



National Transportation Safety Board Aviation Accident Final Report

Location:	Climax, GA	Accident Number:	ERA16FA035
Date & Time:	11/09/2015, 1016 EST	Registration:	N164GP
Aircraft:	CESSNA 441	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The purpose of the flight was for the commercial pilot/owner to pick up passengers at the destination airport and return to the departure airport. The airplane was 33 miles from its destination in cruise flight at 3,300 ft mean sea level (msl) and above a solid cloud layer when the pilot declared to air traffic control (ATC) that he had the destination airport "in sight" and cancelled his instrument flight rules (IFR) clearance. During the 13 minutes after cancellation of the IFR clearance, the airplane's radar track made an erratic sequence of left, right, and 360° turns that moved the airplane away from the destination airport in a westerly direction. The altitudes varied between about 4,000 and 900 ft msl. Later, the pilot reestablished communication with ATC, reported he had lost visual contact with the airport, and requested an instrument approach to the destination airport. The controller then provided a sequence of heading and altitude assignments to vector the airplane onto the approach, but the pilot did not maintain these assignments, and the controller provided several corrections. The pilot expressed his inability to identify the initial approach fix (IAF) and asked the controller for the correct spelling. The radar target then climbed and subsequently entered a descending right turn at 2,500 ft msl and 180 knots groundspeed near the IAF, before radar contact with the airplane was lost.

Although a review of airplane maintenance records revealed that the airplane was overdue for several required inspections, examination of the wreckage revealed signatures consistent with both engines being at high power at impact, and no evidence of any preimpact mechanical anomalies were found that would have precluded normal operation. Examination of the airplane's panel-mounted GPS, which the pilot was using to navigate the flight, revealed that the navigation and obstruction databases were expired.

During a weather briefing before the flight, the pilot was warned of low ceilings and visibility. The weather conditions reported near the destination airport about the time of the accident also included low ceilings and visibilities. The restricted visibility conditions and the high likelihood of inadvertent entry into instrument meteorological conditions were conducive to the development of spatial disorientation. The flight's erratic track, which included altitude and

directional changes inconsistent with progress toward the airport, were likely the result of spatial disorientation. After reestablishing contact with ATC and being cleared to conduct an instrument approach to the destination, the airplane's flight track indicated that the pilot was not adequately prepared to execute the controller's instructions. The pilot's subsequent loss of control was likely the result of spatial disorientation due to his increased workload and operational distractions associated with his attempts to configure his navigation radios or reference charts.

Postaccident toxicological testing of samples obtained from the pilot revealed the presence of ethanol; however, it could not be determined what percentage was ingested or produced postmortem. The testing also revealed the presence of amphetamine, an opioid painkiller, two sedating antihistamines, and marijuana. Although blood level quantifications of these medications and drugs could not be made from the samples provided, their combined effects would have directly impacted the pilot's decision-making and ability to fly the airplane, even if each individual substance was only present in small amounts.

Based on the reported weather conditions at the time the pilot reported the airport in sight and canceled his IFR clearance, he likely was not in a position to have seen the destination airport even though he may have been flying between cloud layers or may have momentarily observed the ground. His decision to cancel his IFR clearance so far from the destination, in an area characterized by widespread low ceilings and reduced visibility, increased the pilot's exposure to the hazards those conditions posed to the successful completion of his flight. The pilot showed other lapses in judgment associated with conducting this flight at the operational, aircraft, and the personal level. For example, 1) the pilot did not appear to recognize the significance of widespread low ceilings and visibility along his route of flight and at his destination (nor did he file an alternate airport even though conditions warranted); 2) the accident airplane was being operated beyond mandatory inspection intervals; and 3) toxicological testing showed the pilot had taken a combination of multiple medications and drugs that would have likely been impairing and contraindicated for the safe operation of an airplane. The pilot's decision-making was likely affected by the medications and drugs.

Probable Cause and Findings

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

The pilot's loss of airplane control due to spatial disorientation. Also causal to the accident was the pilot's impairment by the combined effects of multiple medications and drugs.

Findings

Aircraft	Performance/control parameters - Not attained/maintained (Cause)
Personnel issues	Spatial disorientation - Pilot (Cause) Impairment/incapacitation - Pilot (Cause) Aircraft control - Pilot (Cause)

Factual Information

History of Flight

Approach-circling (IFR)

Loss of control in flight (Defining event)

On November 9, 2015, at 1016 eastern standard time, a Cessna 441, N164GP, was destroyed during collision with trees, terrain, and a post-crash fire following a loss of control while maneuvering near Climax, Georgia. The commercial pilot/owner and the commercial pilot-rated passenger were fatally injured. Instrument meteorological conditions (IMC) prevailed, and an instrument flight rules (IFR) flight plan was filed for the personal flight, which departed Lakeland Linder Regional Airport (LAL), Lakeland, Florida, at 0906, and was destined for Cairo-Grady County Airport (70J), Cairo, Georgia. The flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

The purpose of the flight was to pick up two passengers employed by the pilot's firm and return to LAL. Radar and voice communication information from the Federal Aviation Administration (FAA) revealed that the pilot contacted Tallahassee Approach Control at 0948:42 while he was descending the airplane from 5,200 to 4,000 ft mean sea level (msl). The airplane was 62 nautical miles (nm) from and flying direct to 70J. The pilot informed the controller that he was trying to "get to" visual meteorological conditions (VMC) and that, if he could not get to VMC, he would request the RNAV RWY 31 approach at 70J.

The controller advised the pilot that weather was not available for the destination airport but that two airports in the vicinity were both reporting instrument meteorological conditions. The pilot acknowledged and requested the RNAV RWY 31 approach at 70J, and the controller then instructed him to maintain 3,200 ft msl. The controller asked the pilot if he could proceed directly to the Greenville VOR, which was the initial approach fix (IAF) for the RNAV RWY 31 approach, and the pilot responded that he was "loading it."

At 0953:43, while the airplane was at 3,300 ft msl and 33 nm from 70J, the pilot reported that he had the destination airport in sight and cancelled his IFR flight plan. The controller then issued a frequency change to the common traffic advisory (CTAF) frequency at 70J but offered the pilot the option to stay on the approach frequency until the airplane got closer to its destination. The pilot reported that he was "VFR" and changed radio frequencies to the CTAF.

Radar data showed that, during the next 13 minutes, the airplane's radar track displayed an erratic sequence of left, right, and 360° turns that took the it away from the destination airport in a westerly direction at altitudes between about 4,000 and 900 ft msl.

At 1006:16, the pilot contacted air traffic control (ATC) on the approach control frequency, reported that he had lost visual contact with the airport, and requested the RNAV RWY 13 approach at 70J. The controller then provided a sequence of heading and altitude assignments to vector the airplane to the OCAPE waypoint, which was the IAF for the requested approach. The airplane did not maintain its heading and altitude assignments, and ATC provided several corrections to the pilot.

At 1012:31, the controller instructed the pilot to proceed directly to OCAPE and join the approach. Over the next 3 minutes, the pilot stated that he was unable to identify OCAPE and asked the controller for the correct spelling so he could "load it." At 1015:37, the pilot acknowledged the approach clearance. No further transmissions were received from the pilot.

Subsequently, radar data showed that the airplane climb and descend in the vicinity of OCAPE, and at 1016:40, the airplane entered a descending right turn at 2,500 ft msl and 180 knots groundspeed, at which point radar contact was lost.

PERSONNEL INFORMATION

The pilot/owner held a commercial pilot certificate with ratings for airplane single-engine land, multiengine land, rotorcraft helicopter, and instrument airplane. His most recent FAA third-class medical certificate was issued on May 30, 2013. At that time, the pilot reported 1,150 total hours of flight experience.

The pilot-rated passenger held a commercial pilot certificate with ratings for airplane single-engine land, multiengine land, rotorcraft helicopter, and instrument airplane and helicopter. His most recent FAA second-class medical certificate was issued on December 4, 2014. At that time, he reported 9,500 total hours of flight experience.

AIRCRAFT INFORMATION

According to FAA and maintenance records, the airplane was manufactured in 1980 and was equipped with two 715-horsepower Garrett Research TPE331-8-402S turboprop engines. The most recent phase inspections were completed on April 25, 2014, at 18,422.8 total aircraft hours. The airframe logbook entry documenting those phase inspections noted that 3 subsequent phase inspections were due in September 2014, with an additional phase inspection due in September 2015. No additional phase inspections had been logged. The final airframe logbook entry dated September 22, 2015, indicated that the airplane had accrued 18,513.7 total aircraft hours.

An aircraft maintenance facility at the pilot's home airport (LAL) maintained the accident airplane, the other airplanes in the pilot's fleet, and their collective maintenance records. The owner and president of the maintenance company, an airframe and powerplant mechanic, provided a detailed maintenance and event history on the accident airplane and the rest of the pilot's fleet.

The airplane was purchased from Australia, and the engines were on an approved operator's maintenance program there. Once purchased and brought to the United States, the airplane's engines were due for overhaul. They were subsequently removed at LAL, overhauled in Ohio, then reinstalled at LAL. The engine overhauls were not completed at the same time, so the pilot/owner requested that the overhauled engine be installed along with a rental engine.

On the first flight after installation, the pilot aborted the first takeoff, closed the throttles, feathered the propellers, and then attempted an engine restart. The pilot's actions were contrary to the checklist and resulted in damage to the compressor section of the overhauled engine.

In June 2014, new, metal, four-bladed propellers were installed on the airplane at the owner's request. No one was immediately available to conduct the mandatory postinstallation test flight, so he chose to start and taxi the airplane forward and backward by himself over the course of 2 days. At one point, he attempted to move a propeller out of the feather position by motoring the starter, which destroyed the starter and melted its wiring harness.

On another occasion, the pilot identified an engine exhaust gas temperature (EGT) gauge as inoperative, and requested troubleshooting from the mechanic. The mechanic arrived "several times" to investigate, and each time the pilot was flying the airplane. When asked about why the airplane was operating with an inoperative EGT gauge, the pilot's assistant, who was also the copilot on the accident flight, told the mechanic that the pilot "knows" the EGT based on fuel flow.

The mechanic reported that the pilot often taxied the airplane out of its hangar using reverse thrust because the use of a tug was "too much trouble."

Lastly, the mechanic advised the pilot through his copilot/assistant of the due dates for mandatory inspections on the airplane, but the airplane was operated continuously for several months, and about 100 flight hours, beyond the due dates up to the day of the accident. When asked why the mandatory inspections were not conducted, the copilot/assistant explained that because the pilot's other twin-engine airplane was down for maintenance, he would not have both "down for maintenance at the same time."

When asked if the database in the panel-mounted GPS was up to date on the airplane at the time of the accident, the mechanic responded that "nothing on that airplane was up to date."

METEOROLOGICAL INFORMATION

The 1015 weather observation at Decatur County Industrial Airpark (BGE), 8 miles west of the accident site, included wind from 050° at 10 knots, an overcast ceiling at 400 ft, 2 miles visibility in fog, temperature 16°C, dew point was 15°C, and an altimeter setting of 30.04 inches of mercury.

Weather observations at airports surrounding the accident site reported cloud ceilings between 200 and 800 ft above ground level (agl). Photographs taken a few minutes before the accident by a passenger waiting at the destination airport showed a ceiling estimated to be between 200 and 250 ft agl with mist and fog in the treetops.

The pilot received an official weather briefing from Lockheed Martin Flight Service (LMFS) by phone at 0830. During his weather briefing, the pilot and the briefer discussed how the pilot had "looked up" the latest weather conditions, a SIGMET along his route of flight, a center weather advisory for rain, embedded thunderstorms, and low IMC. The LMFS weather briefer told the accident pilot that "it's pretty bad out there." The pilot then requested the closest terminal area forecast and mentioned that he might "give it an hour before taking off, as it sounds like things are clearing out." Instead, the pilot departed about 30 minutes later. The pilot did not file an alternate airport in his flight plan.

A center weather advisory for IFR conditions was in effect for the area surrounding the destination airport at the time of the accident, and upper air balloon data showed a solid cloud layer that reached about 2,500 ft msl over the southeastern United States. Clouds above that layer were likely between 5,000 and 12,000 ft msl.

WRECKAGE AND IMPACT INFORMATION

The wreckage was examined at the accident site on November 10, 2015. There was a strong odor of fuel, and all major components of the airplane were accounted for at the scene. The wreckage path was oriented along a magnetic heading of about 175° and was about 150 ft long and about 45 ft wide. The initial impact point was in a 60-ft-tall tree, and the airplane impacted several other trees before impacting the ground about 24 ft beyond the first tree strike. Several pieces of angularly cut wood were found throughout the length of the debris field.

The airplane was fragmented and scattered along the length of the wreckage path. Control continuity to the wings, rudder, and elevator was confirmed through the control cables and bellcranks to the cockpit area.

The cockpit, cabin area, and empennage were destroyed by impact forces and postcrash fire and were found entangled about 48 ft down the wreckage path. The engines and their respective propeller assemblies were entangled with the main wreckage and were severely damaged by impact and fire. All four propeller blades exhibited similar twisting, bending, leading and trailing edge gouging, and chordwise scratching. The tips of each blade on one propeller system were melted away by fire. One propeller blade tip was fractured and found 215 ft southeast of the main wreckage. The compressor and power turbine sections of both engines were exposed, and the compressor tips were all bent opposite the direction of rotation. Metal spray deposits were observed on the suction side of the third-stage stator vanes.

AIRPORT INFORMATION

The field elevation at 70J was 264 ft msl. The single runway, oriented 13/31, was 4,000 ft long by 75 ft wide. The airport was not tower-controlled. The lateral navigation minimum descent altitude for the RNAV GPS RWY 13 approach was 860 ft msl.

MEDICAL AND PATHOLOGICAL INFORMATION

The Division of Forensic Sciences, Georgia Bureau of Investigation, performed an autopsy on the pilot. The autopsy report stated that the cause of death was "blunt force injuries."

The FAA Bioaeronautical Research Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicology testing on specimens from the pilot. The testing identified 0.203 gm/dl of ethanol, N-propanol, amphetamine, 0.6 ug/g of tramadol, and its active metabolite O-desmethyltramadol in the muscle tissue. In addition, tetrahydrocannabinol (THC), the active compound in marijuana, and its metabolite, tetrahydrocannabinol carboxylic acid (THC-COOH) were found in the lung tissue. Cetirizine and THC-COOH were identified in the kidney tissue. Finally, 0.044 gm/dl of ethanol, doxylamine, 1.976 ug/g of tramadol, O-desmethyltramadol, and THC-COOH were found in the liver tissue.

Ethanol may be detected due to ingestion, or it may be produced in body tissues by postmortem microbial activity. Ethanol significantly impairs pilots' performance even at very low levels. Federal Aviation Administration regulations prohibits any person from acting or attempting to act as a crewmember of a civil aircraft while having 0.040 gm/dl or more ethanol in the blood. N-propanol is another type of alcohol that is produced in body tissues after death.

Amphetamine is a prescription medication used to treat attention deficit/hyperactivity disorder and narcolepsy. It is often marketed with the name Adderall. It carries a warning regarding the high likelihood for abuse. Tramadol is an opioid analgesic available by prescription, commonly marketed with the name Ultram. O-desmethyltramadol is created in the body by the metabolism of tramadol and has psychoactive effects. Cetirizine and doxylamine are both sedating antihistamines available in several over-the-counter products. Doxylamine is so sedating, it is primarily used as a sleep aid. Tramadol, cetirizine, and doxylamine all carry warnings regarding sleepiness and hazards to driving safety.

Medical, pharmacy, and drug rehabilitation records were requested from three different law firms handling affairs for the pilot and his estate and none were provided.

TESTS AND RESEARCH

A Garmin Aera 796 portable GPS and a Samsung Galaxy Note II personal electronic device were recovered and examined at the NTSB Recorders Laboratory in Washington, DC. Each had sustained catastrophic impact damage, and no useful data were recovered from either device.

A Garmin GNS 530 panel-mounted GPS receiver, which was the only GPS device on board the airplane that was certified for IFR navigation, was recovered and had also sustained catastrophic impact damage. The database cards were removed and placed into a surrogate receiver. On startup, the database information displayed revealed that the obstacle database expired April 8, 2010, and that the aviation database expired March 5, 2015.

ADDITIONAL INFORMATION

Maintenance and Event History of Pilot's Other Aircraft

Maintenance and event history for the pilot's Cessna 414 airplane revealed that the airplane was purchased about January 2010, and within 23 total aircraft hours, that "several" tires and broken engine mounts were replaced and that the engines were overhauled due to metal in the oil. In November 2010, both propellers were replaced due to strike damage and separated blade tips.

In July 2014, the airplane was towed from "mud" adjacent to the owner's hangar. In September 2014, the airplane was again towed from the mud adjacent to the hangar, and the airplane had again sustained propeller damage. An engine was removed and repaired due to "internal damage." Both propellers were removed and replaced with composite propellers.

The composite propellers were installed in April 2015, and in July 2015, 6.3 total aircraft hours later, the left propeller was removed and shipped to the manufacturer for repair due to tip damage. The pilot/owner would not authorize the mandatory sudden-stoppage inspection for

the engine because he decided that the inspection was not required given the propellers were of composite construction.

The pilot also asked the mechanic on multiple occasions to inspect and repair damage to the airplane that included broken rudder caps, separated landing gear fairings, separated tires and tubes, and eroded propeller blades.

Spatial Disorientation

The FAA Airplane Flying Handbook (FAA-H-8083-3) described some hazards associated with flying when visual references, such as the ground or horizon, are obscured. The handbook stated that "The vestibular sense (motion sensing by the inner ear) in particular tends to confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in the attitude of the airplane, nor can they accurately sense attitude changes that occur at a uniform rate over a period of time. On the other hand, false sensations are often generated; leading the pilot to believe the attitude of the airplane has changed when in fact, it has not. These false sensations result in the pilot experiencing spatial disorientation."

Pilot Judgement

FAA-H-8083-2, Risk Management Handbook, identified five "hazardous attitudes" that may contribute to poor pilot judgment: antiauthority, impulsivity, invulnerability, macho, and resignation. The publication also stated,

In an attempt to discover what makes a pilot accident prone, the Federal Aviation Administration (FAA) oversaw an extensive research study on the similarities and dissimilarities of pilots who were accident free and those who were not. The project surveyed over 4,000 pilots, half of whom had "clean" records while the other half had been involved in an accident. Five traits were discovered in pilots prone to having accidents:

1. Disdain toward rules
2. High correlation between accidents in their flying records and safety violations in their driving records
3. Frequently falling into the personality category of "thrill and adventure seeking"
4. Impulsive rather than methodical and disciplined in information gathering and in the speed and selection of actions taken
5. Disregard for or underutilization of outside sources of information, including copilots, flight attendants, flight service personnel, flight instructors, and air traffic controllers.

Pilot Information

Certificate:	Commercial	Age:	40, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Unknown
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 Without Waivers/Limitations	Last FAA Medical Exam:	05/07/2013
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	1150 hours (Total, all aircraft), 150 hours (Total, this make and model)		

Pilot-Rated Passenger Information

Certificate:	Commercial	Age:	58, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Unknown
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	Yes
Instructor Rating(s):	Helicopter; Instrument Helicopter	Toxicology Performed:	Yes
Medical Certification:	Class 2 With Waivers/Limitations	Last FAA Medical Exam:	12/04/2014
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	9500 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	Registration:	N164GP
Model/Series:	441 NO SERIES	Aircraft Category:	Airplane
Year of Manufacture:	1980	Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	441-0164
Landing Gear Type:	Tricycle	Seats:	11
Date/Type of Last Inspection:	04/25/2014, AAIP	Certified Max Gross Wt.:	9850 lbs
Time Since Last Inspection:	91 Hours	Engines:	2 Turbo Prop
Airframe Total Time:	18422.8 Hours as of last inspection	Engine Manufacturer:	Garrett Research
ELT:	C126 installed, activated	Engine Model/Series:	TPE331-10
Registered Owner:	On file	Rated Power:	715 hp
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	Condition of Light:	Day
Observation Facility, Elevation:	BGE, 141 ft msl	Distance from Accident Site:	12 Nautical Miles
Observation Time:	1015 EST	Direction from Accident Site:	292°
Lowest Cloud Condition:		Visibility	3 Miles
Lowest Ceiling:	Overcast / 400 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	50°	Turbulence Severity Forecast/Actual:	/ N/A
Altimeter Setting:	30.04 inches Hg	Temperature/Dew Point:	16° C / 15° C
Precipitation and Obscuration:	Fog		
Departure Point:	Lakeland, FL (LAL)	Type of Flight Plan Filed:	IFR
Destination:	Cairo, GA (70J)	Type of Clearance:	IFR
Departure Time:	0906 EST	Type of Airspace:	Class E; Class G

Airport Information

Airport:	Cairo-Grady Co (70J)	Runway Surface Type:	
Airport Elevation:	264 ft	Runway Surface Condition:	Dry
Runway Used:	13	IFR Approach:	RNAV
Runway Length/Width:	4000 ft / 75 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Fatal	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	30.904722, -84.445833

Administrative Information

Investigator In Charge (IIC):	Brian C Rayner	Report Date:	07/05/2017
Additional Participating Persons:	Patrick A Hempen; FAA/AVP-100; Washington, DC David Studtmann; Honeywell Aerospace; Phoenix, AZ Ernest Hall; Textron Aviation; Wichita, KS		
Publish Date:	07/05/2017		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=92310		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).