Aviation Investigation Final Report

Location:	Cameron, Missouri	**Accident Number:**	CEN15FA282
Date & Time:	June 27, 2015, 13:53 Local	**Registration:**	N877UP
Aircraft:	CHRISTEN INDUSTRIES INC PITTS S-2B	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Air race/show		

Analysis

The pilot was performing a series of aerobatic flight maneuvers at a low altitude during an airshow. Another airshow pilot, who was familiar with the accident pilot's airshow routine, reported that the accident pilot intended to do a 45-degree knife-edge climb, perform a "Lomcevak" maneuver, and then continue the knife-edge climb. Video recordings taken by persons on the ground showed the airplane in a knife-edge climb. The pilot then entered the Lomcevak maneuver by performing a climbing snap-roll to the left. The airplane pitched nose-down and tumbled two times to the left while descending. Rather than returning to the knife-edge climb, the airplane instead entered a left spin and completed about two and a half revolutions before it impacted the terrain. The video recordings indicated that the engine was operating throughout the flight to ground impact.

A postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. A review of medical, pathological, and toxicological information revealed no evidence of any medical condition or substance that would have contributed to the pilot's loss of control during performance of aerobatic maneuvers.

Probable Cause and Findings

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

The pilot's failure to maintain airplane control during a low-level aerobatic flight maneuver.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Not attained/maintained

Factual Information

History of Flight

Maneuvering-aerobatics	Loss of control in flight (Defining event)
Maneuvering-aerobatics	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On June 27, 2015, about 1353 central daylight time, a Christen Industries Pitts S-2B, N877UP, sustained substantial damage when it impacted terrain during an aerobatic flight at the Cameron Memorial Airport (EZZ), Cameron, Missouri. The airline transport pilot received fatal injuries. The airplane was registered to and operated by the pilot under the provisions of the 14 Code of Federal Regulations as a Part 91 airshow flight. Day visual meteorological conditions prevailed for the airshow demonstration flight that departed from EZZ about 1340. No flight plan was filed.

The pilot's flight demonstration card used during the airshow indicated that he planned to do 10 aerobatic maneuvers during the flight. For the ninth maneuver, it indicated that he planned to do a Lomcevak maneuver, an advanced aerobatic maneuver. An airshow pilot who was familiar with the accident pilot's airshow routine, reported that the accident pilot intended to do a 45-degree knife-edge climb, perform the Lomcevak maneuver, and then continue the knife-edge climb.

Video recordings taken by persons on the ground showed the airplane flying the planned routines. The eighth aerobatic maneuver was a steep climb maneuver to a near stalled condition that the pilot titled a "chopper (helicopter) pass." After the chopper pass, the airplane entered a dive to gain airspeed. It then flew straight and level for about 5 seconds before doing a course reversal by pulling up into a left climb and then turning back to the right before diving down to gain airspeed. Then it pulled up and flew straight and level for about 4 seconds before entering into about a 30-degree knife-edge climb. During the knife-edge climb, the airplane appeared to enter the Lomcevak maneuver by doing a climbing snap-roll to the left. The nose of the airplane pitched down and the airplane tumbled two times to the left while descending. The airplane entered a left spin and completed about two and a half revolutions before it impacted the terrain.

Pilot Information

Certificate:	Airline transport	**Age:**	50,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Helicopter; Instrument airplane; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	February 15, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	11000 hours (Total, all aircraft), 200 hours (Total, this make and model)		

The 50-year-old pilot held an airline transport pilot certificate with single-engine land, multi-engine land, helicopter, airplane instrument, and helicopter instrument ratings. He was also an instructor pilot with airplane single-engine, multi-engine, helicopter, airplane instrument, and helicopter instrument instructor ratings. He held a first class medical certificate issued in February 15, 2015. The pilot completed an insurance application on August 25, 2014, that indicated that he had a total of 11,000 flight hours with 200 hours in the accident airplane make and model. The pilot held a Level 3 Statement of Aerobatic Competency from the Federal Aviation Administration for solo aerobatics with a 500 ft base altitude limit in Pitts airplanes. The Level 3 flight evaluation was conducted on May 7, 2015.

Aircraft and Owner/Operator Information

Aircraft Make:	CHRISTEN INDUSTRIES INC	**Registration:**	N877UP
Model/Series:	PITTS S-2B	**Aircraft Category:**	Airplane
Year of Manufacture:	1985	**Amateur Built:**	
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	5080
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	May 1, 2015 Annual	**Certified Max Gross Wt.:**	1700 lbs
Time Since Last Inspection:	13 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1819 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	AEIO-540-D4A5
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane was a Christen Industries factory-built, tandem two-seat, experimental single-engine Pitts

S-2B biplane manufactured in 1985. It was equipped with a 300-horsepower aerobatic Lycoming AEIO-540-D4A5 engine, serial number L-22892-48A. The engine powered a 3-bladed MT propeller. The most recent annual maintenance inspection was conducted on May 1, 2015, with a total aircraft time on 1,806 hours. The airplane had 1,819 total hours at the time of the accident. The engine had a total time of 141.2 hours since the last overhaul.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	MCI	**Distance from Accident Site:**	33 Nautical Miles
Observation Time:	13:53 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:	Scattered / 4600 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.1 inches Hg	**Temperature/Dew Point:**	26°C / 16°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Cameron, MO (EZZ)	**Type of Flight Plan Filed:**	None
Destination:	Cameron, MO (EZZ)	**Type of Clearance:**	None
Departure Time:	13:40 Local	**Type of Airspace:**	

At 1353, the surface weather observation at Kansas City International Airport (MCI), located 33 nm northwest of EZZ, was: wind variable at 5 kts; visibility 10 miles; sky condition scattered clouds at 4,500 ft; temperature 26 degrees C; dew point 16 degrees C; altimeter 30.10 inches of mercury.

Airport Information

Airport:	Cameron Memorial Airport EZZ	**Runway Surface Type:**	Asphalt
Airport Elevation:	1040 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	35	**IFR Approach:**	None
Runway Length/Width:	4000 ft / 75 ft	**VFR Approach/Landing:**	None

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:**	39.726665,-94.279167

The airplane impacted the trees and terrain in a shallow nose down attitude with a high vertical descent rate. The engine compartment, fuselage, wings, and empennage exhibited crushing and buckling from the ground impact, but the airplane remained intact. There was no post impact ground fire. The engine compartment exhibited upward crushing, and the leading edges of the wings did not exhibit aft crushing. Flight control continuity was confirmed from all flight control surfaces to their respective cockpit controls. The elevator trim continuity was confirmed from the elevator trim tabs to the elevator trim control.

The engine was shipped to the manufacturer for examination. The examination revealed that the damage to the engine would not preclude an engine run on a test stand. Due to impact damage, the following slaved parts were used during the engine run test: fuel servo, magneto harness, 2 spark plugs, 3 intake pipes, oil supply hoses, fuel supply hoses, oil filter base, fuel pump, and starter support. The engine was installed in an engine test cell for an engine run. The engine was started and operated at the following points: 1) warm up at 1,500 rpm for 5 minutes; 2) run at 1,800 rpm for 5 minutes; 3) run at 2,200 rpm for 5 minutes; 4) magneto check at 2,200 rpm; 5) rated run at 2,700 rpm for 10 minutes; 6) idle run for 5 minutes; and 7) manual acceleration check. The engine passed all points within the prescribed limits of the engine run.

The fuel pump was examined. It displayed significant damage, including several cracks in the body, and separation at the screw-fastened interface between two of the subcomponents, and with two of the screws no longer in their installed position, and others loose. The screws and their mating, threaded holes were examined. None of the screws were broken, but all of them had metallic material present in their lower threads, along with some hardened, blue colored nonmetallic substance consistent with a cured thread locking compound. The mating, internal threads in the pump body were severely stripped.

Medical and Pathological Information

The autopsy of the pilot was performed at the Frontier Forensics Morgue, Kansas City, Missouri, on June 28, 2015. The cause of death was from multiple blunt force injuries sustained in an airplane accident. A Forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aerospace Medical Institute. No carbon monoxide was detected in the blood (cavity). No ethanol was detected in the vitreous. Azacyclonol was detected in the urine but not detected in the blood (femoral). Fexofenadine was detected in the urine and the blood (femoral). Ibuprofen was detected in the urine.

Fexofenadine is a non-sedating antihistamine available over the counter; it is commonly marketed with the name Allegra. Ibuprofen is a non-steroidal anti-inflammatory medication available over the counter with the names Motrin and Advil.

Tests and Research

The National Transportation Safety Board's (NTSB) Vehicle Recorder Division received three image files containing video and audio that captured the accident. The recorder laboratory correlated the videos to local time and a summary of the flight was made. In brief, the video files showed the aircraft performing aerobatic maneuvers while producing a smoke oil trail throughout the flight.

At 1351:56, the aircraft was straight and leveled as it prepared for its next maneuver two seconds later.

At 1351:58, the aircraft began to climb. The smoke oil trail indicated a constant angle climb. Two seconds later the aircraft rolled left wing down as it continued its constant angle climb.

At 1352:02, the aircraft performed a 360 degree rolling maneuver which resulted in the aircraft tumbling toward the ground. The tumble was similar to an aerobatic maneuver known as the "Lomcevak". At this time, the sound of the engine became faint and the trailing smoke oil began to dissipate.

At 1352:11, the aircraft continued tumbling and smoke oil trails became visible again when the sound of the engine became noticeable again. The sound of the engine and smoke oil trails remained noticeable until impact.

At 1352:12, the aircraft ended its tumble but continued nose down descending toward the ground.

At 1352:13, the sound of the engine ends as the aircraft impacted the ground.

Additional Information

The Lomcevak is a family of aerobatic flight maneuvers where the aircraft, with almost no forward airspeed, rotates on chosen axes due to gyroscopic precession and torque of the rotating propeller. One type of Lomcevak is an when the pilot follows a knife-edge roll by flipping the airplane end-over-end and into a spin, from which the pilot then recovers control of the airplane.

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	James T Seabolt; FAA Kansas City FSDO; Kansas City, MO Judson Rupert; Lycoming Engines; Williamsport , PA
Original Publish Date:	January 11, 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=91442