



Aviation Investigation Final Report

Location:	CLINTON, Utah	Accident Number:	SEA97FA105
Date & Time:	May 10, 1997, 12:42 Local	Registration:	N5434B
Aircraft:	Cessna 182	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot of the Cessna 182, N5434B, called departing as a flight of two behind the Piper PA-28R-200, N5270T, and was cleared by tower to depart as a flight of two. The passenger in the Piper reported that shortly before the two aircraft collided, he observed the high-wing Cessna 45 degrees aft and right of the low-wing Piper, well low, but then lost sight of the Cessna and did not regain sight of it before the collision. The line of sight from the Cessna to the sun just before the collision was computed to be approximately at the Cessna's 9:30 position, 65 degrees above the horizon, with the line of sight from the Cessna to the Piper at about the Cessna's 10:30 position and well high. The Piper pilot reported that at the time of the collision, he was looking at opposite direction traffic in front of and above the Piper. The Cessna's empennage separated and the Cessna crashed. The Piper was able to return to the departure airport and land. The Piper pilot reported that the Cessna pilot made no prior arrangements with him to fly in formation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Inadequate prior arrangements for formation flight by the pilot-in-command of the Cessna 182, N5434B, and his subsequent failure to see-and-avoid the Piper PA-28R, N5270T. Factors were: the Cessna pilot's visibility of the Piper impaired by the sun; restricted visibility for both aircraft due to low wing/high wing formation configuration; and the Piper pilot's attention diverted to other traffic.

Findings

Occurrence #1: MIDAIR COLLISION

Phase of Operation: CRUISE

Findings

1. (C) PREFLIGHT PLANNING/PREPARATION - INADEQUATE - PILOT IN COMMAND
2. (F) LIGHT CONDITION - SUNGLARE
3. (F) VISUAL LOOKOUT - RESTRICTED
4. (C) VISUAL LOOKOUT - INADEQUATE - PILOT IN COMMAND
5. (F) DIVERTED ATTENTION - PILOT OF OTHER AIRCRAFT

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

HISTORY OF FLIGHT

On May 10, 1997, approximately 1242 mountain daylight time, a Cessna 182, N5434B, collided in midair with a Piper PA-28R-200, N5270T, near Clinton, Utah. The Cessna subsequently impacted terrain and was destroyed, and its three occupants, consisting of a commercial pilot-in-command and two passengers, were killed. The Piper was able to return to Ogden Municipal/Hinckley Airport, Ogden, Utah, and land successfully. The private pilot-in-command and a pilot-rated passenger (who owned the Cessna) in the Piper were uninjured, but the Piper was substantially damaged in the collision. Both airplanes were en route from Ogden to Salt Lake City, Utah, and were operating under 14 CFR 91 at the time of the collision. Visual meteorological conditions prevailed, and neither aircraft had filed a flight plan.

The five aircraft occupants had flown separately in the two involved aircraft from Salt Lake City to Ogden for a social engagement together, and were returning to Salt Lake City at the time of the occurrence. Recordings of the ground control and tower frequencies at Ogden showed that shortly after N5270T received taxi instructions and its pilot requested a departure "out west around the lake", the pilot of N5434B called for taxi. The ground controller asked for N5434B's requested departure routing and was told, "we will go over [Antelope] island same as these guys...in fact we'll make that a flight of two." (Antelope Island is a predominantly north-south oriented island, approximately 13 nautical miles long, in the Great Salt Lake; its northern end is approximately 13 nautical miles southwest of the Ogden airport.) The Ogden control tower tape also showed that just after N5270T had been cleared for takeoff with a direction of flight toward Antelope Island, the pilot of N5434B called that he was departing as a flight of two, and was cleared to take off as a flight of two. Ogden air traffic control (ATC) personnel stated in a post-accident interview with investigators that the two airplanes took off on runway 16 with about 2,000 feet of separation. Following the takeoff of the two aircraft, the Ogden tower controller initially suggested a turn to N5270T "of no more than...two ten to like...runway heading", to avoid another aircraft on an instrument landing system (ILS) final approach to Ogden runway 3.

Both the pilot and passenger of the Piper stated that they observed the Cessna on one occasion after takeoff. The pilot described the Cessna's position at the time he observed it to be to the right of his aircraft, slightly behind, and slightly high. The passenger described the Cessna's position at the time of his observation as behind (about 45 degrees aft) and to the right of the Piper, and well low. The passenger, who was sitting on the right side of the low-wing Piper, stated that he subsequently lost sight of the high-wing Cessna, and attempted to regain sight of it but did not see it again before the two planes collided despite looking for it continuously until the collision.

Approximately two minutes before the crash, Ogden Tower called traffic to the pilot of the Piper, consisting of a flight of two skywriting aircraft en route to an operating area between Ogden airport and Hill Air Force Base (approximately 4 nautical miles south-southeast of the Ogden airport.) The controller told the pilot of N5270T that the flight of two skywriting aircraft was at twelve o'clock (directly in front of the Piper) at one and one-half miles, flying in the opposite direction to the Piper, at 6,200 feet above sea level. The Piper at this time, according to ATC records, was at 5,400 feet above sea level (approximately 1,000 feet above ground level in that area.) The pilot of the Piper stated in an initial interview that he was looking at the flight of skywriting aircraft, directly in front of and above him, when he felt a "thump" from underneath his aircraft. The Piper pilot stated that he was flying straight and level at the time this occurred. The passenger in the Piper subsequently observed the Cessna in a descent for a brief interval before it impacted the ground. He stated that the Cessna descended "straight down."

Several witnesses to the accident reported to Sunset, Utah, police that immediately prior to the collision, the Cessna moved to a position below the Piper and then pulled up sharply, with the collision ensuing. The witnesses stated that when the aircraft collided, they saw pieces separate from the Cessna (which piece or pieces separated varied among the different witness accounts) and the Cessna then fell to earth, exploding and burning upon ground impact.

The accident occurred during the hours of daylight at approximately 41 degrees 7.8 minutes North and 112 degrees 5.7 minutes West. According to a plot of the crash site coordinates made on the Salt Lake City VFR Terminal Area Chart, the Cessna crash site underlies Class E airspace with a floor of 700 feet above ground level (AGL), and is approximately 1 nautical mile outside the lateral boundary of Ogden's Class D airspace area.

AIRCRAFT INFORMATION

According to the 1956 Cessna 182 owner's manual, normal climb airspeed for the Cessna 182 is 100 to 120 MPH. Normal cruise airspeed for the type at 5,000 feet above sea level ranges from 143 MPH true airspeed at 57% power to 162 MPH true airspeed at 78% power. The aircraft's best rate of climb airspeed under standard atmospheric conditions and maximum gross weight is 85 to 86 MPH indicated airspeed (approximately 92 MPH true airspeed under standard atmospheric conditions at 5,000 feet), with a climb rate of 950 feet per minute. Based on mathematical relationships, the combination of a true airspeed of 92 MPH and climb rate of 950 feet per minute corresponds to a climbing flight path angle of 6.7 degrees above the horizontal.

According to the PA-28R-200 pilot's operating handbook, recommended enroute climb airspeed for the PA-28R-200 is 110 MPH. True airspeed at 5,000 feet density altitude ranges from 138 MPH at 55% power to 162 MPH at 75% power. The aircraft's best rate of climb airspeed with landing gear retracted, at maximum gross weight and 5,000 feet, is 100 MPH (108 MPH true airspeed under standard atmospheric conditions at 5,000 feet), with a climb rate of 630 feet per minute. Based on mathematical relationships, the combination of a true

airspeed of 108 MPH and climb rate of 630 feet per minute corresponds to a climbing flight path angle of 3.8 degrees above the horizontal.

METEOROLOGICAL INFORMATION

Computed astronomical data indicated that at the time of the accident, the sun's azimuth in the accident area was approximately 160 degrees true and its altitude was approximately 65 degrees above the horizon. Based on this solar position, the direction in which the accident aircraft were heading (approximately 234 degrees true from Ogden-Hinckley Airport to the northern end of Antelope Island), and the Piper passenger's observed position of the Cessna relative to the Piper (about 45 degrees aft, to the right of the Piper, well low) before the accident, the lines of sight from the Cessna to the sun and from the Cessna to the Piper immediately before the accident were computed. The line of sight from the Cessna to the sun was computed to be approximately 286 degrees relative to the Cessna's nose (i.e., at about the Cessna's 9:30 position) and 65 degrees above the horizon, with the line of sight from the Cessna to the Piper being about 315 degrees relative to the Cessna's nose (i.e., at about the Cessna's 10:30 position) and well high.

The cloud cover at Ogden (about 5 1/2 nautical miles northeast of the Cessna main wreckage site) was reported as "few" (one to two-eighths' sky cover) at 15,000 feet above ground level at 1300.

COMMUNICATIONS

According to the U.S. Government Airport/Facility Directory (A/FD), Ogden-Hinckley Airport was in a class D airspace area at the time of the accident; however, the crash site was outside the lateral boundary of Ogden-Hinckley's class D airspace, underlying a class E airspace area. ATC procedures contained in the FAA Aeronautical Information Manual (AIM) specify that pilots may leave the control tower frequency at their discretion upon departing Class D airspace after takeoff. Paragraphs 3-2-5e and 3-2-6f of the AIM state that no ATC separation services are provided to visual flight rules (VFR) aircraft in class D or E airspace.

The pilot of N5434B indicated to the Ogden tower controller that he was taking off as a flight of two with N5270T, which departed just before N5434B, and was cleared to take off as a flight of two. The FAA Pilot/Controller Glossary (P/CG) defines formation flight as: "More than one aircraft which, by prior arrangement between the pilots, operate as a single aircraft with regard to navigation and position reporting." The P/CG states that for a formation flight, "Separation between aircraft within the formation is the responsibility of the flight leader and the pilots of the other aircraft in the flight", including during formation join-ups.

The passenger in the Piper, who owned the Cessna and was the Cessna pilot's brother, was interviewed by NTSB and FAA investigators at the FAA Salt Lake City, Utah, Flight Standards District Office (FSDO) on May 12, 1997. During this interview, the passenger stated that he and his brother had often flown together in formation in the past, with his brother always taking the

lead of the formation. The passenger reported that he was not aware of any preflight arrangements between the pilots to operate in formation (other than the Cessna pilot informing Ogden tower that they would be a flight of two), but that he did not consider such arrangements necessary since he and his brother had a tacit understanding with each other to operate in formation when they flew together. The passenger could not recall whether the Piper pilot had taken part in any formation flights flown previously by the passenger and his brother.

The pilot of the Piper was interviewed by NTSB and FAA investigators, separately from the passenger, at the Salt Lake FSDO on May 12, 1997. During this interview, the pilot stated that he had extremely limited formation flight experience; that he was not familiar with the Federal aviation regulations applicable to formation flight; that he had made no prior arrangements with the Cessna pilot to fly in formation; that he had never flown in formation with the Cessna pilot or his brother before; and that he was not thinking of himself as being in formation with the Cessna at the time of the collision. He did state that prior to takeoff, the Cessna pilot asked him which way he was going. The Piper pilot replied that he was going toward Antelope Island and asked the Cessna pilot which way he was going, to which the Cessna pilot replied "the same." The Piper pilot stated that at the time the two aircraft took off, he heard someone call taking off as a flight of two, but was not certain who had made this call (although he assumed it was the Cessna pilot.) The pilot stated that had he been certain that the Cessna pilot had been the one who made the radio call, he would not have objected to the Cessna pilot flying in formation with him. The pilot also indicated that at the time he felt a "thump" on his aircraft, he was looking directly in front of his aircraft, and slightly high, for the opposite direction traffic above and in front of him which had been called out to him by ATC.

14 CFR 91.111(b) prohibits operation of aircraft in formation flight "except by arrangement with the pilot in command of each aircraft in the formation."

There were no plane-to-plane radio communications between the two aircraft, from the time of takeoff to the collision, recorded on the Ogden tower frequency or reported by either occupant of the Piper.

WRECKAGE

Wreckage of Cessna

The wreckage of the Cessna was examined at the crash site on May 10 and 11, 1997. Wreckage from the Cessna was distributed along a generally northeast-to-southwest path approximately 1/4 mile long, with the main wreckage site at the southwest end of the wreckage path. The northeast area of the wreckage path contained pieces of the Cessna's left outboard horizontal stabilizer and elevator, the upper tip of the Cessna's rudder, and a section of a Whelen anticollision strobe (with its clear glass globe broken out) which had been installed on top of the Cessna's vertical stabilizer. Several small (approximately 1 to 4 inches long by 1/2 inch wide) curled fragments of sheet metal, painted and marked in patterns

matching the Cessna's left upper tailcone area, were also found in the northeast area of the wreckage path. These sheet metal fragments contained jagged serrations along parallel edges, of a type consistent with shear overstress separations.

The Cessna main wreckage site was in a level, freshly plowed agricultural field. The main wreckage of the Cessna was extensively burned. The forward fuselage and cabin section had come to rest inverted with its nose pointed approximately southwest. The tail section, which had separated from the forward fuselage structure but remained attached to it by control cables, was upright and facing in an easterly direction. Approximately the outboard 2 feet of the Cessna's left horizontal stabilizer and elevator was missing from the main wreckage; the separated pieces were located in the northeast area of the wreckage path as indicated above. The upper tip and counterweight from the rudder was also missing from the main wreckage, and was located in the northeastern area of the wreckage path. A mounting point for an anticollision strobe, installed on top of the vertical stabilizer at approximately its leading edge, was missing the strobe components, which were also found in the northeast portion of the wreckage area. The remaining vertical tail and rudder assembly was folded over approximately 90 degrees to the left of the fuselage centerline.

A measurement of the distance from the location of the anticollision beacon mounting point, forward to the point where the tail section was separated from the forward fuselage section, was taken and found to be 98 inches along the aircraft's longitudinal axis. It was also noted that the sheet metal edges at the separation point, in the upper left portion of the tail cone, displayed jagged serrations consistent with shear overstress, similar to those on the small curled strips of sheet metal found in the northeast part of the wreckage area. Also, sheet metal edges on the top of the tail cone at the point of separation were curled inward, while those on the left side of the tail cone at the same point were curled outward.

Both wings were found on the Cessna at the main wreckage site. The left wing was folded and twisted back over onto its top about 2 to 3 feet outboard of the wing root, such that the lower surface of the wing tip was in contact with the upper surface of the wing root, and the wing tip pointed generally inboard. The right wing was burned but was generally in its normal structural location (with respect to the forward fuselage and cabin) and had substantially retained its original shape. The lower right wing lift strut was separated from the fuselage, with the lower end of the surviving section of right wing lift strut exhibiting evidence of post-crash thermal melting.

The Cessna's engine and propeller were in their normal locations on the aircraft. The propeller hub and spinner were buried about 1 foot into the ground. Both propeller blades remained attached to the hub, with one blade protruding out of the ground and the other buried in the ground underneath the hub. Excavation and removal of the engine and propeller from the ground revealed that the entire propeller was present, with no pieces missing. The protruding blade was bent forward, and the buried blade was found to be bent back approximately 35 degrees at about mid-span of the blade, with a slight forward curl at the blade tip. Visual examination of the engine's exterior revealed no readily observable evidence of pre-collision

mechanical problems with the engine. A detailed examination of the engine was not performed.

No evidence of flight control malfunction or inflight fire was found in the wreckage of the Cessna.

Damage to Piper

The damage to the Piper was examined at the Great Western Aviation aircraft parking ramp at Ogden-Hinckley Airport on May 11, 1997. The aircraft was substantially intact, with the exceptions noted below.

Both propeller blades displayed damage from the blade tips to approximately 12 inches inboard of the tips. This damage consisted of leading edge gouging, chordwise scratching on both front and rear blade faces, and forward bending of the blade tips. The right side of the Piper's nose displayed scratching and gouging to the paint finish, and a dent on the bottom right side of the fuselage about 1 foot forward of the right wing root leading edge.

The underside of the right wing had an approximate 2-inch-square puncture in the wing skin, 32 inches aft of the wing leading edge and 62 inches outboard of the right wing root. Starting outboard of this puncture, there was a 34-inch-long, generally linear scratch pattern, proceeding in a direction consistent with right-to-left and slightly forward motion relative to the Piper. A fuel tank vent was also bent in the same direction (pointing forward and inboard), flush with the bottom wing surface, in this area. A black, partial annular, 8-inch-diameter mark was located on the bottom of the right wing, centered on a location 20 inches aft of the wing leading edge and 36 inches outboard of the right wing root. A 2 3/4 inch diameter red circular mark was contained within the larger black mark, 2 1/4 inches forward and 1 inch outboard of the center point of the black annular mark. Small (approximately sand grain size) fragments of clear glass were found adhering to the underside of the Piper's right wing in the damaged area.

FIRE

Witnesses reported that the Cessna exploded and burned upon ground impact. The Cessna wreckage was extensively fire-damaged. The witnesses did not report seeing any fire on board the Cessna prior to ground impact, and no inflight fire evidence was observed in the wreckage of the Cessna. The Piper did not sustain any fire damage.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy on the Cessna pilot was performed by the Utah State Medical Examiner, Salt Lake City, Utah, on May 11, 1997. The immediate cause of death was attributed to "multiple blunt force injuries."

Toxicology tests on the Cessna pilot were performed by the FAA Civil Aeromedical Institute

(CAMI), Oklahoma City, Oklahoma. The CAMI toxicology tests screened for drugs and alcohol and detected none. CAMI reported that they did not perform tests for carbon monoxide or cyanide on the Cessna pilot due to lack of suitable specimens.

Toxicology tests on the occupants of the Piper were not performed.

ADDITIONAL INFORMATION

Aircraft drawings contained in the Cessna 182 and Piper PA-28R-200 flight manuals were reproduced to 1/48 scale, and observed damage locations plotted thereon, in an attempt to determine collision geometry. This technique revealed that with the two aircraft heading in approximately the same direction, when the Cessna's vertical tail anticollision strobe mount was matched to the black annular mark on the bottom of the Piper's right wing, the location of the separation point on the left side of the Cessna's tail cone exactly aligned with the right side of the Piper's propeller arc.

The wreckage of the Cessna was released to Mr. Rex A. Thompson, Jr., president of CLAIMTX Aviation Claims Services, Scottsdale, Arizona, on May 12, 1997. CLAIMTX is the insurance adjuster firm representing the owner of the Cessna.

The Piper was released to Mr. Myron Carlson of AIG Aviation (formerly COMAV Managers, Inc.), Northglenn, Colorado, on October 31, 1997. AIG Aviation is the insurance company representing the owner of the Piper, and bought the damaged Piper from the owner following the accident.

Pilot Information

Certificate:	Commercial	Age:	53, 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):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	Last FAA Medical Exam:	July 31, 1995
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	4000 hours (Total, all aircraft), 100 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N5434B
Model/Series:	182 182	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	33434
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	April 3, 1997 Annual	Certified Max Gross Wt.:	2550 lbs
Time Since Last Inspection:	7 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	5723 Hrs	Engine Manufacturer:	Continental
ELT:	Installed, not activated	Engine Model/Series:	O-470-L
Registered Owner:	GARY MCARTHUR	Rated Power:	230 Horsepower
Operator:	KEITH E. MCARTHUR	Operating Certificate(s) Held:	None
Operator Does Business As:		Operator Designator Code:	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	OGD ,4470 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	13:00 Local	Direction from Accident Site:	34°
Lowest Cloud Condition:	Scattered / 15000 ft AGL	Visibility	30 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	5 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	330°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	24°C / 3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	OGDEN (OGD)	Type of Flight Plan Filed:	None
Destination:	SALT LAKE CITY (SLC)	Type of Clearance:	None
Departure Time:	12:38 Local	Type of Airspace:	Class E

Airport Information

Airport:	OGDEN-HINCKLEY OGD	Runway Surface Type:	
Airport Elevation:	4470 ft msl	Runway Surface Condition:	
Runway Used:	0	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	2 Fatal	Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	On-ground
Total Injuries:	3 Fatal	Latitude, Longitude:	41.119255,-112.060913(est)

Administrative Information

Investigator In Charge (IIC): NESEMEIER, GREGG

Additional Participating Persons: DAVID RODDA; SALT LAKE CITY , UT
RANDY L VANDENHUL; WICHITA , KS

Original Publish Date: April 24, 1998

Last Revision Date:

Investigation Class: [Class](#)

Note:

Investigation Docket: <https://data.nts.gov/Docket?ProjectID=42500>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).



Aviation Investigation Final Report

Location:	CLINTON, Utah	Accident Number:	SEA97FA105
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Aircraft:	Piper PA-28R-200	Aircraft Damage:	Substantial
Defining Event:		Injuries:	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot of the Cessna 182, N5434B, called departing as a flight of two behind the Piper PA-28R-200, N5270T, and was cleared by tower to depart as a flight of two. The passenger in the Piper reported that shortly before the two aircraft collided, he observed the high-wing Cessna 45 degrees aft and right of the low-wing Piper, well low, but then lost sight of the Cessna and did not regain sight of it before the collision. The line of sight from the Cessna to the sun just before the collision was computed to be approximately at the Cessna's 9:30 position, 65 degrees above the horizon, with the line of sight from the Cessna to the Piper at about the Cessna's 10:30 position and well high. The Piper pilot reported that at the time of the collision, he was looking at opposite direction traffic in front of and above the Piper. The Cessna's empennage separated and the Cessna crashed. The Piper was able to return to the departure airport and land. The Piper pilot reported that the Cessna pilot made no prior arrangements with him to fly in formation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Inadequate prior arrangements for formation flight by the pilot-in-command of the Cessna 182, N5434B, and his subsequent failure to see-and-avoid the Piper PA-28R, N5270T. Factors were: the Cessna pilot's visibility of the Piper impaired by the sun; restricted visibility for both aircraft due to low wing/high wing formation configuration; and the Piper pilot's attention diverted to other traffic.

Findings

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Phase of Operation: CRUISE

Findings

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2. (F) LIGHT CONDITION - SUNGLARE
3. (F) VISUAL LOOKOUT - RESTRICTED
4. (C) VISUAL LOOKOUT - INADEQUATE - PILOT OF OTHER AIRCRAFT
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Factual Information

HISTORY OF FLIGHT

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The five aircraft occupants had flown separately in the two involved aircraft from Salt Lake City to Ogden for a social engagement together, and were returning to Salt Lake City at the time of the occurrence. Recordings of the ground control and tower frequencies at Ogden showed that shortly after N5270T received taxi instructions and its pilot requested a departure "out west around the lake", the pilot of N5434B called for taxi. The ground controller asked for N5434B's requested departure routing and was told, "we will go over [Antelope] island same as these guys...in fact we'll make that a flight of two." (Antelope Island is a predominantly north-south oriented island, approximately 13 nautical miles long, in the Great Salt Lake; its northern end is approximately 13 nautical miles southwest of the Ogden airport.) The Ogden control tower tape also showed that just after N5270T had been cleared for takeoff with a direction of flight toward Antelope Island, the pilot of N5434B called that he was departing as a flight of two, and was cleared to take off as a flight of two. Ogden air traffic control (ATC) personnel stated in a post-accident interview with investigators that the two airplanes took off on runway 16 with about 2,000 feet of separation. Following the takeoff of the two aircraft, the Ogden tower controller initially suggested a turn to N5270T "of no more than...two ten to like...runway heading", to avoid another aircraft on an instrument landing system (ILS) final approach to Ogden runway 3.

Both the pilot and passenger of the Piper stated that they observed the Cessna on one occasion after takeoff. The pilot described the Cessna's position at the time he observed it to be to the right of his aircraft, slightly behind, and slightly high. The passenger described the Cessna's position at the time of his observation as behind (about 45 degrees aft) and to the right of the Piper, and well low. The passenger, who was sitting on the right side of the low-wing Piper, stated that he subsequently lost sight of the high-wing Cessna, and attempted to regain sight of it but did not see it again before the two planes collided despite looking for it continuously until the collision.

Approximately two minutes before the crash, Ogden Tower called traffic to the pilot of the Piper, consisting of a flight of two skywriting aircraft en route to an operating area between Ogden airport and Hill Air Force Base (approximately 4 nautical miles south-southeast of the Ogden airport.) The controller told the pilot of N5270T that the flight of two skywriting aircraft was at twelve o'clock (directly in front of the Piper) at one and one-half miles, flying in the opposite direction to the Piper, at 6,200 feet above sea level. The Piper at this time, according to ATC records, was at 5,400 feet above sea level (approximately 1,000 feet above ground level in that area.) The pilot of the Piper stated in an initial interview that he was looking at the flight of skywriting aircraft, directly in front of and above him, when he felt a "thump" from underneath his aircraft. The Piper pilot stated that he was flying straight and level at the time this occurred. The passenger in the Piper subsequently observed the Cessna in a descent for a brief interval before it impacted the ground. He stated that the Cessna descended "straight down."

Several witnesses to the accident reported to Sunset, Utah, police that immediately prior to the collision, the Cessna moved to a position below the Piper and then pulled up sharply, with the collision ensuing. The witnesses stated that when the aircraft collided, they saw pieces separate from the Cessna (which piece or pieces separated varied among the different witness accounts) and the Cessna then fell to earth, exploding and burning upon ground impact.

The accident occurred during the hours of daylight at approximately 41 degrees 7.8 minutes North and 112 degrees 5.7 minutes West. According to a plot of the crash site coordinates made on the Salt Lake City VFR Terminal Area Chart, the Cessna crash site underlies Class E airspace with a floor of 700 feet above ground level (AGL), and is approximately 1 nautical mile outside the lateral boundary of Ogden's Class D airspace area.

AIRCRAFT INFORMATION

According to the 1956 Cessna 182 owner's manual, normal climb airspeed for the Cessna 182 is 100 to 120 MPH. Normal cruise airspeed for the type at 5,000 feet above sea level ranges from 143 MPH true airspeed at 57% power to 162 MPH true airspeed at 78% power. The aircraft's best rate of climb airspeed under standard atmospheric conditions and maximum gross weight is 85 to 86 MPH indicated airspeed (approximately 92 MPH true airspeed under standard atmospheric conditions at 5,000 feet), with a climb rate of 950 feet per minute. Based on mathematical relationships, the combination of a true airspeed of 92 MPH and climb rate of 950 feet per minute corresponds to a climbing flight path angle of 6.7 degrees above the horizontal.

According to the PA-28R-200 pilot's operating handbook, recommended enroute climb airspeed for the PA-28R-200 is 110 MPH. True airspeed at 5,000 feet density altitude ranges from 138 MPH at 55% power to 162 MPH at 75% power. The aircraft's best rate of climb airspeed with landing gear retracted, at maximum gross weight and 5,000 feet, is 100 MPH (108 MPH true airspeed under standard atmospheric conditions at 5,000 feet), with a climb rate of 630 feet per minute. Based on mathematical relationships, the combination of a true

airspeed of 108 MPH and climb rate of 630 feet per minute corresponds to a climbing flight path angle of 3.8 degrees above the horizontal.

METEOROLOGICAL INFORMATION

Computed astronomical data indicated that at the time of the accident, the sun's azimuth in the accident area was approximately 160 degrees true and its altitude was approximately 65 degrees above the horizon. Based on this solar position, the direction in which the accident aircraft were heading (approximately 234 degrees true from Ogden-Hinckley Airport to the northern end of Antelope Island), and the Piper passenger's observed position of the Cessna relative to the Piper (about 45 degrees aft, to the right of the Piper, well low) before the accident, the lines of sight from the Cessna to the sun and from the Cessna to the Piper immediately before the accident were computed. The line of sight from the Cessna to the sun was computed to be approximately 286 degrees relative to the Cessna's nose (i.e., at about the Cessna's 9:30 position) and 65 degrees above the horizon, with the line of sight from the Cessna to the Piper being about 315 degrees relative to the Cessna's nose (i.e., at about the Cessna's 10:30 position) and well high.

The cloud cover at Ogden (about 5 1/2 nautical miles northeast of the Cessna main wreckage site) was reported as "few" (one to two-eighths' sky cover) at 15,000 feet above ground level at 1300.

COMMUNICATIONS

According to the U.S. Government Airport/Facility Directory (A/FD), Ogden-Hinckley Airport was in a class D airspace area at the time of the accident; however, the crash site was outside the lateral boundary of Ogden-Hinckley's class D airspace, underlying a class E airspace area. ATC procedures contained in the FAA Aeronautical Information Manual (AIM) specify that pilots may leave the control tower frequency at their discretion upon departing Class D airspace after takeoff. Paragraphs 3-2-5e and 3-2-6f of the AIM state that no ATC separation services are provided to visual flight rules (VFR) aircraft in class D or E airspace.

The pilot of N5434B indicated to the Ogden tower controller that he was taking off as a flight of two with N5270T, which departed just before N5434B, and was cleared to take off as a flight of two. The FAA Pilot/Controller Glossary (P/CG) defines formation flight as: "More than one aircraft which, by prior arrangement between the pilots, operate as a single aircraft with regard to navigation and position reporting." The P/CG states that for a formation flight, "Separation between aircraft within the formation is the responsibility of the flight leader and the pilots of the other aircraft in the flight", including during formation join-ups.

The passenger in the Piper, who owned the Cessna and was the Cessna pilot's brother, was interviewed by NTSB and FAA investigators at the FAA Salt Lake City, Utah, Flight Standards District Office (FSDO) on May 12, 1997. During this interview, the passenger stated that he and his brother had often flown together in formation in the past, with his brother always taking the

lead of the formation. The passenger reported that he was not aware of any preflight arrangements between the pilots to operate in formation (other than the Cessna pilot informing Ogden tower that they would be a flight of two), but that he did not consider such arrangements necessary since he and his brother had a tacit understanding with each other to operate in formation when they flew together. The passenger could not recall whether the Piper pilot had taken part in any formation flights flown previously by the passenger and his brother.

The pilot of the Piper was interviewed by NTSB and FAA investigators, separately from the passenger, at the Salt Lake FSDO on May 12, 1997. During this interview, the pilot stated that he had extremely limited formation flight experience; that he was not familiar with the Federal aviation regulations applicable to formation flight; that he had made no prior arrangements with the Cessna pilot to fly in formation; that he had never flown in formation with the Cessna pilot or his brother before; and that he was not thinking of himself as being in formation with the Cessna at the time of the collision. He did state that prior to takeoff, the Cessna pilot asked him which way he was going. The Piper pilot replied that he was going toward Antelope Island and asked the Cessna pilot which way he was going, to which the Cessna pilot replied "the same." The Piper pilot stated that at the time the two aircraft took off, he heard someone call taking off as a flight of two, but was not certain who had made this call (although he assumed it was the Cessna pilot.) The pilot stated that had he been certain that the Cessna pilot had been the one who made the radio call, he would not have objected to the Cessna pilot flying in formation with him. The pilot also indicated that at the time he felt a "thump" on his aircraft, he was looking directly in front of his aircraft, and slightly high, for the opposite direction traffic above and in front of him which had been called out to him by ATC.

14 CFR 91.111(b) prohibits operation of aircraft in formation flight "except by arrangement with the pilot in command of each aircraft in the formation."

There were no plane-to-plane radio communications between the two aircraft, from the time of takeoff to the collision, recorded on the Ogden tower frequency or reported by either occupant of the Piper.

WRECKAGE

Wreckage of Cessna

The wreckage of the Cessna was examined at the crash site on May 10 and 11, 1997. Wreckage from the Cessna was distributed along a generally northeast-to-southwest path approximately 1/4 mile long, with the main wreckage site at the southwest end of the wreckage path. The northeast area of the wreckage path contained pieces of the Cessna's left outboard horizontal stabilizer and elevator, the upper tip of the Cessna's rudder, and a section of a Whelen anticollision strobe (with its clear glass globe broken out) which had been installed on top of the Cessna's vertical stabilizer. Several small (approximately 1 to 4 inches long by 1/2 inch wide) curled fragments of sheet metal, painted and marked in patterns

matching the Cessna's left upper tailcone area, were also found in the northeast area of the wreckage path. These sheet metal fragments contained jagged serrations along parallel edges, of a type consistent with shear overstress separations.

The Cessna main wreckage site was in a level, freshly plowed agricultural field. The main wreckage of the Cessna was extensively burned. The forward fuselage and cabin section had come to rest inverted with its nose pointed approximately southwest. The tail section, which had separated from the forward fuselage structure but remained attached to it by control cables, was upright and facing in an easterly direction. Approximately the outboard 2 feet of the Cessna's left horizontal stabilizer and elevator was missing from the main wreckage; the separated pieces were located in the northeast area of the wreckage path as indicated above. The upper tip and counterweight from the rudder was also missing from the main wreckage, and was located in the northeastern area of the wreckage path. A mounting point for an anticollision strobe, installed on top of the vertical stabilizer at approximately its leading edge, was missing the strobe components, which were also found in the northeast portion of the wreckage area. The remaining vertical tail and rudder assembly was folded over approximately 90 degrees to the left of the fuselage centerline.

A measurement of the distance from the location of the anticollision beacon mounting point, forward to the point where the tail section was separated from the forward fuselage section, was taken and found to be 98 inches along the aircraft's longitudinal axis. It was also noted that the sheet metal edges at the separation point, in the upper left portion of the tail cone, displayed jagged serrations consistent with shear overstress, similar to those on the small curled strips of sheet metal found in the northeast part of the wreckage area. Also, sheet metal edges on the top of the tail cone at the point of separation were curled inward, while those on the left side of the tail cone at the same point were curled outward.

Both wings were found on the Cessna at the main wreckage site. The left wing was folded and twisted back over onto its top about 2 to 3 feet outboard of the wing root, such that the lower surface of the wing tip was in contact with the upper surface of the wing root, and the wing tip pointed generally inboard. The right wing was burned but was generally in its normal structural location (with respect to the forward fuselage and cabin) and had substantially retained its original shape. The lower right wing lift strut was separated from the fuselage, with the lower end of the surviving section of right wing lift strut exhibiting evidence of post-crash thermal melting.

The Cessna's engine and propeller were in their normal locations on the aircraft. The propeller hub and spinner were buried about 1 foot into the ground. Both propeller blades remained attached to the hub, with one blade protruding out of the ground and the other buried in the ground underneath the hub. Excavation and removal of the engine and propeller from the ground revealed that the entire propeller was present, with no pieces missing. The protruding blade was bent forward, and the buried blade was found to be bent back approximately 35 degrees at about mid-span of the blade, with a slight forward curl at the blade tip. Visual examination of the engine's exterior revealed no readily observable evidence of pre-collision

mechanical problems with the engine. A detailed examination of the engine was not performed.

No evidence of flight control malfunction or inflight fire was found in the wreckage of the Cessna.

Damage to Piper

The damage to the Piper was examined at the Great Western Aviation aircraft parking ramp at Ogden-Hinckley Airport on May 11, 1997. The aircraft was substantially intact, with the exceptions noted below.

Both propeller blades displayed damage from the blade tips to approximately 12 inches inboard of the tips. This damage consisted of leading edge gouging, chordwise scratching on both front and rear blade faces, and forward bending of the blade tips. The right side of the Piper's nose displayed scratching and gouging to the paint finish, and a dent on the bottom right side of the fuselage about 1 foot forward of the right wing root leading edge.

The underside of the right wing had an approximate 2-inch-square puncture in the wing skin, 32 inches aft of the wing leading edge and 62 inches outboard of the right wing root. Starting outboard of this puncture, there was a 34-inch-long, generally linear scratch pattern, proceeding in a direction consistent with right-to-left and slightly forward motion relative to the Piper. A fuel tank vent was also bent in the same direction (pointing forward and inboard), flush with the bottom wing surface, in this area. A black, partial annular, 8-inch-diameter mark was located on the bottom of the right wing, centered on a location 20 inches aft of the wing leading edge and 36 inches outboard of the right wing root. A 2 3/4 inch diameter red circular mark was contained within the larger black mark, 2 1/4 inches forward and 1 inch outboard of the center point of the black annular mark. Small (approximately sand grain size) fragments of clear glass were found adhering to the underside of the Piper's right wing in the damaged area.

FIRE

Witnesses reported that the Cessna exploded and burned upon ground impact. The Cessna wreckage was extensively fire-damaged. The witnesses did not report seeing any fire on board the Cessna prior to ground impact, and no inflight fire evidence was observed in the wreckage of the Cessna. The Piper did not sustain any fire damage.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy on the Cessna pilot was performed by the Utah State Medical Examiner, Salt Lake City, Utah, on May 11, 1997. The immediate cause of death was attributed to "multiple blunt force injuries."

Toxicology tests on the Cessna pilot were performed by the FAA Civil Aeromedical Institute

(CAMI), Oklahoma City, Oklahoma. The CAMI toxicology tests screened for drugs and alcohol and detected none. CAMI reported that they did not perform tests for carbon monoxide or cyanide on the Cessna pilot due to lack of suitable specimens.

Toxicology tests on the occupants of the Piper were not performed.

ADDITIONAL INFORMATION

Aircraft drawings contained in the Cessna 182 and Piper PA-28R-200 flight manuals were reproduced to 1/48 scale, and observed damage locations plotted thereon, in an attempt to determine collision geometry. This technique revealed that with the two aircraft heading in approximately the same direction, when the Cessna's vertical tail anticollision strobe mount was matched to the black annular mark on the bottom of the Piper's right wing, the location of the separation point on the left side of the Cessna's tail cone exactly aligned with the right side of the Piper's propeller arc.

The wreckage of the Cessna was released to Mr. Rex A. Thompson, Jr., president of CLAIMTX Aviation Claims Services, Scottsdale, Arizona, on May 12, 1997. CLAIMTX is the insurance adjuster firm representing the owner of the Cessna.

The Piper was released to Mr. Myron Carlson of AIG Aviation (formerly COMAV Managers, Inc.), Northglenn, Colorado, on October 31, 1997. AIG Aviation is the insurance company representing the owner of the Piper, and bought the damaged Piper from the owner following the accident.

Pilot Information

Certificate:	Private	Age:	61, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	None	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 Valid Medical-w/ waivers/lim	Last FAA Medical Exam:	August 1, 1996
Occupational Pilot:	UNK	Last Flight Review or Equivalent:	
Flight Time:	1800 hours (Total, all aircraft), 800 hours (Total, this make and model), 1725 hours (Pilot In Command, all aircraft), 5 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N5270T
Model/Series:	PA-28R-200 PA-28R-200	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	28R-7235211
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:	November 1, 1996 Annual	Certified Max Gross Wt.:	2650 lbs
Time Since Last Inspection:	17 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	4695 Hrs	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	IO-360-C1C
Registered Owner:	LEE T. SORENSON	Rated Power:	200 Horsepower
Operator:		Operating Certificate(s) Held:	None
Operator Does Business As:		Operator Designator Code:	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	OGD ,4470 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	13:00 Local	Direction from Accident Site:	34°
Lowest Cloud Condition:	Scattered / 15000 ft AGL	Visibility	30 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	5 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	330°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	24°C / 3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	OGDEN (OGD)	Type of Flight Plan Filed:	None
Destination:	SALT LAKE CITY (SLC)	Type of Clearance:	None
Departure Time:	12:38 Local	Type of Airspace:	Class E

Airport Information

Airport:	OGDEN-HINCKLEY OGD	Runway Surface Type:	
Airport Elevation:	4470 ft msl	Runway Surface Condition:	
Runway Used:	0	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	41.119255,-112.060913(est)

Administrative Information

Investigator In Charge (IIC): NESEMEIER, GREGG

Additional Participating Persons: DAVID RODDA; SALT LAKE CITY , UT
RANDY L VANDENHUL; WICHITA , KS

Original Publish Date: April 24, 1998

Last Revision Date:

Investigation Class: [Class](#)

Note:

Investigation Docket: <https://data.nts.gov/Docket?ProjectID=42500>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).