National Transportation Safety Board
Aviation Accident Final Report

Location:	Tucson, AZ	**Accident Number:**	WPR17FA057
Date & Time:	01/23/2017, 1233 MST	**Registration:**	N385KA
Aircraft:	BEECH 300	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The pilot and the passenger departed on a cross-country, personal flight in the airplane that the operator had purchased the day before the accident. Shortly after takeoff, after reaching an altitude of about 100 to 150 ft above the runway in a nose-high pitch attitude, the airplane rolled left to an inverted position as its nose dropped, and it descended to terrain impact on airport property, consistent with an aerodynamic stall.

Postaccident examination of the accident site revealed propeller strike marks separated at distances consistent with both propellers rotating at the speed required for takeoff and in a normal blade angle range of operation at impact. Both engines exhibited rotational scoring signatures that indicated the engines were producing symmetrical power and were most likely operating in the mid-to upper-power range at impact. The engines did not display any pre-impact anomalies or distress that would have precluded normal engine operation before impact. No evidence was found of any preexisting mechanical anomalies that would have precluded normal operation of the airplane.

Toxicology testing revealed the pilot's use of multiple psychoactive substances including marijuana, venlafaxine, amphetamine, pseudoephedrine, clonazepam, and pheniramine. The wide variety of psychoactive effects of these medications precludes predicting the specific effects of their use in combination. However, it is likely that the pilot was impaired by the effects of the combination of psychoactive substances he was using and that those effects contributed to his loss of control. The investigation was unable to obtain medical records regarding any underlying neuropsychiatric disease(s); therefore, whether these may have contributed to the accident circumstances 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 exceedance of the airplane's critical angle of attack during takeoff, which resulted in an aerodynamic stall. Contributing to the accident was the pilot's impairment by the effects of a combination of psychoactive substances.

Findings

Aircraft	Yaw control - Capability exceeded (Cause)
Personnel issues	Illicit drug - Pilot (Factor)
	Aircraft control - Pilot (Cause)

Factual Information

History of Flight

Initial climb	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

On January 23, 2017, about 1233 mountain standard time, a Beech 300 airplane, N385KA, was destroyed when it impacted terrain shortly after takeoff from runway 11L at Tucson International Airport (TUS), Tucson, Arizona. The airline transport pilot and the passenger were fatally injured. The airplane was registered to and operated by KAAZ, LLC under the provisions of Title 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed for the cross-country personal flight to Hermosillo (MMHO), Sonora, Mexico.

A witness, who was located about 0.7 mile southwest of the midfield of runway 11L observed the airplane take off and rapidly pitch up during the initial climb. He stated that after reaching an altitude of between 100 to 150 ft above the runway, the airplane suddenly yawed to the left while maintaining a nose-up pitch attitude. The airplane then appeared to slow down that the witness believed it was about to stall. The left wing dropped, the airplane rolled left to the inverted position as the nose dropped, and the airplane struck the ground inverted.

Another witness, who was located near the approach end of runway 11L, described the airplane yawing from left to right while climbing. The airplane then rolled left and eventually became inverted, in a manner he described as similar to a barrel roll. The airplane then exited his field of view.

A surveillance camera, located on the roof of the terminal building 0.2 mile northwest of the impact point, captured the airplane entering its field of view in a level attitude. About 1 second later, the nose dropped, and the airplane rolled to the left and descended. The wings became nearly vertical, and the airplane impacted terrain. The video footage was of a poor quality and airplane's airspeed or altitude could not be determined.

Another surveillance camera, located on a building about 0.7 mile southwest of runway 11L with a northeast-facing field of view that encompassed the control tower and the terminal building, captured the airplane passing in front of the tower in a slight nose-up attitude while gradually climbing before it went out of view. No smoke or vapors were observed coming from the airplane before impact.

Pilot Information

Certificate:	Airline Transport	**Age:**	56, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap Only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without Waivers/Limitations	**Last FAA Medical Exam:**	04/05/2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 15100 hours (Total, all aircraft), 13000 hours (Pilot In Command, all aircraft)		

The pilot, age 56, held an airline transport pilot certificate with an airplane multi-engine land rating and type ratings in DA-200, SA-227, BE300, CL604-605, and CASA 212 airplanes. He held commercial privileges in airplane single-engine land and sea airplanes. The pilot was issued a first-class Federal Aviation Administration (FAA) medical certificate on April 5, 2016, with no limitations.

The pilot did not report his flight experience on his most recent FAA medical certificate application. On the application from July 7, 2014, he reported a total of 12,000 hours flight experience with 400 hours in the last 6 months. On the July 22, 2013, application, he did not report his flight time, and on the October 12, 2012, application, he reported 12,000 hours total with 400 hours in the last 6 months. On the March 15, 2012, application, he reported 9,000 hours total with 500 hours in the last 6 months. The pilot's personal flight logbooks were not available for examination during the investigation.

In a resume submitted to his last employer, dated October 2016, the pilot reported a total flight experience of 15,100 hours, including 13,000 hours as pilot-in-command. He reported 9,500 hours in multi-engine airplanes, over 9,000 hours in turboprop airplanes, 3,500 hours in jet airplanes, and 3,900 hours in amphibious/float airplanes. Between 1979 and 1988, he served on active duty in the United States Air Force. Throughout his aviation career, he flew as a line and corporate pilot for various companies. He also flew in Afghanistan and Iraq as a contracted pilot through the Air Force and as a captain for various companies in Africa and Saudi Arabia.

Aircraft and Owner/Operator Information

Aircraft Make:	BEECH	**Registration:**	N385KA
Model/Series:	300 300	**Aircraft Category:**	Airplane
Year of Manufacture:	1985	**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	FA42
Landing Gear Type:	Tricycle	**Seats:**	
Date/Type of Last Inspection:	01/19/2017,	**Certified Max Gross Wt.:**	14000 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Prop
Airframe Total Time:	9962.7 Hours as of last inspection	**Engine Manufacturer:**	P&W CANADA
ELT:	C126 installed, not activated	**Engine Model/Series:**	PT6A-60A
Registered Owner:	KAAZ LLC	**Rated Power:**	1127 hp
Operator:	KAAZ LLC	**Operating Certificate(s) Held:**	None

The eight-seat, twin-engine, low-wing, retractable-landing-gear airplane, serial number FA-42, was manufactured in 1985. It was powered by two Pratt & Whitney PT-6A-60, 1,050-horsepower turboprop engines. Each engine drove a Hartzell HC-B4MP-3B four-bladed constant-speed propeller with feathering and reversing capabilities. Review of maintenance records showed that the most recent airframe, engine, and propeller inspections were completed on January 19, 2017, at a total airframe time of 9,962.7 hours.

On January 22, 2017, the airplane was flown from Long Beach, California, to Tucson, Arizona as a pre-buy and post-maintenance test flight in order for KAAZ, LLC to purchase the airplane. During that flight, the airplane was still under the ownership of the seller. The flight was conducted by the seller's contracted pilot, with the accident pilot and a pilot- rated passenger on board. The seller's contracted pilot reported that during the flight, the accident pilot did not fly the airplane. After completion of the flight, sale's transactions were finished, and the airplane's ownership was transferred to KAAZ, LLC. In a post-flight conversation with the KAAZ, LLC's representative, the accident pilot reported no issues with the airplane, and the representative had the impression that the accident pilot had flown the airplane. The representative further stated that she had been told that the pilot-rated passenger would be the pilot -in -command and that the accident pilot would be allowed to fly the airplane during the flight; the representative was not aware that the accident pilot did not fly the airplane during this flight and was unaware of the seller's contracted pilot's presence in the airplane.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	KTUS, 2555 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	1153 UTC	**Direction from Accident Site:**	322°
Lowest Cloud Condition:		**Visibility**	10 Miles
Lowest Ceiling:	Overcast / 5500 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	15 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.93 inches Hg	**Temperature/Dew Point:**	18°C / 4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tucson, AZ (TUS)	**Type of Flight Plan Filed:**	IFR
Destination:	Hermosillo, FN (MMHO)	**Type of Clearance:**	IFR
Departure Time:	1232 MST	**Type of Airspace:**	

The TUS special weather observation at 1240 reported wind from 240° at 12 knots gusting to 22 knots, visibility 10 miles, ceiling overcast at 6,000 ft above ground level, temperature 19°C, dew point 6°C, and altimeter 29.89 inches of mercury.

The 2-minute average wind in the 5-minute period surrounding the time of the accident was from 230° magnetic at 13 to 15 knots with gusts to 22 knots. Runway 11L had a magnetic heading of 123°, which resulted in a 12- to 14-knot crosswind and a 4-knot tailwind based on the sustained wind and a 21-knot crosswind and a 6-knot tailwind based on the peak wind gust. For further weather information, see the meteorological factual report in the public docket for this investigation.

Airport Information

Airport:	TUCSON INTL (TUS)	**Runway Surface Type:**	Asphalt
Airport Elevation:	2643 ft	**Runway Surface Condition:**	Dry
Runway Used:	11L	**IFR Approach:**	None
Runway Length/Width:	10996 ft / 150 ft	**VFR Approach/Landing:**	None

TUS is a tower-controlled airport located at an elevation of 2,643 ft mean sea level (msl). The airport is equipped with three asphalt runways: 11L/29R, which is 10,996 ft long, 11R/29L, which is 8,408 ft long, and 3/21, which is 7,000 ft long.

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:**	32.116111, -110.941111 (est)

The accident site was located on the ramp adjacent to the south terminal. The initial impact point was about 4,000 ft from the departure end of runway 11L. A debris path led north from the impact point about 650 ft across the ramp to the main wreckage, which was resting against an 8-ft-tall concrete wall. A postimpact fire damaged the wreckage. All major structural components of the airplane were located within the wreckage debris path.

The first identified point of contact (FIPC) was a slash mark from the left propeller on the ground located about 250 ft from the terminal building. Four propeller strike marks created by the left propeller and three propeller strike marks created by the right propeller were observed with 25 to 27 inches distance between each mark. According to the representative from Hartzell Propeller Inc., those distances suggested rotation at or near the rated speed of 1,700 rpm at the estimated impact velocity.

The debris path from the FIPC to the main wreckage was marked by charred, black burned stains and smudges. A portion of the right wing spar was separated and found 52 ft from the FIPC. The right wing tip separated from the wing and came to rest 223 ft from the FIPC. The left propeller assembly was found 470 ft east of the FIPC. Three out of four propeller blades were still attached to the hub. The fourth blade was found near the main wreckage.

The main wreckage consisted of the cabin, fuselage, portions of both wings, a compression section of the right engine, a compression section and accessory gearbox of the left engine, the right propeller, and the empennage. These components were damaged by the impact and burned by the postimpact fire.

The right propeller assembly was located under the wreckage. Three blades were attached to the hub; the fourth blade was located 460 ft north of the main wreckage. The cockpit area was displaced rearwards into the cabin. The instrument panel was mostly consumed by fire.

The left wing was separated from the fuselage; both aileron cables were separated at the root. The aileron bellcrank was attached to the spar, and the cable was attached from the bellcrank to the root. The inboard portion of the right wing was held on to the fuselage by flight control cables only.

The left and right flaps were in their retracted positions on the flap tracks. The left flap

actuators were separated from their drive cables. The left inboard flap actuator measured at 4 inches, which corresponded to a 10° extended position. The left outboard flap actuator was partially melted, and its position could not be determined. The right inboard and outboard flap actuators measured at 2.2 inches, which corresponded to a retracted position.

The empennage separated from the fuselage on the left side and was bent to the right. The right side of the empennage was still attached to the fuselage by its skin. The emergency locator transmitter was located in the empennage area, and it was intact.

The elevator cable was connected to bellcrank, and both pushrods were connected to the elevator. The right and left elevator trim actuators measured at 1.5 inches and 1.4 inches, respectively, which corresponded to a 10° tab-down position. Both cables were connected to the rudder trim servo actuator. The rudder boost switch was found in the "RUDDER BOOST" position.

The main and nose landing gear were found in the up (retracted) position. Flight control cable continuity was established from each cockpit control to the associated flight control.

The left engine power section and the propeller were impact-separated from the engine. The power turbine shaft was fractured, and the exhaust duct was severely compressed. Circumferential rubbing and machining were displayed on the compressor turbine, the power turbine guide vane, the interstage baffle, and the power turbines from contact with their adjacent components under impact loads and housing deformation.

The right engine power section, the propeller, the propeller shaft section of the front reduction gearbox, the accessory gear box, and three stages of the compressor were impact-separated from the engine. The power turbine shaft was fractured, and the exhaust duct was severely compressed. Circumferential rubbing and machining were displayed on the compressor turbine, the power turbine guide vane, the interstage baffle, and the 2nd stage power turbine from contact with their adjacent components under impact loads and housing deformation.

Both engines exhibited rotational scoring signatures that indicated they were producing symmetrical power and, according the Pratt and Whitney specialist, were most likely operating in the mid- to upper-power range at impact. The engines did not display any preimpact anomalies that would have precluded normal engine operation.

The blades of both propellers had deep chordwise/rotational scoring on their camber sides. There were no discrepancies noted that would have prevented or degraded normal operation before impact. All damage was consistent with high impact forces. According to the Hartzell Propeller specialist, both propellers were rotating under power and in the normal blade angle range of operation at impact; neither propeller appeared feathered or near the reverse stop. In comparing damage between the propellers, the right propeller had damage suggesting it was operating at a higher blade angle and power than the left propeller.

The pilot occupied the front left seat and was using the 4-point restraint system. The passenger occupied the front right seat, and the restraint system was found unbuckled.

Medical And Pathological Information

The Pima County Office of the Medical Examiner, Tucson, Arizona, performed an autopsy of the pilot and determined the cause of death to be the result of blunt force and thermal injuries. No significant natural disease was identified.

Toxicology testing performed by AXIS Forensic Toxicology at the request of the medical examiner found tetrahydrocannabinol (THC, the primary psychoactive substance in marijuana) at 6.4 ng/ml and its inactive metabolite, 11-carboxytetrahydrocannabinol (THC-COOH), at 22.8 ng/ml in cavity blood. In addition, amphetamine at 238 ng/ml and pseudoephedrine at 452 ng/ml were found in cavity blood. Amphetamine and 7-aminoclonazepam were detected in urine.

Toxicology testing performed by the FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, identified venlafaxine and its metabolite O-desmethylvenlafaxine, alfuzosin, and pseudoephedrine in liver and cavity blood. In addition, amphetamine was found at 265 ng/ml, THC at 10.9 ng/ml, and THC-COOH at 15.1 ng/ml in cavity blood. Amphetamine and pheniramine were detected in liver; THC was detected in lung; and THC-COOH was detected in liver and urine.

Marijuana has mood altering effects, including inducing euphoria and relaxation. Specific performance effects include decreased ability to concentrate and maintain attention, and impairment of hand-eye coordination. Impairment in retention time and tracking, subjective sleepiness, distortion of time and distance, vigilance, and loss of coordination in divided attention tasks have been reported.

Postmortem test results for marijuana may not indicate antemortem levels. Marijuana has been demonstrated to have clinical effects at levels as low as 0.001 µg/ml. While significant performance impairments are usually observed for at least 1 to 2 hours following marijuana use, residual effects have been reported up to 24 hours, even when the blood level is undetectable.

Amphetamine is a Schedule II controlled substance that stimulates the central nervous system and is available by prescription for the treatment of attention deficit disorder and narcolepsy; commonly marketed names include Adderall, Dexedrine, and Vyvanse. It carries a warning about its potential for abuse and has warnings about an increased risk of sudden death and the potential for mental health and behavioral changes. After a single 30 mg oral dose, early blood levels averaged 0.111 µg/ml, and average blood levels in adults using the long acting prescription orally for a week were about 0.065 µg/ml. However, amphetamine is also prepared and used as a street drug, often by snorting, inhaling, or injecting. Generally, levels above 0.2 µg/ml (200 ng/ml) are the result of misusing amphetamine to maximize its psychoactive effects.

In the early phase, amphetamine misusers may experience a combination of euphoria, excitation, exhilaration, rapid flight of ideas, increased libido, rapid speech, motor restlessness, hallucinations, delusions, psychosis, insomnia, reduced fatigue or drowsiness, increased alertness, a heightened sense of well-being, stereotypes behavior, feelings of increased physical strength, and poor impulse control. As the initial effects wear off, users commonly experience dysphoria, restlessness, agitation, and nervousness; they may experience paranoia, violence, aggression, a lack of coordination, delusions, psychosis, and drug craving.

Pseudoephedrine available from behind-the-counter without a prescription in multiple products used to treat nasal congestion. It is commonly marketed with the name Sudafed. It may cause sleeplessness and excitability and exacerbate the effects of other stimulants.

7-aminoclonazapam is a metabolite of clonazepam that is excreted into the urine. Clonazepam is a sedating benzodiazepine used to treat some types of seizures and to calm patients with anxiety and panic disorders. It is commonly marketed with the name Klonopin and carries this warning, "Since clonazepam produces CNS [central nervous system] depression, patients receiving this drug should be cautioned against engaging in hazardous occupations requiring mental alertness, such as operating machinery or driving a motor vehicle. They should also be warned about the concomitant use of alcohol or other CNS-depressant drugs during clonazepam therapy."

Venlafaxine is a prescription antidepressant commonly marketed with the name Effexor that is used in the treatment of major depression. O-desmethylvenlafaxine is its major active metabolite. Major depression itself is associated with significant cognitive degradation, particularly in executive functioning. The cognitive degradation may not improve even with remission of the depressed episode, and patients with severe disease are more significantly affected than those with fewer symptoms or episodes. This is the reason depression is a disqualifying condition for pilot medical certification. The FAA will consider a special issuance of a medical certificate for depression after 6 months of treatment if the applicant is clinically stable on one of four approved medications; venlafaxine is not one of them.

Alfuzosin is a prescription medication used to treat the symptoms of an enlarged prostate that may also decrease blood pressure. It is not generally considered impairing.

Pheniramine is a sedating antihistamine used primarily in over-the-counter allergy products and eye drops in the United States.

The investigation was unable to obtain medical records regarding any underlying neuropsychiatric disease(s); as a result, whether these were adequately controlled could not be determined.

Administrative Information

Investigator In Charge (IIC):	Maja Smith	**Adopted Date:**	10/10/2018
Additional Participating Persons:	Craig Tompkins; FSDO; Scottsdale, AZ Henry Soderlund; Textron; Wichita, KS Denise Wilson; DesertJet; Palm Springs, CA Les Doud; Hartzell Propeller,Inc.		
Publish Date:	10/10/2018		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=94637		