



National Transportation Safety Board Aviation Accident Final Report

Location:	McDade, TX	Accident Number:	CEN15FA056
Date & Time:	11/23/2014, 0945 CST	Registration:	N14AV
Aircraft:	AERO COMMANDER 500A	Aircraft Damage:	Substantial
Defining Event:	Aerodynamic stall/spin	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General Aviation - Positioning		

Analysis

The airline transport pilot was conducting a cross-country repositioning flight. While en route to the destination airport, the pilot contacted air traffic control and stated that he was beginning to descend. No further radio transmissions were made by the pilot. Radar and GPS information showed, about the same time as the pilot's last transmission, the airplane's flightpath began descending in a westerly direction. The last recorded GPS point showed the airplane about 200 ft southwest of the initial impact point, 90 ft above ground level, and at a groundspeed of 66 knots.

The airplane wreckage was located in an open field and impact signatures were consistent with a stall/spin, which had resulted in a near-vertical impact at a slow airspeed. The right propeller blades were found in the feathered position. Examination of the right engine found that the oil gauge housing extension was improperly secured to the oil gauge housing, which resulted in a loss of engine oil. Additionally, the examination revealed a hole in the right engine's crankcase, metal material in the oil sump, and signatures consistent with the lack of lubrication. Cockpit switches were positioned in accordance with the in-flight shutdown of the right engine. No anomalies were found with the left engine or airframe that would have precluded normal operation.

Another pilot who had flown with the accident pilot reported that the pilot typically used the autopilot, and the autopilot system was found with the roll, heading, and pitch modes active. During the descent, no significant changes of heading were recorded, and the direction of travel before the stall was not optimal for the airplane to land before a fence line. It is likely that the autopilot was controlling the airplane's flightpath before the stall.

Despite one operating engine, the pilot did not maintain adequate airspeed and exceeded the airplane's critical angle-of-attack (AOA), which resulted in an aerodynamic stall/spin. Correcting the last GPS recorded airspeed for prevailing wind, the airplane's indicated airspeed would have been about 72 knots, which is above the airplane's 0-bank stall speed, but an undetermined amount of bank would have been applied to maintain heading, which would have accelerated the stall speed. It could not be determined why the pilot did not maintain

adequate airspeed or notify air traffic controller of an engine problem.

Although a review of the pilot's medical records revealed that he had several historical medical conditions and the toxicology tests detected several sedating allergy medications in his system, it was inconclusive whether the medical conditions or medications impaired the pilot's ability to fly the airplane or if the pilot was incapacitated. It is also possible that the pilot was distracted by the loss of oil from the right engine and that this resulted in his failure to maintain adequate airspeed, his exceedance of the airplane's critical AOA, and a subsequent stall/spin; however, based on the available evidence, the investigation could not determine the reason for the pilot's lack of corrective actions.

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 and his exceedance of the airplane's critical angle-of-attack for reasons that could not be determined based on the available evidence, which resulted in an aerodynamic stall/spin. Contributing to the accident was the improperly installed oil gauge housing extension, which resulted in a loss of oil quantity and right engine power.

Findings

Aircraft	Airspeed - Not attained/maintained (Cause) Recip eng oil sys - Incorrect service/maintenance (Factor) Angle of attack - Capability exceeded (Cause)
Personnel issues	Aircraft control - Pilot (Cause)

Factual Information

HISTORY OF FLIGHT

On November 23, 2014, about 0945 central standard time, an Aero Commander 500A airplane, N14AV, impacted terrain near McDade, Texas. The airline transport rated pilot, the sole occupant, was fatally injured. The airplane was substantially damaged. The airplane was registered to and operated by Aerial Viewpoint Aerial Photography under the provisions of 14 Code of Federal Regulations Part 91 as a positioning flight. Visual meteorological conditions prevailed for the flight, which operated without a flight plan. The flight departed the David Wayne Hooks Memorial Airport (KDWH), Houston, Texas, at 0854 and was en route to the Austin Executive Airport (KEDC), Austin, Texas.

The pilot was in radio contact with air traffic control and was receiving flight following while en route to his destination. The pilot radioed his intention to descend in altitude for landing at KEDC. There were no reported distress calls from the pilot.

A local landowner heard the airplane impact terrain and called 911.

PERSONNEL INFORMATION

The pilot, age 63, held an airline transport pilot certificate with airplane multiengine land and instrument airplane ratings. He held a commercial pilot certificate with a single engine land rating. He also held a flight instructor certificate for airplane single engine, multiengine, and instrument airplane, and a mechanic certificate with airframe and power plant ratings.

On May 8, 2014, he was issued a second class medical certificate with the restrictions must wear corrective lenses. On that date he reported his total flight time at 7,075 hours, with 110 hours in the preceding 6 months.

AIRCRAFT INFORMATION

The airplane, serial number 500A-914-22, was a high wing, two-engine airplane manufactured in 1960. It was powered by two 300-horsepower Continental Motors IO-520-E8B engines. Each engine drove a metal, three-bladed, variable pitch, Hartzell EHC-G3YF-2YF full-feathering propeller. The airplane's last annual inspection occurred on October 1, 2014. At this inspection, the airframe had accumulated 12,859.2 hours.

The airplane was acquired by the operator in 1998 and was configured for aerial surveying and photography operations.

METEOROLOGICAL INFORMATION

At 0955, an automated weather reporting facility located at the Giddings-Lee County Airport (KGYB), about 16 nautical miles southeast of the accident site reported a wind from 240 degrees at 9 knots gusting to 14 knots, visibility 10 miles, a clear sky, temperature 64° Fahrenheit (F), dew point 55° F, and a barometric pressure of 29.70 inches of mercury.

COMMUNICATIONS

Although a flight plan had not been filed for the flight, the pilot communicated with Austin approach control. An Air Traffic Control group was formed to review the actions taken by the approach controller and the interaction with the accident airplane. A review of data found that at 0922:16, the pilot radioed that he was at an altitude of 6,500 feet. The controller

acknowledged the pilot's radio transmission and issued the Austin altimeter of 29.66 inches. At 0927:59, the pilot radioed that he was descending, which was the last recorded transmission from the pilot. The controller did not acknowledge this transmission.

At 0944:23, the last radar return was recorded as the airplane was at an altitude of 800 ft mean sea level. The airplane's radar returns displayed CST or "coast" after the last valid radar return. At 0946:40, the controller told the pilot that radar service was terminated and approved a frequency change. There were no recorded distress calls from the accident airplane.

A review of these interactions found that one controller handled the accident airplane until the pilot had reported descending out of 6,500 ft. The controller thought he had acknowledged the pilot's transmission. He watched as the airplane descended and did not recall anything unusual. Shortly thereafter, the controller was relieved so he could go on a break. The relieving controller was briefed of the active traffic to include N14AV. The relieving controller recalled scanning the southwest corner of his assigned airspace and became busy with visual flight rules aircraft, parachute activity, and other routine traffic.

After a few minutes of working traffic, the controller saw the data block of N14AV had not moved on the radar display, and did not see the data block in coast (CST) status on the radar display. He thought the pilot of N14AV may have switched from the Austin approach frequency to the advisory frequency, so he advised the pilot that radar services were terminated and did not receive an acknowledgement from the pilot. Later, the supervisor's telephone rang and the supervisor asked the original controller if he had lost contact with any airplane in the east sector. The relieving controller thought that the airplane he terminated radar services on could be the airplane in question.

Paragraph 10-2-5 of Federal Aviation Administration (FAA) order 7110.65 addresses emergency situations and states [in part] that when an unexpected loss of radar and communications occurs, air traffic controllers shall consider that an emergency situation exists and notify the Rescue Coordination Center (RCC) or Air Route Traffic Control Center (ARTCC). "Consider that an aircraft emergency exists and inform the RCC and ARTCC when any of the following exists: ... (b). There is an unexpected loss of radar contact and radio communications with any [instrument flight rules] IFR or [visual flight rules] VFR aircraft."

WRECKAGE AND IMPACT INFORMATION

The airplane wreckage was located in an open pasture with rolling terrain about 65 yards east of a fence line. Impact signatures were consistent with a slow speed, near vertical impact. All four corners of the airplane and flight controls surfaces were accounted for at the scene.

The initial impact point consisted of a circular crater. About 6 feet on either side of the crater were both propeller assemblies. The left propeller assembly was almost completely buried in the soil and the right assembly was partially buried. The right propeller blades appeared to be fully feathered. The left propeller blades were all curled with polishing of the leading edges and blade faces, along with chordwise scratches and gouges.

The remainder of the airplane wreckage was located about 15 feet northwest of the impact crater. It consisted of the fuselage, empennage, both wings, and the left engine. The right engine had separated and was located about 25 feet northwest of the right wing.

The fuselage was crushed and wrinkled along its entire length. The cockpit area was distorted and crushed rearward. A majority of the structure enclosing the top and right portions of the

cabin area was torn and displaced. The left wing's leading edge had accordion crushing along its entire length. The right wing had crushing on the inboard one-third of its leading edge. The left aileron remained attached to both hinges; however, the outboard hinge was torn from the wing structure. The right aileron remained attached to the right wing. Both flaps appeared to be partially extended. Both main landing gear were fully retracted in their wheel wells.

The elevators and rudder remained attached to their respective attach points. The left horizontal stabilizer and elevator had minor impact damage. The horizontal stabilizer's leading edge was soiled with oil. The rudder remained attached to the vertical stabilizer and both surfaces were not damaged. The right horizontal stabilizer and elevator were crushed upward at mid-span. The outboard section was soiled with oil.

Flight control continuity was established from the cockpit controls to the ailerons, elevators, and rudder. The throttle quadrant was impact damaged and distorted. The left throttle was near the full forward position and the right throttle was fully aft. Both throttle control levers were twisted. Both propeller controls were found in the feather range and bent to the left. Both mixture controls were in the full rich position but had fractured just above the control shroud.

The cockpit instrumentation was heavily damaged; only a few instruments were readable. The altimeter's Kollsman's window indicator was between 29.72 and 29.73. The flap gauge showed 1/2 flaps. The battery switch was found in the off position, which had been set by first responders. The left hand generator switch was in the "on" position and the right hand generator switch was in the "off" position. The left engine fuel cutoff switch was in the open position, the fuel aux pump switch was in the "off" position, and the ignition switch was in the "both" position. The right engine fuel cutoff switch was in the closed position, the fuel aux pump switch was in the "off" position, and the ignition switch was in the "off" position. The landing gear handle was in the up position. The Century III autopilot controls displayed roll, heading, and pitch in the on positions with the altitude hold turned off. The emergency locator transmitter was found in the armed position and had activated during the accident.

A Garmin GPSMap 296 was found in the wreckage and shipped to the National Transportation Safety Board laboratory for data download.

Both engines were partially examined on-scene. The right engine's crankcase had a hole above the #2 cylinder. Its oil gauge (gage) housing extension was found disconnected from its housing. Both engines were sent to a laboratory for further examination.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was conducted on the pilot by the Deputy Medical Examiner as authorized by the Justice of the Peace, Precinct 4 for Lee County, Texas. The autopsy noted the cause of death as a result of blunt force injuries and the manner of death was an accident.

The FAA Civil Aerospace Medical Institute performed forensic toxicology tests on specimens from the pilot. Findings were negative for carbon monoxide and ethanol. The following drugs were detected:

22 (ug/ml, ug/g) Acetaminophen detected in Urine

Azacyclonol detected in Urine

Azacyclonol NOT detected in Blood (Cavity)

Cetirizine detected in Urine

Cetirizine detected in Blood (Cavity)

Diphenhydramine detected in Urine

0.053 (ug/ml, ug/g) Diphenhydramine detected in Blood (Cavity)

Fexofenadine detected in Blood (Cavity)

Fexofenadine detected in Urine

Naproxen detected in Urine

Fexofenadine is a prescription and over-the counter antihistamine used to relieve the allergy symptoms of seasonal allergic rhinitis ("hay fever"). It is marketed as a non-sedating antihistamine.

Azacyclonol is a minor metabolite of fexofenadine.

Cetirizine is an over-the-counter antihistamine is used to temporarily relieve the symptoms of hay fever and allergy to other substances. This medication causes drowsiness and could impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery). The FAA recommends waiting at least 48 hours after the last dose before performing safety related duties.

Diphenhydramine is an over-the-counter antihistamine used to treat allergic conditions and as a sleep aid. This medication causes drowsiness and could impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery). The FAA recommends waiting at least 60 hours after the last dose before performing safety related duties.

Naproxen and acetaminophen are over the counter analgesics for the relief of pain; naproxen also has some anti-inflammatory properties.

A review of the pilot's medical history revealed that he had a history of allergies, cataracts treated with surgical removal, and primary angiitis of the central nervous system associated with significant neurologic deficits which had been treated with steroids and cyclophosphamide from 2002 to 2009. However, his neurologic exam had returned to normal and he had been off medications for five years before the accident.

TESTS AND RESEARCH

Engine Examinations

Both engines were examined under the auspices of the NTSB investigator-in-charge. The left engine was impact damaged and a test run could not be performed. The engine was torn down and inspected. Of note, the oil gauge housing extension was secured. No anomalies were detected with the left engine which would have precluded normal operation.

In addition to the hole in the crankcase, the right engine was impact damaged and a test run could not be performed. The left magneto and ignition harness were both impact damaged and could not be tested. The oil sump was opened and found to contain metallic material consistent with connecting rods, bearings, and crankcase material.

The oil pickup screen contained a small amount of metallic material. The oil pump was disassembled and metallic material was present in the oil pump gears along with scoring on the pump housing consistent with passage of hard material. The oil screen contained a significant

amount of metallic material on the screen. The oil gauge housing extension was found separated from its housing at the accident site. No impact damage was noted to the housing extension. The hose and clamps were not positioned in a way to place the oil gauge housing extension joint in the middle of the hose. According to manufacturer specifications, the hose should be centered over the connection joint. The top hose clamp was placed below the oil gauge housing extension bead. The extension bead is designed to be securely fitted against the oil gauge housing. In addition, it was also noted that the hose material was not the material specified by the manufacturer. Examination of the engine bearings found signatures consistent with lubrication distress with scoring and thermal smearing of the surface babbitt. Connecting rods 1 and 2 had separated from their respective journals. All connecting rods and rod bearings displayed signatures of thermal discoloration consistent with lubrication distress.

The engine log books did not contain any recent entries of work performed concerning on the oil gauge housing extension. Several entries documented oil changes to include a check for oil leaks. The last entry dated November 18, 2014, reported "[r]eplaced oil with Aero Shell 100W oil, cleaned engine from excess oil and checked for oil leaks, none found. Ops check good, returned to service." The entry was endorsed by the pilot, who was also one of the mechanics that maintained the airplane.

ADDITIONAL INFORMATION

Garmin GPSMap 296

Data from the GPS unit was downloaded and found to contain the accident flight. The data field for the accident flight's date was recorded as April 9, 1995, but the time and route of flight remained consistent with the accident flight. The airplane departed the David Wayne Hooks Memorial Airport about 0854. It departed the airport to the south before turning west towards Austin, Texas. While en route the airplane cruised about 6,700 feet mean sea level (msl) and about 138 knots groundspeed. At 0927, the airplane began to descend and the groundspeed decreased. The ground track varied between 270-290° but averaged 281° close to the pre-descent heading of 282°. The average descent rate was 440 feet per minute. The last recorded point was recorded at 0944:35 with the airplane about 200 feet southwest of the initial impact point, at a GPS altitude of 610 feet msl, groundspeed of 66 knots, and descent rate of 290 feet per minute. Terrain elevation at that location was approximately 520 feet msl.

Aero Commander 500A Speeds

A review of the operator's manual for the Aero Commander 500A found that the minimum control speed, which is the minimum speed at which the airplane is controllable in flight, with sudden failure of one engine and takeoff power on the other engine is 61 knots. At its maximum gross weight, the stall speed with zero-degrees of bank is 63 knots with the flaps up and 57 knots with the flaps down.

Aero Commander 500A Engine Failure During Cruise

The published procedure for an engine failure during cruise flight is as follows:

1. Correctly determine inoperative engine by checking with throttles.
2. Feather engine as outlined in Propeller Section of the Normal Operating Procedures.
3. Maintain 70% power on the operative engine for best cruise.

The procedure to feather an engine as found in the Propeller Section of the Normal Operating

Procedures is as follows:

1. Throttle – CLOSED (inoperative engine)
2. Mixture control – IDLE CUTOFF (inoperative engine)
3. Fuel valves – CLOSED (inoperative engine)
4. Ignition switch – OFF (inoperative engine)
5. Propeller control – FEATHER RANGE

NOTE: The above feather procedure is for normal operation. For emergency use, propeller may be feathered first.

Assessment of the Pilot's Abilities

An employee of the company, also a flight instructor, provided an assessment of the pilot's flying ability. This employee flew most recently from October 20 to November 7, 2014, with the accident pilot. During this time he was able to observe the pilot's flying ability since he was seated in the right cockpit seat. The employee recalled the pilot had a habit of engaging the autopilot for every ferry leg on flights to and from the survey lines. For long distances, the pilot flew between 6,000 – 9,000 feet msl. He reported that the pilot was very comfortable with the airplane and easily landed with strong winds. During instrument meteorological conditions, the pilot maintained good control of the airplane. On one of the flights, the right engine's oil temperature reading was "abnormal" so the flight returned back to the KDWH where the issue could be fixed. The pilot routinely preflighted the airplane daily and after every fuel servicing, and routinely inspected oil and fuel quantities.

A notebook that was maintained by the accident pilot was found in the wreckage. Between the dates of October 20 and November 7, there were no notes about an oil malfunction. There were also no maintenance log book entries between those dates concerning corrective maintenance of either engine's oil system.

History of Flight

Enroute-descent	Powerplant sys/comp malf/fail Engine shutdown Unknown or undetermined Aerodynamic stall/spin (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Airline Transport; Flight Instructor	Age:	63, Male
Airplane Rating(s):	Multi-engine Land; Single-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 With Waivers/Limitations	Last FAA Medical Exam:	05/08/2014
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 7075 hours (Total, all aircraft), 168.4 hours (Last 90 days, all aircraft), 131.4 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	AERO COMMANDER	Registration:	N14AV
Model/Series:	500A	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	500A-914-22
Landing Gear Type:	Retractable - Tricycle	Seats:	2
Date/Type of Last Inspection:	10/01/2014, Annual	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	2 Reciprocating
Airframe Total Time:	12859.2 Hours as of last inspection	Engine Manufacturer:	Continental
ELT:	C91A installed, activated, did not aid in locating accident	Engine Model/Series:	IO-520-E8B
Registered Owner:	AERIAL VIEWPOINT AERIAL PHOTOGRAPHY	Rated Power:	300 hp
Operator:	AERIAL VIEWPOINT AERIAL PHOTOGRAPHY	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	KGYB, 485 ft msl	Distance from Accident Site:	16 Nautical Miles
Observation Time:	0955 CST	Direction from Accident Site:	132°
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	9 knots / 14 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	240°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.7 inches Hg	Temperature/Dew Point:	18° C / 13° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	HOUSTON, TX (DWH)	Type of Flight Plan Filed:	None
Destination:	AUSTIN, TX (EDC)	Type of Clearance:	VFR Flight Following
Departure Time:	0854 CST	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	30.345833, -97.206667

Administrative Information

Investigator In Charge (IIC):	Jason T Aguilera	Report Date:	08/10/2016
Additional Participating Persons:	Brian Fricker; FAA; San Antonio, TX Kurt Gibson; Continental Motors; Mobile, AL		
Publish Date:	08/10/2016		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=90418		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).