located immediately above the surface to 2,488 feet and this inversion would have kept any clouds that formed below the inversion in place if the background wind environment was relatively light. With the relative humidity greater than 80% from the surface to 10,000 feet, the complete Rawinsonde Observation program (RAOB) indicated that clouds were likely from the surface through 10,000 feet. Moderate or greater icing conditions were indicated by RAOB in the cloud cover between 750 feet and 6,500 feet. A detailed meteorology study is located in the public docket for this accident.

WRECKAGE AND IMPACT INFORMATION

The airplane is presumed to have sustained substantial damage during impact with the open waters of Lake Clark shortly after takeoff. Due to the depth of the lake, about 500 ft in some locations, there are no search and recovery efforts planned at the time of this report.

MEDICAL AND PATHOLOGICAL INFORMATION

To date, the remains of the pilot have not been located; therefore, no pathological or toxicology information exists. At the time of his last medical examination, the pilot reported no medical concerns, and no significant issues were identified by the aviation medical examiner.

Accident Rpt# ERA16FA257 07/16/2016 1845 EDT	**Regis# N2241Q**	**Esperance, NY**	**Apt: Hogan NY05**	
Acft Mk/Mdl PIPER PA 28R-201-201	**Acft SN 28R-7737029**	**Acft Dmg: DESTROYED**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl LYCOMING IO-360-C1C6	**Acft TT 6574**	**Fatal 3 Ser Inj 1**	**Flt Conducted Under: FAR 091**	
Opr Name: A AND N COMPANY INC	**Opr dba:**		**Aircraft Fire: GRD**	
			AW Cert: STN	

Summary

The private pilot and three passengers departed in the airplane from a 3,000-ft-long runway with a density altitude of about 3,000 ft and a light wind. Surveillance video showed that the airplane did not use the entire length of the runway for takeoff; the pilot began his takeoff roll where the paved section of the part turf/part asphalt runway began, resulting in 2,400 ft of available runway. During the ground roll, the nose of the airplane lifted off and then settled back onto the runway, and the airplane became airborne at 1,500 ft. Witnesses described the takeoff and initial climb as "slow" and "sluggish." The wings rocked, and the airplane climbed to about 100 ft in a continuous left turn before descending into trees 1,000 ft left of the runway centerline.

Examination of the airplane and its engine revealed no evidence of preimpact mechanical malfunction or anomaly. An estimate of the airplane's takeoff weight indicated that it was about 66 lbs over the maximum allowable takeoff weight of 2,750 pounds. Review of performance charts revealed that the takeoff ground roll distance for the airplane at the maximum allowable gross weight was about 2,180 ft. Review of radar data showed that from rotation to the final radar target, the airplane's groundspeed (which was about the same as its airspeed given the light wind) varied between 61 and 67 knots, which was about the airplane's calculated stall speed of 60 knots. Further, the witness observations were consistent with the pilot failing to attain sufficient airspeed, which resulted in the airplane's wing exceeding its critical angle of attack and an aerodynamic stall.

It is likely that the pilot lifted off prematurely at a speed lower than normal and was unable to accelerate or climb the airplane once it exited ground effect. A premature liftoff and a climb attempt at a speed significantly below best angle of climb speed (78 knots) placed the airplane in a situation where the power required for level flight was very near or exceeded the available power. To recover from this situation the pilot needed to lower the airplane's nose in order to accelerate the airplane to obtain a positive rate of climb. However, such an action is counterintuitive when low to the ground and requires accurate problem recognition, knowledge of the correct solution, and sufficient terrain clearance to accomplish.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's inadequate preflight weight and balance and performance planning, which resulted in the airplane being over gross weight. Also causal were the pilot's decision not to use the entire runway for takeoff, his premature liftoff, and his failure to attain adequate airspeed, which resulted in the airplane exceeding its critical angle of attack and an aerodynamic stall.

Events

1. Initial climb - Collision with terr/obj (non-CFIT)
2. Initial climb - Collision during takeoff/land

Findings - Cause/Factor

1. Personnel issues-Task performance-Planning/preparation-Performance calculations-Pilot - C
2. Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
3. Aircraft-Aircraft oper/perf/capability-Aircraft capability-Maximum weight-Capability exceeded - C
4. Personnel issues-Action/decision-Info processing/decision-Decision making/judgment-Pilot - C
5. Aircraft-Aircraft oper/perf/capability-Aircraft capability-Takeoff distance-Not attained/maintained - C
6. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Airspeed-Not attained/maintained - C
7. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Angle of attack-Capability exceeded - C
8. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Climb rate-Not attained/maintained - C
9. Personnel issues-Action/decision-Action-Incorrect action performance-Pilot - C

Narrative

HISTORY OF FLIGHT

On July 16, 2016, about 1845 eastern daylight time, a Piper PA-28R-201, N2241Q, collided with terrain after takeoff from Hogan Airport (NY05), Esperance, New York. The private pilot was seriously injured, the three passengers were fatally injured, and the airplane was destroyed. No flight plan was filed for the personal flight conducted under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed for the flight that originated

at NY05 and was destined for Tweed-New Haven Airport (HVN), New Haven, Connecticut.

According to a fixed base operator at HVN, on the day of the accident, the airplane was fueled with 14 gallons of 100LL aviation fuel, which brought the fuel level to "just above the tabs." The pilot then flew the airplane with the three passengers onboard from HVN to NY05. According to witnesses, the pilot and passengers attended a party at NY05. A witness reported that the accident airplane was the last of a group of airplanes to depart from NY05 and that another pilot had suggested to the accident pilot that he depart on runway 12L. A review of surveillance video revealed that the airplane took off on runway 30R, which was 3,000 ft long; the first 600 ft and the final 400 ft of runway 30R were turf, and middle 2,000 ft was asphalt. The surveillance video showed that the pilot began the takeoff roll where the paved section of the runway began (with 2,400 ft of available runway). During the takeoff roll, the nosewheel of the airplane lifted off and then settled back onto the runway. The nosewheel lifted again, and the airplane became airborne with about 900 ft of runway remaining.

Several witnesses observed the airplane's takeoff from runway 30R. They consistently described the airplane's takeoff as "slow" and "sluggish" and reported that it entered a "gentle" left turn immediately after takeoff. One witness stated that the airplane attempted to rotate earlier than the other airplanes that were departing that day. When the airplane became airborne, "the nose was pitched so high that the wings wallowed;" the witness then reached for his phone to dial 911. The airplane overflew a hangar located left of the departure end of the runway at a low altitude as it continued its left turn before descending into trees. Another witness stated that "the airplane was under full power the entire time. The engine did not fail."

Due to his injuries, the pilot was not interviewed. In a written statement, the pilot reported that he had "no personal recollection of the subject flight."

Radar track data obtained from the Federal Aviation Administration (FAA) depicted the airplane in a left turn after takeoff. The airplane climbed to about 100 ft above ground level, and its groundspeed ranged between 58 and 67 knots from takeoff to the final radar target. The radar track ended about 100 ft beyond the departure end of the runway and about 1,000 ft left of the runway centerline.

PERSONNEL INFORMATION

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. He was issued a third-class medical certificate on May 1, 2015. The pilot reported about 561 total hours of flight experience. The pilot's logbooks were not recovered and no determination could be made of his flight experience in the accident airplane make and model.

AIRCRAFT INFORMATION

The four-seat, low-wing, retractable-gear airplane was manufactured in 1977. It was powered by a 200-horsepower Lycoming IO-360 engine driving a McCauley two-blade, constant-speed propeller.

The airplane's most recent annual inspection was completed on March 1, 2016, at 6,573.6 total aircraft hours.

The airplane's weight and balance condition at the time of takeoff was calculated based on the estimated fuel onboard the airplane and the estimated weights of the passengers. According to the information provided by the fixed base operator at HVN, the airplane departed HVN with about 25 gallons or about 300 lbs of usable fuel. Fuel burn from HVN to NY05 was estimated to be about 8 gallons or 48 lbs.

The airplane's takeoff weight at NY05 was calculated to be 2,816.5 lbs, which was 66.5 lbs above the maximum allowable gross weight of 2,750 lbs. There are no performance charts for any weight above the maximum gross weight.

The performance charts indicated that at the airplane's maximum allowable gross weight, the estimated takeoff ground roll was 2,180 ft and the total distance to clear a 50-ft obstacle was 2,750 ft.

According to the pilot's operating handbook for the airplane, the rotation speed for a normal takeoff was between 65 and 75 knots indicated airspeed (KIAS). With a flap setting of 25ø, the rotation speed for a short-field takeoff was between 50 and 60 KIAS. After liftoff, the pilot was to increase airspeed to 55 to 65 KIAS.

There are no performance charts or procedures for a 10ø flap setting during takeoff. The performance charts do not consider the effects of a grass runway

surface on takeoff and landing performance.

The gross weight stalling speed with power off and full flaps is 55 KIAS, and, with flaps up, this speed is increased 5 knots. Loss of altitude during stall can be as great as 400 ft depending on configuration and power. The manufacturer did not publish power-on stall speeds for the airplane. The best rate of climb speed at gross weight is 90 KIAS, and the best angle of climb speed is 78 KIAS.

METEOROLOGICAL INFORMATION

At 1851, the weather reported at Albany International Airport (ALB), Albany, New York, located about 23 nautical miles east of the accident site, included wind from 030ø at 3 knots, visibility 10 statute miles; few clouds at 5,000 ft, scattered clouds at 11,000 ft, broken clouds at 22,000 ft, overcast at 25,000 ft; temperature 27øC; dew point 16øC; and altimeter 30.04 inches of mercury. The calculated density altitude at NY05 was about 3,000 ft.

The density altitude at HVN when the airplane departed at 1845 was 1,971 ft.

AIRPORT INFORMATION

NY05 was a private-use airport at 1,260 ft elevation, configured with two parallel runways, each of which was 3,000 ft long. Runway 12R/30L was a turf runway, and runway 12L/30R combined both asphalt and turf surfaces.

The elevation of HVN was 12.4 ft. HVN is equipped with two asphalt runways; runway 2/20 is 5600 ft long, and runway 14/32 is 3,626 ft long.

WRECKAGE AND IMPACT INFORMATION

The airplane came to rest in swampy, wooded terrain and was destroyed by impact and postcrash fire. All major components of the airplane were accounted for at the scene. The wreckage path was oriented on a 180ø magnetic heading and was 60 ft in length. The main wreckage was oriented on a magnetic heading of 350ø and rested upright about 1,400 ft beyond the departure end of the runway and about 700 ft left of the runway's centerline.

The right stabilator and a portion of the right wing were separated and found in trees along the debris path. All flight controls surfaces were accounted for at the accident site, and flight control continuity was confirmed from the cockpit to each control surface. The left wing was separated at the wing root and had thermal damage on the inboard portion. The right wing was still attached to the fuselage and sustained substantial thermal damage. The flap control handle indicated a flap position of 10ø.

The cockpit and fuselage were destroyed by fire. Both propeller blades exhibited aft bending and leading-edge polishing. The landing gear was retracted.

The engine was rotated by hand at the propeller, and continuity of the drive train, valve train, and accessory section were established. The sparkplugs showed signs of normal wear. The magnetos were destroyed by fire. Thumb compression was confirmed on all cylinders. Examination of the engine and disassembly of its accessories revealed no evidence of any preimpact mechanical anomalies.

MEDICAL AND PATHOLOGICAL INFORMATION

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological testing of samples from the pilot, which were negative for ethanol and drugs of abuse.

ADDITIONAL INFORMATION

According to FAA Pamphlet FAA-P-8740-2, Density Altitude:

Whether due to high altitude, high temperature, or both, reduced air density (reported in terms of density altitude) adversely affects aerodynamic performance and decreases the engine's horsepower output. Takeoff distance, power available (in normally aspirated engines), and climb rate are all adversely affected. Landing distance is affected as well; although the indicated airspeed (IAS) remains the same, the true airspeed (TAS) increases. From the pilot's point of view,

therefore, an increase in density altitude results in the following:

- Increased takeoff distance.
- Reduced rate of climb.
- Increased TAS (but same IAS) on approach and landing.
- Increased landing roll distance.

Because high density altitude has particular implications for takeoff/climb performance and landing distance, pilots must be sure to determine the reported density altitude and check the appropriate aircraft performance charts carefully during preflight preparation. A pilot's first reference for aircraft performance information should be the operational data section of the aircraft owner's manual or the Pilot's Operating Handbook developed by the aircraft manufacturer. In the example given in the previous text, the pilot may be operating from an airport at 500 ft MSL, but he or she must calculate performance as if the airport were located at 5,000 ft. A pilot who is complacent or careless in using the charts may find that density altitude effects create an unexpected -and unwelcome - element of suspense during takeoff and climb or during landing.

According to the Pilot's Handbook of Aeronautical Information, Chapter 3 (pg. 3-3, para. 1) per the section entitled Density Altitude (DA):

DA is the vertical distance above sea level in the standard atmosphere at which a given density is to be found. The density of air has significant effects on the aircraft's performance because as air becomes less dense, it reduces:

- Power because the engine takes in less air.
- Thrust because a propeller is less efficient in thin air.
- Lift because the thin air exerts less force on the air foils.

Accident Rpt# GAA18CA081	**12/05/2017 1030 CST**	**Regis# N4887S**	**Cheboygan, MI**	**Apt: Cheboygan County SLH**
Acft Mk/Mdl PIPER PA 32-260		**Acft SN 32-7100011**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
			Fatal 0 **Ser Inj 0**	**Flt Conducted Under: FAR 135**
Opr Name: GREAT LAKES AIR		**Opr dba:**		**Aircraft Fire: NONE**

Accident Rpt# WPR18LA044 12/05/2017 1835 MST	**Regis# N47536**	**Glendale, AZ**	**Apt: Glendale Muni GEU**	
Acft Mk/Mdl PIPER PA 34-200T-220T	**Acft SN 34-7770412**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim**	**Prob Caus: Pending**
Eng Mk/Mdl CONT MOTOR TSIO-360 SER		**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: ANGEL AVIATION INC	**Opr dba:**		**Aircraft Fire: NONE**	

Events

1. Landing-landing roll - Loss of control on ground

Narrative

On December 5, 2017, about 1835 mountain standard time, a Piper PA-34-200T, N47536, was substantially damaged during a runway excursion after landing at Glendale Municipal Airport (GEU), Glendale, Arizona. The certified flight instructor (CFI) and a commercial pilot were not injured. The airplane was registered to and operated by Angel Aviation Inc. under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed, and no flight plan had been filed.

Both pilots reported that during landing roll, the left wing dipped. Despite their control inputs, the airplane veered to the left side of the runway, collided with a runway sign, and came to a stop in a grassy area. During the landing sequence, the left main landing gear collapsed.

Accident Rpt# ERA18LA026	**11/18/2017 1110 EST**	**Regis# N8758N**	**Bladenboro, NC**	**Apt: Bladenboro 3W6**
Acft Mk/Mdl PIPER PA28-140		**Acft SN 28-25579**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-360			**Fatal 0** **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: ROBERT HESTER		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

1. Approach-VFR pattern downwind - Loss of engine power (partial)

Narrative

On November 18, 2017, about 1110 eastern standard time, a Piper PA28-140, N8758N, was substantially damaged during a forced landing near Bladenboro, North Carolina. The private pilot and passenger were not injured. Day, visual meteorological conditions prevailed at the time, and no flight plan was filed for the local, personal flight that departed Bladenboro Airport (3W6). The flight was operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91.

In interview with a Federal Aviation Administration (FAA) inspector the pilot stated that after takeoff from runway 20, he circled to land on runway 02, but then initiated a go-around. On the downwind leg of the traffic pattern to runway 02, the engine experienced a partial loss of engine power. He turned on the carburetor heat, but it did not restore power to the engine. The airplane was unable to reach the runway, and the pilot elected to land in a small field.

Examination of the airplane by an FAA inspector revealed damage to the engine mounts, and wing leading edges. The propeller was manually rotated, and a spark was produced on all spark plug leads. Both fuel tanks were more than half-full of uncontaminated fuel. A mud dauber nest was observed in the carburetor heat control box, which prevented the carburetor heat valve from fully opening.

The four-seat, low-wing airplane was manufactured in 1969 and was equipped with a Lycoming O-360, 180-horsepower reciprocating engine.

The pilot held a private pilot certificate with an airplane single-engine land rating. He reported 60 hours of total flight experience on his most recent application for an FAA third-class medical certificate, which was issued on March 9, 2015.

The weather conditions reported at the Columbus County Municipal Airport (CPC), Whiteville, North Carolina, which was located about 16 miles south of the accident site, included wind from 180ø at 7 knots, visibility 10 statute miles, ceiling broken at 5,500 ft, temperature 18ø C, dew point 10ø C, and an altimeter setting of 30.03 inches of mercury.

Accident Rpt# GAA18CA038	**11/05/2017 1000 EDT**	**Regis# N98299**	**Batavia, OH**	**Apt: Clermont County I69**
Acft Mk/Mdl PIPER PA28-140		**Acft SN 28-26156**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-320-E2A			**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: SCHAAF, ALLEN F.		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

1. Approach-VFR pattern final - Miscellaneous/other

Narrative

The pilot reported that the airplane departed with 10 gallons of fuel to practice crosswind landings at a nearby airport. He added that, about an hour later and during an approach, he was aiming to land on the runway numbers. He reported that, shortly before flying over the airport perimeter fence, "either wind shear or [a] sudden downdraft dropped the plane". The nose landing gear struck the fence and the airplane impacted the ground short of the intended runway.

In a follow-up interview with the National Transportation Safety Board Investigator-in-Charge, the pilot reported that, during approach, the engine was running the entire time without issues. He added that, once he encountered the downdraft, he applied full power, but the airplane continued descending with "no appreciable response". He reported that he did not use carburetor heat during the approach.

The airplane sustained substantial damage to the fuselage and horizontal stabilator.

The pilot reported that there were no preaccident mechanical failures or malfunctions with the airplane that would have precluded normal operation.

A review of recorded data from the automated weather observation station located on the airport reported, about the time of the accident, that the wind was from 210ø at 8 knots, visibility 10 statute miles, clouds overcast at 1,100 ft, temperature 68øF, dew point 63øF, altimeter 29.96" Hg. The airplane was landing on runway 22.

Review of the Federal Aviation Administration Carburetor Icing Chart for the given temperature and dew point revealed that the conditions were conducive to "serious icing (glide power)". (For more information, see Special Airworthiness Information Bulletin CE-09-35 in the public docket.)

Accident Rpt# ERA18LA041	**12/05/2017 1400 CST**	**Regis# N747KM**	**Brewton, AL**	**Apt: N/a**
Acft Mk/Mdl PIPER PA28-180		**Acft SN 28-7305149**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-360 SER			**Fatal 0** **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: STAYTON VAN A		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

1. Enroute-cruise - Loss of engine power (total)

Narrative

On December 5, 2017, about 1400 central standard time, a Piper PA28-180, N747KM, was substantially damaged during a forced landing near Brewton, Alabama. The private pilot and passenger were not injured. Visual meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the personal flight that departed Dekalb-Peachtree Airport (PDK), Atlanta, Georgia, and was destined for Pensacola International Airport (PNS), Pensacola, Florida. The airplane was operated under the provisions of 14 Code of Federal Regulations Part 91.

According to the pilot, the airplane was in cruise flight, at 8,000 ft mean sea level for "a couple hours" when the air traffic control (ATC) controller told him to descend to 4,000 ft and fly around some thunderstorms in that area. The pilot stated there were strong headwinds and he would have preferred to stay at the higher altitude, but complied with the direction from ATC. Subsequently, the engine experienced a total loss of power, and he notified ATC that he wanted to divert to Brewton Municipal Airport (12J), Brewton, Alabama. The pilot further stated that due to the strong headwind, he knew the airplane was not going to be able to glide to 12J, so he attempted to land in a field. During the approach to the field, the airplane collided with some tree tops and landed hard in the field. During the roll-out, the airplane contacted a fence post, which damaged the right wing .

Examination of the wreckage by a Federal Aviation Administration (FAA) inspector revealed that the airplane sustained damage to the landing gear fairings, right side of the fuselage, firewall, and right wing leading edge. There was additional damage to the horizontal stabilator, propeller and the right-wing fuel tank was breached and leaking fuel. The right-wing fuel tank was approximately 1/2 full. The left-wing fuel tank, which was undamaged, contained approximately 20 ounces of fuel. One ounce of fuel was recovered from the firewall mounted fuel strainer bowl. The fuel selector valve was found in the left fuel tank position.

The airplane was retained for further examination.

Accident Rpt# GAA18CA082	**12/09/2017 1200 CST**	**Regis# N8856W**	**Pocasset, OK**	**Apt: N/a**
Acft Mk/Mdl PIPER PA28-235		**Acft SN 28-10410**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
			Fatal 0 **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: SOUTHARD, BRIAN W.		**Opr dba:**		**Aircraft Fire: NONE**

Accident Rpt# CEN18FA049	**12/06/2017 1454 CST**	**Regis# N679EA**	**Chesterfield, MO**		
Acft Mk/Mdl RAYTHEON AIRCRAFT COMPANY B36TC		**Acft SN EA-679**	**Acft Dmg: DESTROYED**	**Rpt Status: Prelim**	**Prob Caus: Pending**
Eng Mk/Mdl TCM TSIO-520-UB		**Acft TT 722**	**Fatal 1 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name:		**Opr dba:**		**Aircraft Fire: GRD**	
				AW Cert: STU	

Events

1. Approach-VFR pattern final - Loss of engine power (total)

Narrative

On December 6, 2017, at 1454 central standard time, a Raytheon Aircraft Company B36TC airplane, N679EA, impacted a gas station pump canopy and parking lot following a reported loss of engine power while on visual approach to the Spirit of St. Louis Airport (SUS), Chesterfield, Missouri. The private pilot sustained fatal injuries, and the airplane was destroyed by post-impact fire. The airplane was registered to Wings West, LLC, Las Vegas, Nevada, and operated by a private individual as a 14 Code of Federal Regulations Part 91 personal flight. Day visual meteorological conditions prevailed at the time of the accident, and the flight was conducted on an instrument rules flight plan. The flight departed the Phoenix Deer Valley Airport (DVT), Phoenix, Arizona, at 0926, and was destined for SUS.

According to preliminary radar and communication information, the airplane was on left traffic visual approach to SUS. During the visual approach, the pilot reported an engine issue and losing power, and the local controller immediately cleared the pilot to land on runway 26L. The pilot responded that he may not be able to make it to the airport. No further communications were received from the pilot.

Several witnesses near the accident location observed the airplane at a low altitude with no engine noise. Shortly thereafter, the airplane impacted a gas station pump canopy, the gas station parking lot, and a post-impact fire ensued. Witnesses attempted to suppress the fire with available fire extinguishers. The witness attempts to suppress the fire were unsuccessful due to the intense heat and smoke.

The airplane came to rest upright on the parking lot surface and grass ditch between the parking lot and adjacent roadway. Post-impact fire consumed the forward and center fuselage, and inboard sections of both wings. The left wing sustained impact damage and was partially separated near the wing root. The right main landing gear tire and strut were separated and came to rest in the intersection of two roadways about 190 feet from the airplane.

At 1454, the SUS automated surface observation system, located about 1.6 miles west of the accident site, reported the wind from 280 degrees at 13 knots, visibility 10 miles, few clouds at 6,500 feet, temperature 9 degrees C, dew point -4 degrees C, and an altimeter setting of 30.13 inches of Mercury.

Accident Rpt# WPR16LA168 08/26/2016 745 HST	**Regis# N74805**	**Kailua/kona, HI**	**Apt: Kona International Airport KOA**
Acft Mk/Mdl ROBINSON R44-II	**Acft SN 10934**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl LYCOMING IO-540	**Acft TT 5747**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: MAUNA LOA HELICOPTER SCHOOL	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STN

Events

1. Landing-flare/touchdown - Loss of control on ground

Narrative

On August 26, 2016, about 0745 Hawaii standard time, a Robinson R44 II helicopter, N74805, was substantially damaged following a loss of control after landing at the Kona International Airport at Keahole (HKO), Kailua/Kona, Hawaii. The certified flight instructor (CFI) and pilot under instruction (PUI), who is also a CFI, were not injured. Visual meteorological conditions prevailed during the instructional flight, which was being conducted in accordance with 14 Code of Federal Regulations Part 91, and a flight plan was not filed. The local flight departed HKO about 0715.

In a written report submitted to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), the CFI/pilot in command, reported that as they entered the North Practice Area (NPA) he instructed the PUI to make the first approach to a spot in the middle of the gravel road, which would provide plenty of clearance. The CFI stated that the spot chosen was one of the gravel roads in the NPA, which has a wide area, and is flat and smooth with no large rocks. The CFI further stated that the PUI began his approach on a left downwind, then turned on to base and final ".and everything was looking great. I told him to complete the approach to a full stop on the ground." The CFI reported that the approach was smooth, and that the initial set down was very soft and smooth as well. The CFI opined that once the skids were on the ground, the PUI continued to lower the collective towards the full down position, at which time the helicopter began to rock in a fore and aft motion. The CFI stated that as the intensity quickly increased he came on the controls, and from that point on all that he could recall was that ".we were in the air again in uncontrollable flight." The CFI reported that the helicopter was oscillating intensely, then came to a stop about 20 to 30 ft and a little more than a 45ø angle to the forward and left of the initial touchdown point. The helicopter sustained substantial damage to the fuselage as a result of impact with terrain.

In a statement submitted to the NTSB IIC, the PUI reported that he and his instructor departed from Kona Airport around 7:50 am local time, for the North practice area. Everything was good, and he performed a controlled and smooth normal approach to a flat well open area. The skids touched the ground and then a strong rocking aft and forward movement accompanied by heavy vibrations started. He tried to lower the collective but made it worse, so he tried to pick up to correct, then it felt like the helicopter shot out forward/leftwards approximately 10 feet away from landing spot. He recalled that the cyclic did not respond to inputs well enough, and ended up crashing nose first with a main rotor blade strike in the ground, no dynamic rollover happened. As soon as the helicopter stopped moving, the mixture was pulled out to shut down the engine.

On October 4, 2016, Federal Aviation Administration aviation safety inspectors assigned to the Honolulu Flight Standards District Office, Honolulu, Hawaii, examined the helicopter.

The tailcone cowling attach points were inspected with the tailcone installed. No damage or defects were noted. The torgue on the tailcone attaching hardware using a calibrated torque wrench was checked. The torque was 655-inch pounds per the manual. The torque broke (nut moved) at 355-inch pounds on all bolts. Additionally, the tailcone was removed and no elongation or damage to the bolts, washers, skin or structure were noted.

Flight Control Servos and Push-Pull Tubes

With the mast fairing removed, the main rotor torque tube, control tubes and servos were examined. No damage or defects were noted. The flight controls were moved through a full range of motion with and without hydraulic power. Control continuity and operation appeared to be normal.

Main Rotor Gearbox Mounts

The main rotor gearbox mounts were inspected with the tailcone and both fuel tanks removed. The inspection of the mounts' rubber portion, as well as the associated ears of the mounts, revealed no damage or defects. Using a calibrated torque wrench, the torque registered on the main transmission bolts was 90-foot pounds, which was consistent with the value denoted in the maintenance manual.

Accident Rpt# GAA17CA356 06/21/2017 1130 CDT	**Regis# N901KC**	**Matagorda, TX**	**Apt: N/a**	
Acft Mk/Mdl ROBINSON HELICOPTER R22	**Acft SN 1450**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-320-B2C	**Acft TT 3477**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 137**	
Opr Name: NELSON FLYERS INC	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: STN	

Events

1. Maneuvering-low-alt flying - Loss of control in flight

Narrative

The pilot of the helicopter reported that, while flying downwind during rice field pollination operations, he "lost control" of the helicopter. The helicopter impacted the ground and rolled onto its right side.

The helicopter sustained substantial damage to the tail boom.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the helicopter that would have precluded normal operation.

The automated weather observation station located about 12 miles west of the accident site reported that, about 37 minutes before the accident, the wind was from 360ø at 19 knots, gusting 26 knots. The same weather observation station reported that, about 23 minutes after the accident, the wind was from 360ø at 18 knots, gusting 26 knots.

Accident Rpt# WPR17FA047 01/04/2017 1736 PST	**Regis# N702JJ**	**San Pedro, CA**	**Apt: N/a**	
Acft Mk/Mdl ROBINSON HELICOPTER R22 BETA	**Acft SN 3791**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl LYCOMING O-360-J2A	**Acft TT 5000**	**Fatal 2 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: JJ HELICOPTERS INC	**Opr dba:**		**Aircraft Fire: NONE**	

Summary

The purpose of the flight was to take nighttime aerial photographs of several cruise ships in a nearby harbor. The helicopter with the commercial pilot and the passenger/photographer aboard departed from the operator's ramp area, and proceeded to the harbor where it made numerous orbits. Following the orbits, the helicopter flew toward a jetty, and witnesses on one ship reported that the helicopter started spinning as it went straight down into the water. The helicopter came to rest upright in about 18 ft of water. All major components of the helicopter were recovered except the outboard 3/4 of one main rotor blade. The fracture surface at the separation point was jagged and angular consistent with an overstress failure at impact. The intact main rotor blade exhibited coning, which was indicative of low rotor rpm at impact. There were no rotational signatures between the cooling fan and scroll or the upper sheave and the airframe, which indicated that the engine was not operating at impact. Examination of the helicopter revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

The carburetor heat control knob in the cockpit was in the full down or "OFF" position and unlocked. The slider on the carburetor heat airbox was in a midrange position; the airbox was deformed, and the slider cable was displaced. At impact, if the airbox moves out of position, it will likely stretch the cable, which will move the slider valve. The helicopter was equipped with a carburetor heat assist device; lowering the collective mechanically added heat and raising the collective reduced heat. If the pilot was not manipulating the collective, the assist device would not have an effect. Carburetor heat would only be controlled by the pilot's manipulation of the carburetor heat control knob. If the control knob had been up in an "ON" position, it likely would have been bent and still up.

The airframe manufacturer has issued safety notices regarding carburetor ice and low rotor rpm blade stall. One safety notice stated that failure to maintain rotor rpm can result in low rotor rpm stall, and the helicopter can fall at an extreme rate. Another safety notice stated that main rotor blade stall due to low main rotor rpm caused a very high percentage of helicopter accidents. If the pilot had maintained main rotor rpm, he might have been able to make a successful autorotation and touch down less violently on the water, which might have allowed the occupants to egress the helicopter. However, performing an autorotation to water on a dark night would be a difficult maneuver.

The meteorological conditions at the time of the accident were conducive for the formation of carburetor ice, but the carburetor heat control knob was in the "OFF" position. It is likely that the pilot's failure to apply carburetor heat resulted in a loss of engine power due to carburetor ice. During the ensuing forced landing, the pilot did not maintain adequate main rotor rpm, and the helicopter descended rapidly to impact.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's failure to use carburetor heat while operating in conditions conducive to carburetor icing, which resulted in a loss of engine power due to carburetor icing. Also causal was the pilot's failure to maintain rotor rpm following the loss of engine power.

Events

1. Maneuvering-low-alt flying - Fuel related
2. Maneuvering-low-alt flying - Loss of control in flight

Findings - Cause/Factor

1. Aircraft-Aircraft power plant-Engine fuel and control-Fuel control/carburetor-Not used/operated - C
2. Personnel issues-Task performance-Use of equip/info-Use of equip/system-Pilot - C
3. Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
4. Personnel issues-Action/decision-Action-Lack of action-Pilot - C
5. Environmental issues-Conditions/weather/phenomena-Temp/humidity/pressure-Conducive to carburetor icing-Decision related to condition - C

Narrative

HISTORY OF FLIGHT

On January 4, 2017, about 1736 Pacific standard time, a Robinson Helicopter Company (RHC) R22, N702JJ, collided with the water near San Pedro, California. The commercial pilot and the passenger sustained fatal injuries; the helicopter sustained substantial damage. JJ Helicopters was operating the helicopter under the provisions of 14 Code of Federal Regulations Part 91. The local photography flight departed Torrance Municipal Airport, Torrance,

California, about 1635. Night visual meteorological conditions prevailed at the time of the accident, and no flight plan had been filed.

The operator reported that the purpose of the flight was to take aerial photos of several cruise ships in a nearby harbor.

Recorded radar data showed that the helicopter departed from Torrance Municipal Airport and proceeded toward the Los Angeles harbor area. The helicopter made numerous circles, and the last portion of the track showed the helicopter on a southeasterly course crossing perpendicular to a jetty that terminated at a lighthouse marking the west side of the harbor mouth. When the helicopter was southwest of the lighthouse, it made a sweeping left 270ø turn that went past the lighthouse and then began a slightly curved course parallel to the ocean side of the jetty. The last few targets indicate a sharp turn to the right and terminated on the inland side of the jetty. The data points for the last 11 minutes recorded mode C altitudes that varied between 100 ft and 700 ft.

Numerous witnesses on a cruise ship that was exiting the harbor mouth at the time of the accident reported that the helicopter started spinning as it descended straight down into the water. One witness commented that it was "just dark enough to make it difficult to see the helicopter, all you could see clearly were the [spinning] lights."

Several local agencies initiated a search, and the wreckage was located about 1015 on January 5, 2017. The wreckage was on the inland side of the jetty, and southwest of the lighthouse at the end of the jetty.

PERSONNEL INFORMATION

The pilot had 90 hours total time in rotorcraft, and 45 as pilot-in-command in the accident make/model. His initial training was in fixed wing airplanes, and all helicopter flight time had occurred during the current year.

AIRCRAFT INFORMATION

Fueling records established that the helicopter was last fueled on January 3, 2017, with the addition of 11.9 gallons of 100-octane aviation fuel. The owner flew the helicopter just before the accident flight, and said that 15 gallons of fuel remained at the conclusion of that flight.

Investigators drained the fuel tanks. Clear fluid was in the bottom of the buckets with blue fluid on top, and investigators estimated that the 5 gallons of blue fluid looked and smelled like 100-octane aviation fuel.

The pilot and passenger recorded their weights before takeoff. Based on these weights, the operator determined that the helicopter was within both longitudinal and lateral weight and balance limitations at takeoff and at the time of the accident. RHC computations concurred with this determination. Using weights provided by the coroner, RHC determined that the helicopter was slightly out of longitudinal limits at takeoff and at the time of the accident.

METEOROLOGICAL CONDITIONS

FAA Special Airworthiness Information Bulletin CE-09-35 contains a graph that illustrates the probability of carburetor icing for various temperature and relative humidity conditions. The conditions encountered in this accident (ambient temperature 55ø F / dew point 52ø F, 88% relative humidity), were in the area of serious icing at cruise power.

The passenger's camera was examined by the National Transportation Safety Board's Recorders Division. Most of the photographs were of Los Angeles harbor and several cruise ships in the area. The last photograph was an aerial shot of a cruise ship leaving the harbor area and depicted dark light conditions. The helicopter's location was outside of the breakwater and lighthouse at the entrance to the harbor.

WRECKAGE AND IMPACT INFORMATION

The local agencies that recovered the helicopter reported that the helicopter came to rest upright in about 18 ft of water. The first responder dive team noted that the pilot was in the right seat, and the passenger was in the left seat; both victims still had their seat belts fastened. The pilot was wearing a helmet and an inflated life vest. All major components of the helicopter were recovered except the outboard 3/4 of one main rotor blade. The fracture surface at the separation

point was jagged and angular. Multiple searches did not locate the missing portion of the main rotor blade.

The throttle, mixture, and carburetor heat controls were connected at both ends; the airframe structure was collapsed around the controls, and they would not move. The throttle arm at the carburetor was about 3/4 open. The mixture was in the full rich position. The carburetor heat control knob in the cockpit was in the full down or "OFF" position and unlocked. The slider on the carburetor heat airbox was in a midrange position; the airbox was deformed, and the slider cable was displaced.

There were no holes in the crankcase or cylinders that indicated a catastrophic failure of the engine. The tail pipe coloration was light gray with no oil residue. There were no rotational signatures between the cooling fan and scroll or the upper sheave and the airframe.

Investigators left the engine in place, and removed the valve covers. They manually rotated the crankshaft by turning the fan wheel. The crankshaft rotated freely, and the valves moved about the same amount of lift in firing order. The gears in the accessory case turned freely. Investigators obtained thumb compression on all cylinders in firing order.

A borescope inspection revealed no mechanical deformation on the valves, cylinder walls, or internal cylinder head.

Both main rotor blades were bent down at the hub, and then bent upward about 2 ft out from the hub. One blade separated at that point along a jagged angle. The other main rotor blade coned upward at that point; it retained its full length but had a tear at midspan from the trailing edge to the back of the spar.

MEDICAL AND PATHOLOGICAL INFORMATION

The Los Angeles County Coroner, Los Angeles, California, completed an autopsy on the pilot and determined that the cause of death was drowning.

Toxicology testing of specimens from the pilot by the FAA's Bioaeronautical Science's Research Laboratory, Oklahoma City, Oklahoma, were negative for carbon monoxide, ethanol and tested drugs.

ADDITIONAL INFORMATION

RHC Safety Notice (SN) SN-10 stresses the importance of instantly adding throttle and lowering the collective to maintain main rotor rpm in an emergency. It states that failure to do so can result in low rotor rpm stall, and the helicopter can fall at an extreme rate. It notes that failure to maintain main rotor rpm is a leading cause of fatal accidents in light helicopters.

SN-18 states that flying a helicopter in obscured visibility or even on a dark night can be fatal.

SN-19 notes that flying over water is very hazardous. It recommends that a pilot maintain 500 ft above ground level (agl) whenever possible, and avoid maneuvers over water below 200 ft agl.

SN-24 emphasizes that rotor stall due to low rpm causes a very high percentage of helicopter accidents, both fatal and non-fatal. It states that when rotor stall occurs above 40 to 50 ft, it will most likely be fatal.

SN-25 discusses carburetor ice. It stated that carburetor ice could cause engine stoppage, and was most likely to occur when there was high humidity or visible moisture, and the air temperature was below 70ø F. It stated that even in generally dry air, local conditions such as a nearby body of water could be conducive to carburetor ice. It stated that during descent or autorotation, the pilot should ignore the carburetor air temperature gauge, and apply full carburetor heat. RHC published a revision to SN-25 in July 2012 stating that carburetor heat may be required on takeoff, and the carburetor heat control knob should be left unlatched unless it was obvious that conditions were not conducive to carburetor ice. It also noted that carburetor ice could form at outside air temperatures as high as 30ø C (86ø F).

SN-29 states that there have been a number of fatal accidents involving experienced pilots with many hours in airplanes, but limited experience flying helicopters. The ingrained reactions to an emergency could have fatal results. All of the pilot's helicopter time was attained in the current year and was just over

10% of his total time.

SN-31 notes that the governor can mask carburetor ice. With the throttle governor on, carburetor ice will not become apparent as a loss of either rpm or manifold pressure. The governor will automatically adjust throttle to maintain a constant rpm, which will also result in a constant manifold pressure. It states that when in doubt, the pilot should apply carburetor heat as required to keep the carburetor air temperature out of the yellow arc during hover, climb, or cruise, and apply full carburetor heat when the manifold pressure is below 18 inches.

Safety Notice 34 emphasizes that aerial survey and photography flights are high risk.

The R22 Pilot's Operating Handbook (POH) stated that a carburetor heat assist device was installed on the helicopter. The device correlated application of carburetor heat with changes in the collective setting. Lowering the collective mechanically added heat and raising collective reduced heat. The system included a latch at the control knob to lock the carburetor heat off when not required. The system contained a friction clutch that allowed the pilot to override the system. It instructed the pilot to readjust carburetor heat as necessary following any change in power. The POH included "set as required" for the carburetor heat line of the starting engines and run-up checklist, and "adjust carb heat as required" to the takeoff procedure in the normal procedures section of the POH.

Accident Rpt# GAA18CA072	**12/05/2017 1300 EST**	**Regis# N99RW**	**Fort Pierce, FL**	**Apt: Treasure Coast Intl FPR**
Acft Mk/Mdl ROBINSON HELICOPTER		**Acft SN 0793**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
			Fatal 0 **Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: ATLAS AVIATION LP		**Opr dba:**		**Aircraft Fire: NONE**

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Air Data Research
9865 Tower View, Helotes, Texas 78023
210-695-2204 - info@airsafety.com - www.airsafety.com

Accident Rpt# ERA14LA360 07/26/2014 1545 EDT	**Regis# N59418**	**Newnan, GA**	**Apt: Panther Creek Airport 17GA**
Acft Mk/Mdl RYAN AERONAUTICAL ST3KR	**Acft SN 2168**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl KINNER R5 SERIES	**Acft TT 1800**	**Fatal 0 Ser Inj 2**	**Flt Conducted Under: FAR 091**
Opr Name: LEE LARRY W	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STN

Summary

A review of the airplane's maintenance records revealed that the accident flight was the airplane's first flight following an annual inspection. The private pilot and passenger departed on the personal flight and flew about 35 nautical miles to a private airstrip. A witness reported seeing the airplane conduct a low pass over the runway and then enter a climb. As the airplane climbed through about 200 ft above ground level, the engine experienced a sudden loss of power, and the airplane subsequently descended into trees. Video footage from the witness's cell phone corroborated his statement.

Postaccident examination revealed that the engine turned freely by hand when the propeller was rotated, and compression was established on the Nos. 1, 4, and 5 cylinders. No compression was established on the Nos. 2 and 3 cylinders. The No. 3 cylinder was impact-damaged. Examination of the No. 2 cylinder revealed an improperly adjusted intake valve set screw, which prevented the intake valve from closing completely. The No. 2 cylinder set screw was readjusted, and the intake valve subsequently closed normally, and compression was established. However, if the set screw had been set improperly before the flight, the engine problem should have been present throughout the flight rather than developing later in the flight; therefore, the effect of the improperly set screw on the engine performance could not be determined.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: A total loss of engine power for reasons that could not be determined based on the available information.

Events

1. Maneuvering-low-alt flying - Loss of engine power (total)

Findings - Cause/Factor

1. Not determined-Not determined-(general)-(general)-Unknown/Not determined - C
2. Aircraft-Aircraft power plant-Engine (reciprocating)-(general)-Incorrect service/maintenance
3. Environmental issues-Physical environment-Object/animal/substance-Tree(s)-Contributed to outcome

Narrative

On July 26, 2014, about 1545 eastern daylight time, a Ryan Aeronautical ST3KR, N59418, was substantially damaged when it impacted trees and terrain following a total loss of engine power while maneuvering near Panther Creek Airport (17GA), Newnan, Georgia. The private pilot and passenger were seriously injured. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which departed Cobb County International Airport-McCollum Field (RYY), Atlanta, Georgia, at an unknown time. The personal flight was operated under the provisions of Title 14 Code of Federal Regulations Part 91.

A witness stated that the pilot was conducting a "low pass" when the accident occurred. Video footage of the accident obtained from the witness's cell phone showed the accident airplane flying over the runway at 17GA. As it neared the end of the runway and began to climb, a sudden loss of engine power could be heard, and the airplane subsequently descended into the trees from an altitude about 200 feet above ground level.

The pilot held a private pilot certificate with ratings for airplane single engine land, instrument airplane, rotorcraft - helicopter, and glider. His most recent FAA first-class medical certificate was issued in August 2012. His most recent flight review was conducted in April 2014. Neither the pilot's total flight time, nor his time in the accident airplane, was determined.

The airplane was manufactured in 1942 and registered to the pilot in 1989. It was equipped with a Kinner R5 series, 160-hp, reciprocating, radial engine. The most recent annual inspection, the first since 1996, was completed on June 1, 2014. The accident flight was the first flight after the inspection.

The 1555 weather observation at Newnan Coweta County Airport (CCO), located about 10 miles southeast of the accident site, included scattered clouds at 4,500 ft, wind from 260ø at 7 knots, temperature 32ø C, dew point 22ø C, and an altimeter setting of 30.05 inches of mercury.

Postaccident examination revealed that both left and right wing fuel tanks had been breached during the accident and contained no fuel. The throttle and mixture controls were found in a mid-range position. The fuel selector was on the "both" position. The wooden propeller hub remained attached to the crankshaft. Both blades were splintered; one blade was separated.

The engine turned freely when the propeller was rotated by hand. One spark plug was removed from each of the 5 cylinders, and the plugs exhibited normal wear. Cylinder compression was established using the thumb method on the No. 1, 4, and 5 cylinders. The No. 3 cylinder was impact-damaged.

The No. 2 cylinder was intact and undamaged. The valve covers were removed, and it was observed that as the engine was rotated, the intake valve failed to completely close. The valve set screw was observed in an excessively tight position; after readjusting the screw, the intake valve subsequently closed normally and compression was established on the No. 2 cylinder.