



Aviation Investigation Final Report

Location:	Loa, Utah	Accident Number:	SEA07GA142
Date & Time:	June 1, 2007, 08:25 Local	Registration:	N9602R
Aircraft:	Christen Industries A-1	Aircraft Damage:	Substantial
Defining Event:		Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Public aircraft - federal		

Analysis

The pilot and gunner were participating in a low-level, aerial predatory control operation. They were operating over terrain that was approximately 8,300 feet above mean sea level. While maneuvering in a turn at slow airspeed to make an additional pass over an area with coyotes, the airplane impacted the ground with the right wing tip, and then came to rest inverted. A witness, who was working with the pilot from the ground, was in a drainage wash while the airplane circled overhead. They had just identified a coyote den and there were coyotes traversing up and down the wash. The airplane went out of the witness's view, and then the witness heard the impact of the airplane with the ground. No evidence of any preimpact mechanical anomalies was discovered. Weight and balance calculations showed that the airplane was out of its aft center of gravity limits by 1.6 inches, which would result in less stable flight characteristics, especially during slow flight. Previous accidents involving similar flight regimes have been associated with wake vortices encounters. Although it is possible that the airplane encountered its own wake vortices, this could not be determined with the available evidence. Based on standard atmospheric conditions and the temperatures at the closest reporting stations, the density altitude would have been about 10,000 feet.

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 an adequate airspeed during low altitude maneuvering flight that resulted in a stall. The pilot's decision to operate the airplane at a center of gravity beyond the rear limit, the low altitude of the flight, and the high density altitude were contributing factors.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT

Phase of Operation: MANEUVERING

Findings

1. (F) WEATHER CONDITION - HIGH DENSITY ALTITUDE
 2. (F) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND
 3. (F) LOW ALTITUDE FLIGHT/MANEUVER - ATTEMPTED - PILOT IN COMMAND
 4. (C) AIRSPEED - INADEQUATE - PILOT IN COMMAND
 5. (C) STALL/MUSH - ENCOUNTERED - PILOT IN COMMAND
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Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Findings

6. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On June 1, 2007, at 0825 mountain daylight time, a Christen Industries A-1 (Husky), N9602R, collided with rugged terrain approximately 10 statute miles west of Loa, Utah. The United States Department of Agriculture (USDA) was operating the airplane that was owned by the Utah Department of Agriculture and Food as a public use flight under the provisions of 14 Code of Federal Regulations Part 91. The commercial pilot and the passenger (who was serving as a gunner) were killed. The airplane was substantially damaged. Visual meteorological conditions prevailed, and USDA flight tracking procedures were in effect at the time of the accident. The airplane departed from Richfield Municipal Airport, Richfield, Utah, at 0630.

According to USDA personnel, the purpose of the flight was to conduct aerial predator control operations. The operations were conducted through an agreement between the state of Utah and the federal government. The flight had been scheduled as a result of confirmed reports from a local ranch owner that lambs were being attacked and killed by coyotes.

A witness, who was employed by the state of Utah as a Predatory Tracker and in radio contact with the pilot and gunner, described the accident sequence. The witness stated that there were multiple coyotes in the area at the time of the accident. He was located on the western slope of a draw that ran from southwest to northeast. He was approximately 200 yards from, and 75 feet lower than the accident site. The witness recalled the airplane flying over him, and then making a left turn to pass behind and to the eastern slope of the draw. As the airplane flew over the eastern edge of the draw in a northeasterly direction, the witness lost sight of it. He then heard a loud crashing noise, followed by complete silence. A post impact fire erupted shortly thereafter. He further stated that there were no distress calls from the pilot or gunner. The witness stated that up until the accident, the operation was proceeding "normally."

A USDA pilot reviewed information provided by the witness and the details of the accident site. Based on his experience, the pilot indicated that under normal circumstances, the accident pilot would have made a left turn and transitioned southwest-bound to the area of the Predatory Tracker, to once again attain the coyotes near the tracker. However, if the pilot/gunner identified other coyotes that ran out of the wash, they may alter their course. The USDA pilot stated the location of the accident site was consistent with the pilot making a left turn, with the intention of returning to the area of the Predatory Tracker.

PERSONNEL INFORMATION

Pilot Information

The 32 year old pilot held a commercial pilot certificate for single and multi-engine airplanes, and an instrument rating. The pilot's last medical certificate was a second class, issued in August of 2006.

The pilot's last annual USDA Pilot Evaluation Check occurred on August 30, 2006. At the time, the pilot reported 2,261 hours of total time, with 2,081 hours pilot in command time. Over the 7 months leading up to the check, the pilot accrued 709 hours. The pilot indicated 1,225 hours conducting predatory operations, with 875 hours in the Husky and 350 hours in the Piper Super Cub.

Using the USDA daily pilot log reports, the pilot had flown 180.8 hours over the 90 days prior to May 26, 2007, all in the accident airplane. Time records for the week of the accident had not been transferred to the computer system and were most likely destroyed during the accident. Interviews with USDA personnel indicated that the pilot flew 14 hours from May 29, until the date of the accident.

According to the USDA, prior to working in Utah, the pilot worked for 18 months in Colorado, operating in mountainous terrain up to 12,000 feet mean sea level. The pilot had been operating in Utah for approximately 1 year. His last stall/spin awareness training was completed in December of 2006.

Passenger Information

The passenger had been employed by the USDA for 18 years. During his employment with the USDA, he worked as a gunner for 15 years. He had been flying with the pilot since the pilot's arrival in Utah.

AIRCRAFT INFORMATION

General Aircraft History

The airplane was manufactured in 1989. It was powered by a Textron Lycoming O-360-C1G engine equipped with a Hartzell model HC-C2YR-1BF propeller. The last annual inspection was completed on September 15, 2006. The last 100-hour inspection was completed on April 27, 2007, at a total 6,869.4 hours airframe total time and 298.4 hours tachometer time.

The airplane was issued a special airworthiness certificate on September 15, 2006, for operations in the restricted category for agricultural purposes. The provisions of the issuance were set forth in the Aviat Aircraft Inc. Service Bulletin (SB) No. 14, dated April 2, 1999. Under this certificate, the airplane was required to be maintained through normal annual and 100-hour inspections as well as the special airworthiness annual/100 hour inspection. According to SB No. 14, operation was authorized in the restricted-category at gross weights up to 2,100 pounds. The SB also put into effect life-limited hardware for the modification.

At the time of the accident, the airplane's weight was approximately 1,940 pounds and the center of gravity (CG) was 77.808 inches. According to the airplane flight manual supplement for operations from 1,910 to 2,100 pounds, the CG range varied from 72.5 to 76.2 inches. At 1,940 pounds, the supplement showed that the forward CG limit was 74.7 inches and the maximum aft CG limit was 76.2 inches. USDA procedures required that a weight and balance calculation be completed prior to each flight.

Fueling

The last fueling of the airplane was at Richfield. Based on interviews with USDA personnel, the airplane would have departed with 1/2 or 3/4-full tanks for the flight.

METEOROLOGICAL INFORMATION

Milford Municipal/Ben and Judy Briscoe Field Airport, located 57 nautical miles west of the accident site, was reporting the following conditions at 0852 the morning of the accident: clear skies, winds from 230 degrees at 3 knots, 10 statute miles visibility, temperature of 18 degrees Celsius, dew point of minus 5 degrees Celsius, and 30.02 inches of Mercury.

The witness reported calm winds at the accident site.

WRECKAGE AND IMPACT INFORMATION

The accident occurred on the Awapa Plateau in the area of Parker Mountain. The immediate terrain consisted of rolling landscape and low-growing sagebrush. The accident site was at an elevation of about 8,300 feet mean sea level (msl). The wreckage was on the eastern edge of a draw that descended to an elevation of 8,216 feet. The draw continued down slope where the terrain opened on each side.

The first identified point of impact was located 65 feet from the main wreckage. Forward 7 feet and on a bearing of 245 degrees was a crater in the soft soil that contained a navigation light housing and green lens fragments. Moving forward 12 feet there was a deep crater. Forward approximately 10 feet, a propeller tip, cockpit map light, and Plexiglas shards were identified. To the main wreckage 20 feet, there was an additional gouge in the soil, with identified portions of the right main landing gear. The main wreckage was located 12 feet forward from this point, inverted and on a heading of 095 degrees. The wings were canted slightly aft relative to the fuselage.

The airplane and engine sustained extensive fire damage. Fabric covering remained on the empennage and the mid to outboard section of the left wing. All control surfaces remained attached to the aircraft structure. The right wing and elevator sustained crush damage at their tips. Control cables were traced throughout the wreckage. Investigators noted that the flap cable at the pulley was off its track and pinched between the pulley and its mounting clamp. It

could not be moved. There was no evidence of rubbing on the pulley track.

The engine control cables were traced from the carburetor to the cockpit area. The throttle and mixture connections to the carburetor were melted from it, but continuous to the cockpit. The engine was extensively damaged and the piston heads for cylinders 1 and 3 were exposed. The cylinder housings were removed and investigators examined the internal case. Cylinders 2 and 4 were borescoped and there was no evidence of peening on the cylinder walls. The top spark plugs from cylinders 2 and 4 were removed. Their gapping was similar and consistent. The accessory case was removed. All of the gears were intact. The oil pump was examined and no damage was evident. The oil screen was removed and found to be clean as well as the propeller governor screen. The magnetos were destroyed by fire.

The Hartzell propeller was examined. Blade 1 was curled at mid-span and its tip contained leading edge gouging. Blade 2 was missing its tip (located in the debris path leading up to the wreckage).

Examination of the recovered airframe, flight control system components, engine, and system components revealed no evidence of preimpact mechanical malfunction.

MEDICAL AND PATHOLOGICAL INFORMATION

The Utah State Office of the Medical Examiner, Salt Lake City, Utah, completed an autopsy on the pilot. The FAA Bioaeronautical Research Laboratory, Oklahoma City, Oklahoma, completed toxicological testing on specimens of the pilot. The results were negative for carbon monoxide, cyanide, ethanol, and tested drugs.

TESTS AND RESEARCH

Flap Information

A photograph of the flap handle was sent to Aviat Aircraft, Inc. for review to determine the flap setting during the on-site examination. According to the Aviat representative, the flap handle was in a position for 20-degree flap extension.

The Aviat representative was given information regarding the flap cable that was identified between the pulley attach bracket and the pulley. Testing showed that without deformation of the structure, there was not adequate space between the pulley and the bracket for the cable to become lodged. Testing also showed that if the cable had been off the pulley prior to the accident, only limited flap deflection would have been possible.

ADDITIONAL INFORMATION

USDA Pilot Interviews

Several USDA pilots that had flown in the area of the accident were interviewed. They reported that the Parker area was deceiving due to the general layout of the terrain and the high elevation.

One of the pilots, who had about 3,000 hours in the Husky airplane, with 16,000 hours total flight time, reported that the operation was high-risk and the pilots flying the operation know of the hazards involved. The area of the accident site consists of a flat area at 7,000 feet msl, and gradually ascends to 10,000 feet msl. As the terrain ascends, it does so gradually.

The pilot stated that he knew the gunner involved in the accident and they used to fly together. When the gunner began flying with the accident pilot, he told the pilot that the accident pilot knew the operations well and was a safe pilot.

Flight Testing

During the course of this investigation, the retired/contract test pilot for Aviat Aircraft was contacted regarding the flight characteristics of the accident airplane during low-level, orbiting flights, and testing that was accomplished in the early 1990s. He reported that as a result of two Border Patrol accidents, Aviat was requested to flight test the Husky A-1 airplane for its flight characteristics when encountering its own wingtip vortices. During calm wind conditions, in a full flap configuration, approximately one out of seven attempts to fly through the airplane's wingtip and flap vortices would result in a pitch down. At altitude, the airplane would fly out of the pitch down, but the test pilot warned at a low altitude the pilot may not have time to recover the airplane prior to ground impact. The test pilot advised that the best way to avoid this condition was to alter the flight path when performing low-level, orbiting flights to prevent encountering the airplane's wake.

Wingtip Vortices

According to the Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25), "The action of the airfoil that gives an airplane lift also causes induced drag. When a wing is flown at a positive angle of attack, a pressure differential exists between the upper and lower surfaces of the wing- that is, the pressure above the wing is less than atmospheric pressure and the pressure below the wing is equal to or greater than atmospheric pressure. Since air pressure always moves from high pressure toward low pressure, and the path of least resistance is toward the airplane's wingtips, there is a spanwise movement of air from the bottom of the wing outward from the fuselage around the wingtips. This flow of air results in "spillage" over the wingtips, thereby setting up a whirlpool of air called a vortex."

In addition, it states, "The intensity or strength of the wingtip vortices is directly proportional to the weight of the airplane and inversely proportional to the wingspan and speed of the airplane. The heavier and slower the airplane, the greater the angle of attack and stronger the wingtip vortices."

Weight and Balance

The Pilot's Handbook of Aeronautical Knowledge also indicates, "Generally, an airplane becomes less controllable, especially at slow flight speeds, as the CG is moved farther aft." Additionally it states, "This is because when the CG is moved rearward it causes an increase in the angle of attack. Therefore, the wing contribution to the airplane's stability is now decreased, while the tail contribution is still stabilizing. When the point is reached that the wing and tail contributions balance, then neutral stability exists. Any CG movement further aft will result in an unstable airplane."

Pilot Information

Certificate:	Commercial	Age:	32, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Front
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	August 1, 2006
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	December 1, 2006
Flight Time:	2261 hours (Total, all aircraft), 2081 hours (Pilot In Command, all aircraft), 195 hours (Last 90 days, all aircraft), 76 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Christen Industries	Registration:	N9602R
Model/Series:	A-1	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Restricted (Special)	Serial Number:	1119
Landing Gear Type:	Tailwheel	Seats:	2
Date/Type of Last Inspection:	April 1, 2007 100 hour	Certified Max Gross Wt.:	2100 lbs
Time Since Last Inspection:	86 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	6869 Hrs as of last inspection	Engine Manufacturer:	Textron Lycoming
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	O-360-C1G
Registered Owner:	Utah Department of Agriculture and Food	Rated Power:	180 Horsepower
Operator:	United States Department of Agriculture	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KMLF,5039 ft msl	Distance from Accident Site:	57 Nautical Miles
Observation Time:	08:52 Local	Direction from Accident Site:	270°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	3 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	230°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.02 inches Hg	Temperature/Dew Point:	18°C / -5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Richfield Muni, UT (RIF)	Type of Flight Plan Filed:	None
Destination:	Loa, UT	Type of Clearance:	None
Departure Time:	06:30 Local	Type of Airspace:	Unknown

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	1 Fatal	Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	38.396667,-111.820831

Administrative Information

Investigator In Charge (IIC):	Dunks, Kristi
Additional Participating Persons:	Eric McRae; Federal Aviation Administration; Salt Lake City, UT Jacob Wimmer; United States Department of Agriculture; Cedar City , UT Troy Helgeson; Textron Lycoming; Milliken, CO Danny Adams; Aviat Aircraft; Afton, WY Stu Horn; Aviat Aircraft; Afton, WY
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Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=65932

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