Aviation Investigation Final Report

Location:	Wilmot, Arkansas	**Accident Number:**	CEN15FA331
Date & Time:	August 1, 2015, 07:00 Local	**Registration:**	N6007N
Aircraft:	AIR TRACTOR INC AT 602	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The commercial pilot was repositioning the airplane to a grass airstrip where it was to be loaded with chemical for aerial application work. Visual meteorological conditions prevailed with clear skies and 10-mile visibility. GPS data extracted from an onboard aerial guidance system showed that the airplane took off, climbed to 1,000 ft mean sea level (msl), and proceeded south on course. While en route, the airplane descended to 500 ft and turned to the southwest. About 8 minutes into the flight, the airplane began a rapid climb, turned to the northwest, and decreased and increased in altitude before it entered a rapid descent to the ground.

When the airplane did not arrive at the grass airstrip, one of the operator's crewmembers contacted the county sheriff's department and reported the airplane missing. The airplane wreckage was found in a cornfield about 18 nautical miles (nm) southwest of the departure airport and about 2 nm to the west of the direct course to the grass airstrip. No witnesses to the accident were identified.

Examination of the wreckage and ground scars revealed signatures consistent with the airplane impacting the ground in a steep, nose-down attitude. Control continuity was established from the cockpit to the flight control surfaces. An examination of the airplane's engine and systems revealed no anomalies that would have precluded normal operations.

The pilot's autopsy identified moderate three vessel coronary artery disease without evidence of previous scar or muscle injury, and he had a family history of sudden cardiac death in his father at age 39. Based on his age (38) and family history , the pilot was at increased risk of an acute cardiac event such as an arrhythmia or a heart attack that could have caused acute symptoms to include chest pain, shortness of breath, palpitations, or fainting. Any such symptom would likely have been impairing or incapacitating.

The pilot's toxicology showed evidence of the use of two potentially impairing medications, Suboxone, used to treat opioid addiction, and diphenhydramine, a sedating antihistamine. Suboxone is typically dosed based on the patient's response to the drug, which is influenced by the degree of underlying tolerance and addiction. Regular users are likely to become tolerant to the sedating effects of Suboxone,

but there is a potential for abuse; users may increase their dose to obtain desired psychoactive effects . These effects are similar to those of other opioids to include euphoria, a feeling of well-being, relaxation, drowsiness, sedation, lethargy, disconnectedness, self-absorption, mental clouding, and delirium.

Compared to other antihistamines, diphenhydramine causes marked sedation, and altered mood and impaired cognitive and psychomotor performance may also be observed. In a driving simulator study, a single dose of diphenhydramine impaired driving ability more than a blood alcohol of 0.100. The usual therapeutic range for diphenhydramine is 0250 to 0.1120 ug/ml, much lower than the measured level of 1.861 ug/ml in the pilot. However, diphenhydramine undergoes significant postmortem distribution; central levels may be three times higher than peripheral levels. Taking postmortem distribution into account still leaves the pilot at a high level of diphenhydramine, almost six times higher than the usual high end of the therapeutic range. The GPS data for the initial part of the flight, which shows the pilot in control of the airplane suggests that the pilot was regularly using high doses of diphenhydramine and may have become tolerant to some of its effects.

However, even if the pilot had become tolerant to some of the effects of Suboxone and diphenhydramine, in combination, they were likely causing some degree of impairment. If the pilot had taken extra Suboxone or diphenhydramine and unintentionally overdosed, the effects would likely have been acutely impairing or incapacitating.

The airplane's GPS track and its steep, nose-down impact attitude indicate that the pilot lost control of the airplane. Given that weather was not a factor and that the airplane was capable of normal operation, the most likely reason for the loss of control was pilot incapacitation. Whether the incapacitation was from overuse of a combination of sedating medications or an acute cardiac event could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inability to maintain control of the airplane as a result of incapacitation by drug effects or an acute cardiac event.

Findings

Not determined	(general) - Unknown/Not determined
Personnel issues	Aircraft control - Pilot
Personnel issues	(general) - Pilot
Personnel issues	Predisposing condition - Pilot
Personnel issues	Use of medication/drugs - Pilot

Factual Information

History of Flight

Maneuvering-low-alt flying	Loss of control in flight (Defining event)

On August 1, 2015, about 0700 central daylight time, an Air Tractor AT-602 airplane, N6007N, impacted terrain following a loss of control near Wilmot, Arkansas. The commercial pilot was fatally injured, and the airplane was substantially damaged. The airplane was registered to and operated by the Baylee Company under 14 *Code of Federal Regulations* Part 137 . Visual meteorological conditions prevailed, and no flight plan was filed for the aerial application positioning flight that originated at Lake Village Municipal Airport (M32), Lake Village, Arkansas, about 0646, and was en route to a grass airstrip 6 nautical miles (nm) east of Wilmot.

GPS data extracted from an onboard Hemisphere Intellistar CPU aerial guidance system showed that the airplane departed M32, climbed to 1,000 ft mean sea level (msl), and proceeded south. About 4 minutes into the flight, the airplane turned to the southwest and began a gradual descent to 500 ft where it leveled off.

About 4 minutes later, the airplane began a rapid climb to 1,000 ft msl and entered a 270° left turn toward the northwest. The airplane's altitude then decreased and then began to increase again as the airplane continued to turn left. The airplane then entered a rapid descent. The recording ended at 0654:24 with the airplane at 520 ft msl, in a descent and turning toward the south at a groundspeed of 150 knots.

At 0938, one of the operator's crewmembers contacted the county sheriff's department and reported that the airplane had not arrived at the grass airstrip where chemical loading operations were to take place. A search was started, and the airplane wreckage was found about 1058 in a cornfield about 2 nm northeast of Wilmot. The accident site was about 18 nm southwest of M32 and about 2 nm to the west of a direct course from M32 to the grass airstrip. No witnesses to the accident were identified.

Pilot Information

Certificate:	Commercial	**Age:**	38,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	None	**Restraint Used:**	5-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	January 23, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 25, 2014
Flight Time:	(Estimated) 13600 hours (Total, all aircraft), 300 hours (Total, this make and model)		

The pilot, age 38, held a commercial pilot certificate with single-engine land airplane rating. On January 23, 2015, he received a second-class medical certificate limited by a requirement to wear corrective lenses when he flew. The pilot did not include his current flight time on the application for this medical certificate.

No pilot logbooks were made available during the investigation. On his previous medical application, on July 1, 2014, the pilot reported 13,600 total hours and 300 hours during the 6 months before the exam. A paper found among the pilot's personal effects showed that he successfully completed a flight review on June 25, 2014.

Aircraft and Owner/Operator Information

Aircraft Make:	AIR TRACTOR INC	**Registration:**	N6007N
Model/Series:	AT 602 NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	2010	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	602-1192
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	December 12, 2014 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	474 Hrs	**Engines:**	Turbo prop
Airframe Total Time:	2669.9 Hrs at time of accident	**Engine Manufacturer:**	Pratt and Whitney
ELT:		**Engine Model/Series:**	PT6A-60AG
Registered Owner:	On file	**Rated Power:**	1050 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	Agricultural aircraft (137)

The single-place, low-wing, turbine-engine-powered airplane, serial number 602-1192, was configured for aerial application. It was equipped with two 108-gallon fuel tanks and was powered by a 1,050-horsepower Pratt and Whitney PT6A-60AG engine, serial number RG0168, and a 5-bladed Hartzell HC-B5MP-3C propeller. A 630-gallon chemical tank was located forward of the cockpit and aft of the firewall.

A review of the airplane maintenance records revealed that the airplane had undergone an annual inspection on December 12, 2014, at a total airframe time of 2,195.6 hours. The Hobbs meter read 2,669.9 hours at the accident site.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KGLH,128 ft msl	**Distance from Accident Site:**	34 Nautical Miles
Observation Time:	06:53 Local	**Direction from Accident Site:**	45°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots / None	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.02 inches Hg	**Temperature/Dew Point:**	21°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	LAKE VILLAGE, AR (M32)	**Type of Flight Plan Filed:**	None
Destination:	Wilmot, AR	**Type of Clearance:**	None
Departure Time:	06:46 Local	**Type of Airspace:**	Class G

At 0653, the automated weather observation station at Mid-Delta Regional Airport, Greenville, Mississippi, 34 nm northeast of the accident site, recorded wind 360° at 5 knots, visibility 10 miles, clear skies, temperature 70°F, dew point 66°F, and altimeter setting 30.02 inches of mercury.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	33.082221,-91.46083

The airplane came to rest in a nose-down, inverted attitude on an impact heading of 060°. The wreckage was confined to an area that was about 35 ft long and 60 ft wide. The main wreckage consisted of the engine cowling, engine, propeller, chemical tank, main landing gear, wings, fuselage, empennage, and tail wheel. Broken 7 to 8 ft tall cornstalks were crushed beneath the wreckage. There were no broken cornstalks in the area surrounding the wreckage.
An impact crater adjacent to the nose of the airplane contained the propeller blades and spinner. A burned area indicative of a postimpact fire was confined to the area beneath and around the engine. The propeller fractured from the engine with mounting flange damage indicating engine torque. The spinner dome was crushed aft around the cylinder, counterweights, and hub components. Two of the five

propeller blades fractured from their respective clamps and were found in the impact crater. All five propeller blades showed leading edge chordwise abrasion, and the two fractured blades had forward/thrust direction bending. Impact marks in the piston and on the blade shanks indicated the propeller angle was in the normal operating range at the time of impact.

The airplane's nose section forward of the firewall, including the engine, chemical tank, and main landing gear, was broken downward and separated. The chemical tank was empty. The front cockpit, instrument panel, and glareshield were broken forward and down.

The left and right wings showed aft and downward leading-edge crushing. The smell of fuel was prevalent at the accident site. The flaps and ailerons remained attached to the wings. Examination of the flap system showed that the flap actuator was extended to a 3 7/8-inch position, corresponding to a flap deflection of 28° or about full flaps. The fuselage aft of the cockpit was intact. The left horizontal stabilizer and elevator were bent forward. The right horizontal stabilizer and elevator were bent aft. The vertical stabilizer and rudder were bent to the right about 25° starting at mid-span. The tail wheel was undamaged.

Flight control continuity was confirmed from the cockpit to all flight control surfaces. An examination of the engine revealed no preimpact anomalies.

Medical and Pathological Information

The Arkansas State Crime Lab, Medical Examiner Division, performed an autopsy on the pilot. The cause of death was reported to be "multiple blunt force injuries." The autopsy identified significant heart disease. All three of the main coronary arteries had atherosclerotic plaque; the left anterior descending and right coronary arteries had luminal narrowing up to 60%, and the left circumflex coronary artery had a focal area of 20% maximum luminal narrowing. None of the coronary arteries had evidence of thrombosis, prior scarring, or muscle injury.

The autopsy report noted the presence in the pilot's pocket of a "clear plastic bag with a prescription label. In the bag were three medication foils (Suboxone) that had been opened in a similar pattern (as if all three were held together in a stack and were torn open at one time)."

The Federal Aviation Administration's (FAA) Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicology testing of specimens from the pilot. The tests detected buprenorphine, norbuprenorphine (buprenorphine's metabolite), ranitidine, and diphenhydramine in heart blood. All of these substances and naproxen were identified in urine.

Buprenorphine is an opioid medication listed as a Schedule III controlled substance, available in combination with the opioid antagonist naloxone as a film that dissolves in the mouth and is commonly marketed with the name Suboxone. This drug is used in the treatment of opioid addiction. Prescription use of Suboxone is limited under the Drug Addiction Treatment Act, which requires prescribers to have special training and certification. It carries a warning, "may impair mental and/or physical ability for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery)." Overdosing can

cause significant sedation including respiratory depression and death.

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. Diphenhydramine carries the following warning: "may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery)." Compared to other antihistamines, diphenhydramine causes marked sedation; it is also classed as a central nervous system depressant, which is the rationale for its use as a sleep aid. Altered mood and impaired cognitive and psychomotor performance may be observed. In a driving simulator study, a single dose of diphenhydramine impaired driving ability greater than a blood alcohol concentration of 0.100%. The usual therapeutic range is 0250 to 0.1120 ug/ml. The pilot's toxicology results indicated 1.861 ug/ml was detected in heart blood.

Ranitidine is a heartburn medication commonly available over the counter with the name Zantac. Naproxen is a non-steroidal anti-inflammatory analgesic available over the counter with the name Aleve. These medications are not generally considered impairing.At the time of the pilot's most recent medical certificate examination on January 23, 2015, he was 69 inches tall and weighed 195 pounds. He reported a previous eye problem, surgery, and hospitalization related to injuries sustained in a motor vehicle crash in 2007. Among his injuries was a broken neck with spinal cord involvement, which required surgery. He was thought to have fully recovered from these injuries. He reported chronic back pain and the use of ibuprofen to control it. According to his family history, the pilot's father died of a heart attack at age 39.

Administrative Information

Investigator In Charge (IIC):	Liedler, Courtney
Additional Participating Persons:	Matt Disch; FAA; Little Rock, AR Jeff Davis; Pratt & Whitney Canada; Bridgeport, WV Les Doud; Hartzell Propeller, Inc.; Piqua, OH Kyle Schroeder; Air Tractor, Inc.; Olney, TX
Original Publish Date:	August 9, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=91685