Aviation Investigation Final Report

Location:	Springville, California	**Accident Number:**	WPR16FA067
Date & Time:	February 10, 2016, 16:17 Local	**Registration:**	N911TS
Aircraft:	FLIGHT DESIGN GMBH CTLS	**Aircraft Damage:**	Destroyed
Defining Event:	Aerodynamic stall/spin	**Injuries:**	2 Fatal
Flight Conducted Under:	Public aircraft		

Analysis

The airplane, which was owned and operated by the local county sheriff's department, was on a low-altitude observation flight. According to GPS data recovered from the airplane, about 1 minute before the accident, the airplane was flying westbound (heading 242°) over a highway, about 500 feet above ground level (agl), and at a groundspeed of 52 knots. The GPS data and witness observations indicated that the airplane entered a left turn. According to the witnesses, the airplane's wings then dipped left and right, and the airplane descended to ground impact. The witnesses heard the engine operating in a steady tone until ground impact. A postcrash fire ensued, which destroyed the airplane.

Examination of the wreckage did not reveal evidence of any preimpact mechanical malfunctions or anomalies that would have precluded normal operation. The airplane's estimated weight at the time of the accident was about 152 lbs over the airplane's maximum gross weight. Because of the higher gross weight, the airplane's stall speed in a 30° banked turn was 3 knots higher than it would have been at the airplane's maximum gross weight. This resulted in a stall speed of about 48 knots calibrated airspeed, which was near the airplane's recorded groundspeed of 52 knots.

The sun position at the time of the accident was on a bearing of 241° and was 13° above the horizon, indicating that the pilot was looking directly into the sun before the left turn began. Another pilot who flew in the vicinity shortly after the accident reported that when flying westbound over the highway, he was looking straight into the sun, there was a lot of haze, and he could not distinguish the tops of the hills to the left of the highway from the sky. It is likely that the accident pilot was partially blinded by sun glare and did not see the hills rising above him on his left. After he entered the left turn moving away from the sun line, it is likely that the rising terrain suddenly came into view, and he increased the airplane's bank angle in order to avoid the terrain and exceeded the wing's critical angle-of-attack, which resulted in an aerodynamic stall. The altitude the airplane was operating at was too low to allow for a recovery.

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 adequate airspeed while maneuvering at low altitude in hilly terrain, which resulted in the airplane's wing exceeding its critical angle-of-attack and a subsequent aerodynamic stall. Contributing to the accident were the pilot's inability to recognize the rising terrain due to the sun glare and the pilot's operation of the airplane in excess of its gross weight.

Findings

Aircraft	Airspeed - Not attained/maintained
Aircraft	Angle of attack - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Environmental issues	Mountainous/hilly terrain - Contributed to outcome
Environmental issues	Glare - Effect on personnel
Aircraft	Maximum weight - Capability exceeded

Factual Information

History of Flight

Maneuvering-low-alt flying	Abrupt maneuver
Maneuvering-low-alt flying	Loss of control in flight
Maneuvering-low-alt flying	Aerodynamic stall/spin (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On February 10, 2016, at 1617 Pacific standard time, a Flight Design CTLS airplane, N911TS, flying at low altitude entered a hard left turn and descended into terrain 4 miles southwest of Springville, California. The airline transport pilot and single passenger were fatally injured, and the airplane was destroyed by a post-crash fire. The airplane was registered to and operated by the Tulare County Sheriff as a public aircraft under the provisions of 14 Code of Federal Regulations, Part 91. Visual meteorological conditions prevailed for the flight, which operated on visual flight rules company flight plan. The flight originated from Visalia Municipal Airport, Visalia, California, approximately 1446 as a local flight.

Witnesses reported seeing the airplane circling a nearby area at a low altitude, then depart to the southwest. While flying in a westerly direction the airplane made a left turn, the wings dipped left and right, then the airplane descended into the ground in a sideways wing down orientation. The engine was heard operating in a steady tone until ground impact. A post-crash fire ensured, destroying the airplane.

PERSONNEL INFORMATION

The pilot, age 45, held an Airline Transport Pilot certificate, issued on October 11, 2007, with ratings for airplane multiengine land, and commercial privileges for airplane single-engine land, rotorcraft helicopter, and instrument helicopter, and private pilot privileges for gliders. He held a flight instructor certificate with a rating for airplane single engine land issued on June 29, 2014. He held a first-class medical certificate issued on April 2, 2014, with no limitations. Examination of the pilot's civilian logbook revealed that he had 3,675 total civilian flight hours, 3,526.4 hours in single engine airplanes, 1,002.6 hours in the Flight Design CTLS, and his most recent flight review was conducted on December 8, 2015.

The passenger was a Sheriff Deputy who had been employed by the Tulare County Sheriff for about 27 years and had been assigned to the air unit for about a year. His duties as a crew member onboard the airplane was to act as an observer and operate the video camera equipment.

AIRCRAFT INFORMATION

The two-seat, high-wing, fixed-gear airplane, serial number F-11-02-05, was manufactured in 2011. It was powered by a Rotax 912ULS normally aspirated 100-hp engine and equipped with a Sensenich ground adjustable 3-bladed composite propeller. Review of the maintenance logbooks showed that the most recent 100-hour inspection was performed on February 3, 2016, at a total aircraft time of 3,103.9 hours, and a total engine time of 1,103.9 hours.

The basic aircraft was configured as an aerial observation aircraft with the following additional equipment. In the luggage compartment a FM transceiver, mini PC, video interface system, GNSS (global navigation satellite system) receiver, Airlink wireless modem, and a 12V to 28V DC converter. Located on the cabin roof was the GNSS antenna. Located in the cabin was an ARS mapping system, 15-inch LCD monitor, and camera control joy stick. On the bottom of the airplane was a spotlight. Located on the right wing was the video camera pod. Maintenance records showed that the most recent weight & balance performed on August 27, 2015, documented an empty weight plus 90 kg of fuel of 511 kg. Two crewmembers plus 4.5 kg personal gear for each, and a 2.3 kg survival kit added an additional 175.5 kgs. The total weight of the airplane at takeoff was 686.5 kgs. The maximum gross weight as stated in the manufacturers pilot operating handbook is 600 kgs. The center of gravity (cg) was calculated to be 0.448 m (meters) which was within the forward limit of 0.282 m and the aft limit 0.478 m. The airplane had been airborne for 90 minutes before the accident and would have burned about 6 gal of fuel (16.4 kg) which would equate to an aircraft weight at the time of the accident of 669.6 kg.

The Flight Design Pilot Operating Handbook states the following concerning aerodynamic stalls:

"Stalling speed for the CTLS with a weight of 600 kg (1320 lbs) is 72 km/h (39 kcas)with the flaps set at 35°, 77 km/h (42 kcas) with the flaps set at 0° and 90 km/h (44 kcas) with flaps set at -12°. Approaching stall is indicated by a sluggishness around the vertical axis. The controls become "soft" about 5 km/h (3 kts) above stall speed. Release the aft pressure on the stick to increase airspeed. Close to stall the aircraft can only be controlled by rudder and stabilizer. In a stall, the effectiveness of the ailerons is greatly reduced.

When the nose drops during a stall, the aircraft will lose approx. 50 m (165 ft)
altitude. Thus, near the ground a safety minimum speed of approx. 115 km/h (62 kts) should be maintained."

Aviation Circular 23-8C Flight Test Guide states that the following formula can be used to calculate the stall airspeed when the airplane's weight is different than the specified weight, $Vs=Vst\sqrt{(Ws/Wt)}$ where Vs= new stall airspeed, Vst= standard stall airspeed, Ws= new weight, Wt = standard weight. Since the weight of the airplane at the time of the accident is known to be 669.6 kg, the standard weight is 600 kg, and the stall speed with zero flaps of 42 kcas (knots calibrated airspeed), results in a corrected stall speed of 44.4 kcas.

Flight Design provided additional aerodynamic stall information in the form of a stall speed, bank angle, and gross weight table. At a weight of 600 kg and 0° flaps the calculated stall airspeed while in a 15° angle of bank turn is 43 kcas. The stall airspeed in the same configuration at 30° angle of bank is 45 kcas. Using the formula in AC 28-8C to determine stall speeds for the airplane's higher weight of 669.6 kg results in a zero flap stall airspeed at 15° angle of bank of 45.3 kcas, at 30° angle of bank the value is 47.6 kcas, and at 45° angle of bank value is 52.7 kcas.

METEOROLGOICAL INFORMATION

The Porterville Municipal Airport automated weather observation system-3 (AWOS-3), located 11 miles southwest of the accident site, at an elevation of 443 feet mean sea level, recorded at 1556, wind from 300° at 8 knots, visibility 10 statute miles, sky clear, and altimeter setting of 30.18 inHg. A visual inspection of radial velocity observations close to Hanford, CA, located 45 miles west-north-west from the accident site, for altitudes near 1000' msl revealed a wide variety of wind magnitudes, generally below about 7 knots, coming from the northwest or north-northwest. North American Mesoscale model sounding was obtained for the accident area valid at 1600 PST, which identified a wind from about 290° true at 3-4 knots applicable for an altitude of about 1600' msl.

Sun position at the time of the accident was determined by using the National Oceanographic and Atmospheric Administration (NOAA) Solar Calculator. The Sun's position on February 10, 2016, at 1617, as viewed from the accident location was on an azimuth of 241° true and elevation of 13° above the horizon.

A pilot who had flown over the accident site shortly after the accident occurred stated that he was flying out of Springville around 2,000 feet, towards Lake Success, and that the angle the road (Highway 190) was lined up on was straight into the sun and there was a lot of haze. He could not distinguish the tops of the hills from the sky because of the (sun) visibility.

AIDS TO NAVIGATION

A Garmin GPSMAP 496 portable GPS receiver was recovered from the wreckage. The device was sent to the NTSB Vehicle Recorders Laboratory and the data contained within the unit was recovered. The data contained 10 tracklogs from February 4, 2016, through February 10, 2016. The accident flight was recorded starting 1446:36 Pacific standard time (PST) and ending 1614:11 on February 10, 2016. The aircraft departed Visalia Municipal Airport to the northwest at 1456 and turned northeastward. The aircraft briefly orbited a location in the vicinity of Ivanhoe, CA, at 1504, at an altitude of about 550 feet above ground level (agl) and continued eastward. The aircraft proceeded to make a touch and go at Woodlake Airport at 1515. The aircraft continued generally northward following the Friant Kern Canal until reaching a point east of East Orosi, CA, at 1530. The aircraft proceeded southward, briefly orbiting a location approximately 2.5 nautical miles northeast of Farmersville, CA, before continuing southeast. At 1601, the aircraft orbited a location on the northwest corner of Lake Success before continuing eastward. The aircraft maneuvered over a location northeast of Lake Success. At 1613:47 the aircraft was heading 249° true, at 1613:49 heading was 231°, at 1613:59 heading was 230°, and at 1614:00 heading was 242°. The track made a left turn and the last recorded position was at 1614:11 while the aircraft tracked 114.8° true at a GPS altitude of 1,096 feet (400 feet agl) and groundspeed of 52 knots.

WRECKAGE & IMPACT INFORMATION

The wreckage was located on a steep 20° slope covered with green grass, flowering yellow mustard plants, and uneven rock-boulders underneath the vegetation. The wreckage area was 80 feet in length on a bearing of 010° magnetic. The airplane wreckage was inverted pointing from tail to nose on a bearing of 190° magnetic. The airplane structure had been subjected to a post-crash fire that completely consumed the airplane leaving only the black carbon fiber cloth remnants of the airframe. The wings and tail remained attached to the fuselage. The initial point of ground impact consisted of the indentation of

the left main landing gear tire and the left wing tip. Immediately forward of the tire indentation was a 4 foot by 4 foot area of disturbed earth containing fragments from the fiberglass nose cowling. The initial impact was consistent with a high vertical energy component and very little forward velocity energy component.

The horizontal stabilator was partially fire damaged, leaving the outboard sections of the stabilator structure minimally damaged. The vertical stabilizer and rudder were consumed by fire. Both left and right flaps were attached to their respective hinge fixtures. The flap position could not be determined. Both ailerons were in place on each wing and balance weights present. The aluminum push rods connecting the ailerons through the wing to the cockpit were mostly destroyed, however the bell cranks in the wing and hinge points on the aileron were present with the control rod ends attached at each location. The aileron control mixer located in the aft cabin area was located and all attaching hardware was present and fixed in place. The aluminum push rods between the aileron mixer and bell cranks in the wing root were not located (presumed destroyed by fire). The rudder cable ends were located in the cockpit area and the attached turnbuckles were present with rudder bar attaching hardware present and cotter keyed. The cables were traced back to the tail where they remained attached to the rudder horn. The elevator push-pull cable turnbuckle in the cockpit area was separated from the rod end on the control stick torsion tube angle joint. The fractured end of the rod was bent, the fracture surface was angled at 45° and rough, consistent with overload. The push-pull cable was traced to the tail and remained attached to the stabilator bell crank. The balance weight remained attached to the bell crank.

The engine was a Rotax 912ULS, SN: 6783279. External examination revealed extreme heat damage. Fire sleeves that covered the fuel lines and oil lines were fragile and crumbled when touched. Scat tubes disintegrated when touched. All 4 cylinders were attached to the engine case. The reduction gear box remained mounted to the front of the engine. No holes or evidence of uncontained failure was observed. The 3-bladed ICH model propeller hub was attached to the propeller flange. One blade remained attached to the hub. Both carburetors were present and heat damaged. Both throttle and mixture cables remained attached to each carburetor. The accessory section on the back of the engine was destroyed by fire. The oil-air separator was detached from the engine. The oil tank was not attached to the engine. The oil cap was on the oil tank. The top spark plugs of each cylinder were removed and exhibited very light wear, light gray in color, with no mechanical damage observed. The ignition control box was mostly destroyed by extreme heat. The valve covers were removed. All valve arms, push rods, valve springs, were movable when pushed on. The engine crankshaft could not be rotated by hand. No unusual damage or wear was observed.

MEDICAL & PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot February 11, 2016, by a Microcorre Diagnostic Laboratory pathologist who had been retained by the Tulare County Coroner. The listed cause of death was "blunt force injuries."

The Federal Aviation Administration Forensic Toxicology Research Team, at the Civil Aerospace Medical Institute (CAMI) performed forensic toxicology on specimens from the pilot with negative results for carbon monoxide, cyanide, ethanol, and listed drugs.

ADDITIONAL INFORMATION

Some witnesses reported seeing a yellow single engine airplane in the vicinity at the time of the accident. The Tulare County Sheriff investigated and identified the pilot of a yellow Howard DGA15 airplane based out of Bakerfield, CA, who said that he had flown over the accident site sometime after the accident and observed first responders on-scene. He had not witnessed the accident.

Accelerated Stall Information

The Airplane Flying Handbook (FAA-H-8083-3A) states the following concerning accelerated stalls. "At the same gross weight, airplane configuration, and power setting, a given airplane will consistently stall at the same indicated airspeed if no acceleration is involved. The airplane will, however, stall at a higher indicated airspeed when excessive maneuvering loads are imposed by steep turns, pull-ups, or other abrupt changes in its flightpath. Stalls entered from such flight situations are called "accelerated maneuver stalls," a term, which has no reference to the airspeeds involved.

Stalls which result from abrupt maneuvers tend to be more rapid, or severe, than the unaccelerated stalls, and because they occur at higher-than-normal airspeeds, and/or may occur at lower than anticipated pitch attitudes, they may be unexpected by an inexperienced pilot. Failure to take immediate steps toward recovery when an accelerated stall occurs may result in a complete loss of flight control, notably, power-on spins."

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	45,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	3-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	April 30, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 8, 2015
Flight Time:	3675 hours (Total, all aircraft), 1002.5 hours (Total, this make and model)		

Other flight crew Information

Certificate:	None	**Age:**	52,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	None	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	FLIGHT DESIGN GMBH	**Registration:**	N911TS
Model/Series:	CTLS NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	2011	**Amateur Built:**	
Airworthiness Certificate:	Special light-sport (Special)	**Serial Number:**	F-11-02-05
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	February 3, 2016 100 hour	**Certified Max Gross Wt.:**	1323 lbs
Time Since Last Inspection:	28 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3103.9 Hrs as of last inspection	**Engine Manufacturer:**	ROTAX
ELT:		**Engine Model/Series:**	912ULS
Registered Owner:	COUNTY OF TULARE SHERIFFS OFFICE	**Rated Power:**	100 Horsepower
Operator:	COUNTY OF TULARE SHERIFFS OFFICE	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KPTV,443 ft msl	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:		**Direction from Accident Site:**	60°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	300°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.18 inches Hg	**Temperature/Dew Point:**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Visalia, CA (KVIS)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Visalia, CA (KVIS)	**Type of Clearance:**	None
Departure Time:	14:40 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Visalia KVIS	**Runway Surface Type:**	
Airport Elevation:	294 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	36.094722,-118.873336

Administrative Information

Investigator In Charge (IIC):	McKenny, Van
Additional Participating Persons:	Mike Coberly; FAA; Fresno, CA David Williams; Tulare County Sheriff; Visalia, CA Fritz C Bayer; FAA; Fresno, CA Robert Schimpf; Tulare County Sheriff; Visalia, CA
Original Publish Date:	January 18, 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=92707