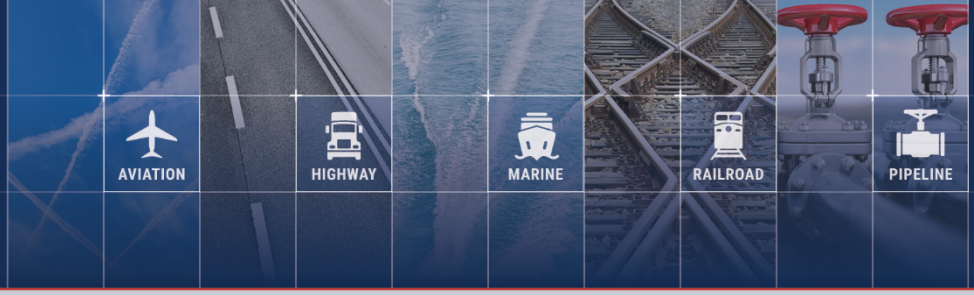

Aviation Investigation Final Report

Location:	ALAMOGORDO, New Mexico	**Accident Number:**	DEN00GA089
Date & Time:	May 15, 2000, 12:33 Local	**Registration:**	N2522S
Aircraft:	Cessna T337C	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

Four minutes after takeoff, the airplane was observed flying straight towards rising terrain (other pilots reported that there had been uplifting air movement there the previous several days). Radar data indicates that the airplane leveled off, and began to slow down. The airplane changed direction and flew over the edge of a 1,000 foot canyon; it then turned north towards rising terrain a second time. A witness said that he couldn't hear any engine sound; he observed the airplane spin towards the ground. He then heard an impact sound, and saw smoke. Examination of the accident site revealed that the airplane impacted the ground in a vertical attitude. The airplane was found with the rear propeller feathered, and the front propeller with no signatures of power. The rear engine fuel selector was found between main and off, and the front engine fuel selector was found on auxiliary. Normal procedure is to fly for an hour after takeoff on the main tanks. Pilots on later flights in this area reported "strong turbulence and very strong variable vertical air movements." The FAA recommends that a mountain ridgeline should be crossed at an angle to allow the pilot to turn away from the ridge with the least amount of turn required should down air be encountered.

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 aircraft control, and the subsequent inadvertent stall/spin. Contributing factors were the loss of engine power on both engines for unknown reasons and the terrain induced turbulence.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: MANEUVERING

Findings
1. (F) 2 ENGINES
2. (F) REASON FOR OCCURRENCE UNDETERMINED
3. PROCEDURES/DIRECTIVES - NOT FOLLOWED - PILOT IN COMMAND

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: EMERGENCY LANDING

Findings
4. (F) WEATHER CONDITION - TURBULENCE,TERRAIN INDUCED
5. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
6. (C) STALL/SPIN - INADVERTENT - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
7. TERRAIN CONDITION - HIGH TERRAIN

Factual Information

HISTORY OF FLIGHT

On May 15, 2000, at 1233 mountain daylight time, a Cessna Skymaster T337C, N2522S, was destroyed following impact with terrain in an uncontrolled descent near Alamogordo, New Mexico. The airline transport pilot and his passenger were fatally injured. Courtney Aviation (dba Skystar, Inc.), of Columbia, California, was operating the airplane under contract to the United States Forest Service (USFS) under Title 14 CFR Part 91. Visual meteorological conditions prevailed for the local flight that originated from Alamogordo, approximately 4 minutes before the accident. No flight plan had been filed with the FAA Flight Service Station, but the USFS had their own internal flight plan and flight following procedures.

According to the pilot's employer, the pilot flew the airplane on May 12 from California to Alamogordo, New Mexico, for a long-term contract with the USFS. According to a USFS representative, the pilot flew forest fire reconnaissance flights on May 13 (5.4 hours) and May 14 (1.6 hours).

On May 15, the pilot was briefed to fly a 3 hour fire watch mission over Lincoln National Forest, just east of Alamogordo. The pilot and his passenger were scheduled to depart between 1100 and 1130, but they were observed in the break area talking with each other at 1155. When USFS personnel reminded them of their departure time, they immediately went to their airplane.

Radar data indicates a target departed on runway 21 at 1229 and made a left hand climbing turn to the northeast. Radar data indicates that the average rate of climb for the 3 and half-minute flight was 519 feet per minute. From 1230:52 to 1231:29, the rate of climb was 804 feet per minute; during the next 47 seconds, the rate of climb dropped to 384 feet per minute. At 1232:06, the target leveled off at 6,100 feet, and slowed to 97 knots. The radar data indicates that during the last two minutes of flight, the target flew directly at the mountain cliffs (USFS pilots reported good up drafts near these cliffs during the previous several days). The FAA prints a publication on Tips on Mountain Flying for their General Aviation Accident Prevention Program that states the following: "A mountain ridgeline should be crossed at an angle to allow the pilot to turn away from the ridge with the least amount of turn required should down air be encountered."

The 4 radar returns at 6,100 feet (1232:06 to 1232:20) were flown over a steeply rising valley with a minimum terrain clearance of 400 to 500 feet. The radar data indicates that the target then turned more easterly, and the altitude was approximately 6,200 feet with terrain clearances as low as 200 feet. The target was then tracked flying over the edge of a 1,000 foot canyon to the south. Next the target turned northward, and disappeared near the point of

impact. Later flights by USFS aircraft, in this geographical area, reported "strong turbulence and very strong variable vertical air movements."

A witness, located approximately 11,000 feet away, said that the airplane was flying in a northeasterly direction and "appeared to by flying very slow." He could not hear any sound coming from the airplane. It then turned north followed by the airplane's wing "dropping downward towards the ground." He said the "airplane went straight down rotating to the left, and disappeared behind the mountain." Seconds later, he heard the impact and saw smoke rising from behind the ridge.

PERSONNEL INFORMATION

According to FAA records, the pilot was an airline transport pilot, a flight instructor, and an airframe mechanic. On his USDA Forest Service application dated May 10, 2000, he stated that he had 8,800 hours of total flight experience, with 875 hours in the Cessna T337C. He also reported that he had 3,500 hours of mountain flight experience.

The pilot flew his last FAA Part 135 proficiency check ride, in a Cessna 337, on April 26, 2000.

AIRCRAFT INFORMATION

The airplane was a twin engine, propeller-driven, five seat, centerline thrust airplane, which was manufactured by Cessna Aircraft Company, in 1967. It was powered by two TCM TSIO-360A, six cylinder, reciprocating, horizontally opposed, direct drive, air cooled, fuel injected, turbo-charged engines, which had a maximum takeoff rating of 210 horsepower at sea level. At the last annual inspection on May 10, 2000, the documented airframe total time was 3,676 hours. Both engines had 775 hours since major overhaul. Witnesses estimated that the airplane had flown approximately 8 hours since annual inspection.

The airplane was equipped with a Robertson STOL (short takeoff and landing) kit (stall speed 47 knots). The airplane also had Graphic Engine Monitors (GEM-603) on both engines. The airplane was fueled at Alamogordo on the morning of the accident by the Fixed Base Operator's manager, and he said that each of the four fuel tanks were topped off (totaling approximately 30 gallons of 100LL).

The airplane was painted during the previous winter, and came out of the paint shop on March 15, 2000. Subsequently, both engines were cleaned and a control cable to the cowl flaps was replaced. The owner estimated that the airplane had flown for 35 to 40 hours from the time it came out of the paint shop until the accident.

METEOROLGICAL CONDITIONS

At 1229, the weather conditions at the Alamogordo-White Sands Regional Airport (elevation 4,197 feet), 220 degrees 10 nautical miles (nm) from the accident site, were as follows: wind

170 degrees at 14 knots gusting to 23 knots; visibility 10 statute miles; cloud condition clear; temperature 93 degrees Fahrenheit; dew point 46 degrees Fahrenheit; altimeter setting 30.05 inches. The airplane's impact location had a density altitude calculated at 9,986 feet.

A fire spread in all directions from the downed airplane. The first aircraft to arrive at the accident scene was a USFS Beech Baron. The pilot reported very heavy turbulence with strong up and down drafts. He believed they were plus and minus 2,000 feet or more. The USFS dispatched slurry bombers to put the secondary grass/brush fire out. The first bomber pilot to the scene reported "really bad air, a lot of turbulence, and strong downdrafts." He said that he aborted two approaches from his bombing runs because of "rough, turbulent, and irregular air." On the third approach, he released his load.

WRECKAGE AND IMPACT INFORMATION

The airplane was found upright (8.5 nm from Alamogordo's airport at 055 degrees) on a flat mesa (N32 degrees, 52.20'; W105 degrees, 53.73'; elevation 6,257 feet). The soil was sandy to small gravel in size, with scattered grasses, yuccas, and occasional 10 to 15 foot cedars. The impact site was approximately 250 feet north of a 1,000 foot cliff, which lead to the valley below.

The right wing leading edge was crushed aft in accordion like fashion almost to the aileron. The nose section of the front engine was crushed, and the spinner was compressed aft and up with no spiraling signatures. A 38 to 40 foot long ground scar (the airplane's wing span was 38 feet) was found on a 245-065 degree orientation with 1 foot deep hole in the center. Red navigation lens fragments were found on the northeastern most end of the ground scar, and blue/green navigation lens fragments were found on the southwestern end of the scar. Ten feet north of the hole (bearing 015 degrees) was the front engine, behind that was the burnt remains of the fuselage (oriented 190 degrees), and then the rear engine.

All of the airplane's major components were accounted for at the accident site. The flight control surfaces were all identified. The right aileron control cable continuity was confirmed to the bell crank. Rudder cable continuity was confirmed along both tail booms to the trailing edge of the wings. Elevator cable continuity was confirmed along the left tail boom to the trailing edge of the left wing. The flap actuator in the right wing indicated that the wing flaps were up. The landing gear was in the up position. All the cockpit controls and instrumentation were consumed by fire.

The right wing was found angled forward, the left wing was angled rearward, the tail booms were angled counter-clockwise to the right. All the fuel tanks were compromised and/or burned; the left fuel selector (front engine) was found in the left auxiliary, and the right fuel selector (rear engine) was found between the right main and fuel shutoff. The right fuel selector was impact damaged. The owner of the airplane said that normal operating procedure was to fly on the main fuel tank for 1 hour, then select the auxiliary tank fuel. In the manufacturer's Owner's Manual for the airplane, it states that the fuel selector should be in the

main tank position for takeoff and landing.

The rear engine was found with its forward firewall wrapped around it. After melted accessories were removed, the engine was manually rotated, verifying internal continuity. "Thumb compression" was obtained from all cylinders, except for #1 and #2. The pistons in these two cylinders were observed to move. The engine exhibited major thermal damage, mainly on the upper half. The spark plug electrodes varied in color from white, to black, to shinny. The turbocharger and housing had no impact signatures. The rear propeller blades were found feathered with no chordwise striations, leading edge damage, or "S" type blade twisting. The propeller manufacturer's representative said that the rear propeller hub received minimal damage, which indicated to him that the pilot manually feathered it.

The front engine sustained heavy thermal damage and received extensive impact damage on the nose section of the case (fractured/missing). The crankshaft was pushed aft breaking the shaft at cheek number 7 through one side of the lightening hole. Cheek numbers 6, 7 and 8 were bent aft pinching their connecting rod big ends. The number 5 connecting rod was broken in the beam section near the piston pin end. The number 6 connecting rod beam was bent due to the crankshaft being pushed aft during the heavy impact forces. Both the broken connecting rod and the broken crankshaft were examined by the engine manufacturer's metallurgist, and it was determined that they failed due to overload forces (impact forces). The spark plug electrodes varied in color from white, to black (most of the plugs were dark black).

The propeller manufacturer's representative said the front propeller assembly, number two socket, exhibited counterweight damage that indicated a blade angle position of approximately low pitch. This finding was supported by latch mechanism damage that indicated piston approximate position at impact. Neither blade exhibited chordwise striations or leading edge damage; both blades were "fairly straight." The representative said that an exact amount of power could not be determined. However, "based upon limited blade bending, it is likely that the propeller was being operated with low or windmilling power."

The front engine turbocharger was found separated from its engine, and the turbine housing was broken from its attachment. The turbine housing exhibited rotational score marks and static impact marks. The turbocharger manufacturer's said the score marks appeared to be high and low speed in nature, but they were found imposed upon each other in a varied sequence as viewed around the housing. The representative further stated that 11 turbine blades make up the "hot side" of this turbocharger. Six adjacent blade's inducer edge corners had material missing from them; their fracture surfaces exhibited overload separations. All 11 blades exhibited broken or bent portions of their exducer. Examination of the piston heads, valves, and valve seats revealed no signatures of foreign object damage (FOD) that might suggest that an object had gone through the engine. An FAA designated IA looked at the photographs of the turbine blade damage, and said it did not look like a typical FODed turbocharger turbine. He thought the damage looked like impact damage.

No preimpact engine or airframe anomalies, which might have affected the airplane's performance, were identified.

MEDICAL AND PATHOLOGICAL INFORMATION

The University of New Mexico's School of Medicine's Office of the Medical Investigator, Albuquerque, New Mexico, performed an autopsy on the pilot on May 17, 2000.

The FAA's Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma, performed toxicology tests on the pilot. According to CAMI's report (200000109001), carbon monoxide and cyanide tests were not performed. The following volatiles, which were attributed to postmortem production, were found in kidney samples: ethanol, acetaldehyde, and N-propanol. The drug metoprolol (trade name Maxzide) and triamterene (trade name Dyrenium), both prescribed for hypertension, were present in his kidney and liver; the pilot had documented both of these medications on his last FAA medical exam application dated March 29, 2000.

ADDITIONAL DATA

The airplane, including all components and logbooks, was released to a representative of the owner's insurance company on October 20, 2000.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	49,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	March 29, 2000
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	8800 hours (Total, all aircraft), 8120 hours (Pilot In Command, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N2522S
Model/Series:	T337C T337C	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	337-0822
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	May 10, 2000 100 hour	**Certified Max Gross Wt.:**	4500 lbs
Time Since Last Inspection:	8 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	3675 Hrs	**Engine Manufacturer:**	Continental
ELT:	Installed, not activated	**Engine Model/Series:**	TSIO-360-A/B
Registered Owner:	SKYSTAR INC.	**Rated Power:**	210 Horsepower
Operator:	UNITED STATES FOREST SERVICE	**Operating Certificate(s) Held:**	None
Operator Does Business As:	CORTNEY AVIATION	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	ALM ,4197 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	12:29 Local	**Direction from Accident Site:**	220°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots / 23 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	170°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	93°C / 45°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	(ALM)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	12:29 Local	**Type of Airspace:**	Class G

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	

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:**	32.880035,-105.94944(est)

Administrative Information

Investigator In Charge (IIC):	Struhsaker, James
Additional Participating Persons:	WALTER TIDMORE; ALBUQUERQUE , NM
Original Publish Date:	November 1, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=49198