



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	WHITE MILLS, PA	<b>Accident Number:</b>	NYC94FA040
<b>Date &amp; Time:</b>	12/16/1993, 1515 EST	<b>Registration:</b>	N9379R
<b>Aircraft:</b>	AERO COMMANDER 500A	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	2 Fatal
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Personal		

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## Analysis

THE AIRPLANE WAS OBSERVED BY WITNESSES IN A ROLLING MANEUVER, FOLLOWED BY THE SEPARATION OF THE LEFT WING AND COLLISION WITH TREES. WITNESSES STATED THAT THE PILOT HAD PERFORMED ACROBATICS IN THIS AIRPLANE ON OTHER OCCASIONS. THE AIRPLANE FLIGHT MANUAL PROHIBITS INTENTIONAL ACROBATICS. NO EVIDENCE OF CORROSION OR FATIGUE IN THE WING SPAR OR SUPPORT STRUCTURES WAS OBSERVED.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: was the fracture and separation of the airplane wing, and the subsequent loss of control and collision with trees, as a result of the pilot's repeated performance of acrobatic maneuvers, which exceeded the design limits of the airplane.

## Findings

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Occurrence #1: ABRUPT MANEUVER  
Phase of Operation: MANEUVERING

### Findings

1. OVERCONFIDENCE IN PERSONAL ABILITY - PILOT IN COMMAND
2. OVERCONFIDENCE IN AIRCRAFT'S ABILITY - PILOT IN COMMAND
3. (C) AEROBATICS - PERFORMED - PILOT IN COMMAND

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Occurrence #2: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION  
Phase of Operation: MANEUVERING

### Findings

4. (C) DESIGN STRESS LIMITS OF AIRCRAFT - EXCEEDED - PILOT IN COMMAND
5. (C) WING - FRACTURED
6. (C) WING - SEPARATION

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Occurrence #3: LOSS OF CONTROL - IN FLIGHT  
Phase of Operation: DESCENT - UNCONTROLLED

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Occurrence #4: IN FLIGHT COLLISION WITH OBJECT  
Phase of Operation: DESCENT - UNCONTROLLED

### Findings

7. OBJECT - TREE(S)

## Factual Information

### HISTORY OF FLIGHT

On Thursday, December 16, 1993, at 1515 eastern standard time, an Aero Commander 500A, N9379R, piloted by Jerry L. Raff, was destroyed by impact with the terrain, while maneuvering, near White Mills, Pennsylvania. The pilot and pilot/passenger were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed. The flight was being conducted under 14 CFR 91.

The airplane departed the Cherry Ridge Airport, Honesdale, Pennsylvania, at 1445, for a local flight. About 1513, witnesses observed the airplane flying east of the airport in a southerly direction.

One witness, stated:

I heard the airplane (pitch of the motors) get loud and saw the plane roll. While he was upside down and starting to descend his plane lost a piece. I could not at that point tell for sure if it was wing, tail or parts. Then he went what appeared to be straight down.

Another witness stated:

Airplane was flying as if normal then maneuvered into an inverted position by going in a clockwise turn and was headed in a south east direction. The plane disappeared over the tree line from my sight in a southerly direction.

A Certified Flight Instructor at the Cherry Ridge Airport, said:

[I] saw aircraft flying south at approximately 5000 ft msl. Aircraft then pulled a nose high attitude and bank sharply into a slow barrel roll. It then looked to go straight down from inverted flight position. Lost sight of aircraft. Heard engines go to full throttle then heard impact...

The accident occurred during the hours of daylight, at about 41 degrees, 31 minutes North; 75 degrees, 15 minutes West.

### PILOT INFORMATION

The pilot, Mr. Jerry L. Raff, held a Private Pilot Certificate, with single engine and multi-engine land ratings. He did not have an instrument rating. The pilot's flight time log book was not located during the investigation. On the pilot's application for an FAA Second Class Medical Certificate, on November 23, 1993, he indicated a total of 585 flight hours.

The other occupant of the airplane, Mr. Allan Landers, held a Private Pilot Certificate, with a single engine rating. According to witnesses, Mr. Landers was flying in N9379R as a passenger and not as a second pilot.

### AIRCRAFT INFORMATION

The aircraft and engine maintenance log books were not located during the investigation. According to Federal Aviation Administration records, N9379R was delivered from the manufacturer on August 31, 1960. Mr. Raff purchased N9379R on September 21, 1992.

### WRECKAGE

The airplane wreckage was examined at the accident site on December 17, 1993. The main wreckage, except for portions of the left wing, left aileron and the top of the vertical stabilizer, was in a wooded area, 25 feet from a dirt road. It came to rest inverted and in a hole approximately 4 feet deep. Several trees 14 inches in diameter were cut and knocked down. One tree was under the wreckage. Both engines were buried in this hole. The landing gears were in the UP position. All cockpit switches and instruments were destroyed. Flight control continuity could not be established, because of impact damage. The right wing was with the main wreckage and was crushed. Both wing flaps were in the UP position.

The outer 12.5 feet of the left wing was located 440 feet from the main wreckage on an approximate magnetic heading of 035 degrees. There was no evidence of corrosion or fatigue on the wing spar or other surfaces. The fracture surfaces were inclined approximately 45 degrees. The wing aluminum skin at the fracture point, both the upper and lower portions, was bent in an upward direction. There was no evidence of rubbing.

The left aileron was located approximately 290 feet from the main wreckage on a magnetic heading of 350 degrees. There was no visual evidence of fatigue or corrosion on the fracture surfaces of the hinges.

The tip of the vertical stabilizer, approximately 3 feet long, was found in a tree 105 feet from the main wreckage, on a magnetic heading of approximately 035 degrees. The top 8 inches of the leading edge of the stabilizer were crushed and fractured. No evidence of corrosion was observed on the support structures.

Four propeller blades were located with the main wreckage. They were separated from the propeller hubs, and each had chordwise scratches on the forward-facing surface of the blade. The blades were bent aft and twisted. There were gauges on the leading edges of each blade, and the tip of one blade was fractured.

#### MEDICAL AND TOXICOLOGICAL INFORMATION

Post-mortem examinations, including autopsies and toxicological tests, were not performed due to extensive injuries sustained by the occupants.

#### ADDITIONAL INFORMATION

Richard W. Enger was interviewed at the Cherry Ridge Airport on the day after the accident. A summary of this interview stated:

...Mr. Enger stated that when he observed the Aero Commander flying in a southerly direction, he had a "feeling" that the pilot, Jerry Raff, would roll the airplane...Mr. Enger said that he had known about Mr. Raff's acrobatic flying from previous conversations. He had even told Mr. Raff to not do such maneuvers in that airplane, because it was not designed for acrobatics.

On January 12, 1994, Dr. Charles G. Kalko was interviewed by telephone by a Safety Board Investigator. In a summary of this interview it stated:

...Dr. Charles G. Kalko...knew Jerry Raff...both through a business relationship and personally. Dr. Kalko described himself as an experienced acrobatic pilot. He said that he had received instruction in acrobatics and owned airplanes... certified for acrobatics. Dr. Kalko stated that he had discussed acrobatics with Jerry Raff several times. According to Dr. Kalko, Mr. Raff had been performing acrobatic maneuvers in the

Aero Commander 500A, which he owned. Dr. Kalko said that he strongly advised Mr. Raff to not perform these maneuvers in that airplane, because it was not certified for acrobatics.

In addition, Dr. Kalko stated that he advised Mr. Raff to obtain some acrobatic training, and he provided him with the name of a well known acrobatic instructor. He said that Mr. Raff did not obtain the training prior to the accident.

Dr. Kalko mentioned that Mr. Raff had performed rolling maneuvers over Dr. Kalko's airport on one occasion....Mr. Raff told Dr. Kalko that he had been rolling the airplane previously. Mr. Raff told Dr. Kalko that he had seen Aero Commanders flown in air shows.

In the book, The Basic Aerobatic Manual, written by William K. Kershner, it stated:

While we're on the subject of your instructor, it should be noted that self-taught aerobatics is not the way to go. That method is certainly very inefficient- and can be dangerous.

The limit load factors (sometimes called flight load factors) are the number of g's (positive and negative) that can be imposed on an airplane without permanent deformation of structure occurring. The ultimate load factors (sometimes called design load factors) are the number of g's that can be imposed on an airplane without destruction of major components (wings, tail, etc.) occurring.

In other words, in any airplane, if you exceed the limit load factors, you'll bend the airplane. If you exceed the ultimate (design) load factors you could break the airplane.

Other airplanes you may be flying will likely be in the normal category limit load factors ...and are not designed or certified for most of the maneuvers you'll be doing.

N9379R was certified by the Federal Aviation Administration, under 14 CFR 23, as a "Normal" category airplane.

In the LIMITATIONS SECTION of the Aero Commander 500A FAA approved Flight Manual, it stated:

Placards:

This airplane must be operated as a Normal Category type in compliance with the airplane Flight Manual. Acrobatics and intentional spins are prohibited.

The wreckage was released to American Aviation Adjusters, Inc., on December 17, 1993.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	44, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Valid Medical--w/ waivers/lim.	<b>Last FAA Medical Exam:</b>	11/23/1993
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	585 hours (Total, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	AERO COMMANDER	<b>Registration:</b>	N9379R
<b>Model/Series:</b>	500A 500A	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	500-A-897-6
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	6
<b>Date/Type of Last Inspection:</b>	Unknown	<b>Certified Max Gross Wt.:</b>	6250 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	CONTINENTAL
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	IO-470-M
<b>Registered Owner:</b>	RAFF AVIATION, INC.	<b>Rated Power:</b>	260 hp
<b>Operator:</b>	RAFF AVIATION, INC.	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	AVP, 962 ft msl	Distance from Accident Site:	28 Nautical Miles
Observation Time:	1500 EST	Direction from Accident Site:	230°
Lowest Cloud Condition:	Scattered / 5000 ft agl	Visibility	15 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	15 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	330°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	2° C
Precipitation and Obscuration:			
Departure Point:	HONESDALE, PA (N30)	Type of Flight Plan Filed:	None
Destination:	(N30)	Type of Clearance:	None
Departure Time:	1445 EST	Type of Airspace:	Class G

## Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Fatal	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	

## Administrative Information

Investigator In Charge (IIC):	CHARLES F LEONARD	Report Date:	09/13/1994
Additional Participating Persons:	GENE KULP; ALLENTOWN, PA		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinquiry@ntsb.gov">pubinquiry@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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](#).