



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	LANSING, MI	<b>Accident Number:</b>	CHI93FA378
<b>Date &amp; Time:</b>	09/27/1993, 1123 EDT	<b>Registration:</b>	N242TC
<b>Aircraft:</b>	AERO COMMANDER 690A	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	2 Fatal
<b>Flight Conducted Under:</b> Part 91: General Aviation - Positioning			

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## Analysis

THE AIRPLANE DEPARTED IN IMC CONDITIONS ON AN IFR FLIGHT PLAN. SHORTLY AFTER TAKEOFF THE PILOT TOLD THE DEPARTURE CONTROLLER HE HAD '...A PROBLEM.' THE AIRPLANE'S FLIGHT PATH WAS A SERIES OF LEFTHAND TURNS WHILE PERFORMING DESCENTS AND ASCENTS. REPORTS OF ENGINE SOUNDS VARIED FROM HIGH RPM TO LOW RPM. MANY WITNESSES REPORTED THE AIRPLANE DESCENDING OUT OF, AND CLIMBING INTO, CLOUDS. THE AIRPLANE WAS OBSERVED IN A 45 DEGREE ANGLE DESCENT, RIGHT WING LOW, AS IT COLLIDED WITH TREES AND THE GROUND. THE ON-SCENE INVESTIGATION FOUND AN INTERMITTENT ELECTRIC GYRO SYSTEM INVERTER, A BROKEN FILAMENT ON THE INVERTER POWER 'OUT' LIGHT BULB, ELECTRICALLY POWERED GYRO'S ROTORS DID NOT HAVE ROTATIONAL DAMAGE, AND A VACUUM POWERED ATTITUDE INDICATOR ROTOR WITH ROTATIONAL DAMAGE. THE PILOT'S TOXICOLOGY REPORT STATED 45 MG/DL OF ETHANOL DETECTED IN HIS MUSCLE TISSUE.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: was the pilot-in-command not maintaining aircraft control during the intermittent operation of the electrically operated attitude gyro. Factor's associated with this accident are an fluctuating (intermittent) electrical system inverter and the pilot-in-command not performing remedial action by using the vacuum powered attitude gyro and other flight instruments once the airplane was making a series of climbs, descents, and heading changes.

## Findings

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Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: CLIMB - TO CRUISE

### Findings

1. (F) ELECTRICAL SYSTEM, INVERTER - FLUCTUATING
2. FLIGHT/NAV INSTRUMENTS, ATTITUDE GYRO - FLUCTUATING

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Occurrence #2: LOSS OF CONTROL - IN FLIGHT

Phase of Operation: CLIMB - TO CRUISE

### Findings

3. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
4. (F) REMEDIAL ACTION - NOT PERFORMED - PILOT IN COMMAND

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Occurrence #3: IN FLIGHT COLLISION WITH OBJECT

Phase of Operation: DESCENT - UNCONTROLLED

## Factual Information

### HISTORY OF FLIGHT

On September 27, 1993, at 1123 eastern daylight time (EDT), an Aero Commander 690A, N242TC, operated by Midwest Flying Service, Incorporated, of Runyard, Michigan, and piloted by commercially certificated pilots, was destroyed when it collided with trees and terrain following witness reported maneuvering. Instrument meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 positioning flight was operating on an IFR flight plan. Both pilots were fatally injured. The flight departed Lansing, Michigan, at 1117 EDT.

The air traffic controller handling N242TC's flight told the pilot to turn to a 230 degree heading and climb to 4,000 feet mean sea level (msl). Shortly after receiving the heading and altitude clearance, the departure controller called the pilot twice before being acknowledged. After acknowledging the controller, the pilot was called two additional times before he advised the controller that "...we got a problem here."

The tower cab supervisor observed N242TC's target on the radar scope after takeoff. He stated: The aircraft's altitude varied rapidly for the next several sweeps of the radar. I observed the aircraft's altitude readout jump from 3,000 feet one sweep to 2,200 feet the next sweep." He said he observed the aircraft descend to 1,700 feet msl on the third radar scope sweep. While the altitude changes were occurring, the supervisor observed N242TC change its heading from south to southeast to east.

A second air traffic controller said that N242TC was "...continually changing direction, and his altitude was changing rapidly up and down. At approximately 1524 UTC, the aircraft disappeared off of the BRITE Radar display."

Witnesses in the area near the crash site stated they heard the airplane flying from south to north. Other witnesses stated they observed the airplane flying low over their vantage point either in level flight or descending and climbing into and out of clouds. One witness observed the airplane make three passes from the south toward the north. During one of the passes the airplane was approximately 200 to 300 feet above the ground. During its last pass the witness said the airplane went into an approximate 45 degree angle dive and collided with the ground.

N242TC's flight path was reconstructed by the air traffic controllers on duty at the time of the accident. After performing a left turn to an approximate south heading the airplane continued this heading for about four miles. At this point N242TC's flight path consisted of repeated left turns. Portions of the left turns have a continuous direction flown in them.

### PERSONNEL INFORMATION

The pilot-in-command of N242TC satisfactorily completed his Federal Aviation Administration (FAA) Airman Competency Check (FAA Form 8410.3) on September 21, 1993. The flight check was conducted by a company check airman in an Aero Commander 690. According to a December 12, 1991, flight training evaluation form, the pilot performed partial panel and instrument flight maneuvering in an Aero Commander 690. The comment section associated with the two maneuvers was "good."

A company pilot and flight training log dated September 12, 1993, showed satisfactory performance on instrument procedures associated with instrument approaches and auto-pilot usage. The form does not contain sections associated with instrument flight maneuvers.

Logbooks for the pilot-in-command were not found in the wreckage. The pilot logbooks were not made available for inspection by the pilot's spouse. According to the company's pilot qualification sheet, dated May 20, 1993, the pilot had 8,710 hours total time. The form showed the pilot had 1,036 hours instrument time (actual and hood), 4,075 hours in multi-engine airplanes, and 696 hours in turbine powered airplanes.

A pilot qualification and approval record that had a pilot medical date of March 5, 1993, showed the pilot stated he had 10,000 hours total time and 1,500 hours instrument time. This form has the pilot's name on it but no date next to the signature.

A company duty and trip sheet dated September 2, 1993, showed a flight of 2.3 hours in a Piper PA-31-350. Duty/trip sheets dated September 21 and 24, 1993, show the pilot had flown the Piper PA-31-350. Flight times were not found on these sheets. The company president said the pilot had flown N242TC for another company approximately two years. He said the pilot had not flown the airplane for about one month prior to the accident flight. According to the company president, the pilot was qualified for single pilot operations in the Aero Commander 690.

The company's monthly "Pilot Flight and Duty Time" records' show flight time information but not the type airplane flown. The sheet for September, 1993, shows two dates flown: September 1 and 2, 1993. September 1, 1993, flight is as 4.0 hours total time, a corresponding company duty/trip sheet was not located in the company records. The September 2, 1993, flight was 2.3 hours total time. A corresponding duty/trip sheet shows the flight was made in a Piper PA-31-350.

The co-pilot's logbook was not found in the wreckage. The logbooks were always carried by the pilot according to his parents. The co-pilot was not an employee of the company. Employment and flight experience records were not in the company records. The company president said the pilot-in-command was a contract pilot and had acquired the co-pilot's services. An FAA medical certificate application (FAA Form 8500-8) dated August 20, 1993, showed a total flight time of 1,100 hours.

#### WRECKAGE AND IMPACT INFORMATION

N242TC's wreckage was distributed along a magnetic heading of 085 degrees over a distance of approximately 174 feet. The wreckage trail was about 100 feet north of an apartment complex located on Hunter's Ridge Road. Outboard sections of the airplane's right wing were found about ten feet from the tree's N242TC collided with before ground impact.

Three impact craters were located along the wreckage trail. The first crater was approximately 60 feet east of the trees N242TC first contacted. Second and third impact craters were located nine and thirty-three feet from the first crater. The right engine and sections of the right wing were located next to the third crater.

The main wreckage was located approximately 81 feet from the third impact crater. The main wreckage consisted of N242TC's fuselage, aft of the wing's leading edge, empennage, and left wing. Structural members and interior components of the cockpit and cabin section of the fuselage were located under and around the wing's center section. The left engine was approximately 160 feet from the tree's N242TC collided with.

Flight control continuity was established for all three axes. Control cables for the aileron and flaps that were separated and exhibited broomed ends. Examination of the broomed ends with

a 15 power magnifying glass revealed necked strands.

N242TC's main attitude and heading indicator were electrically powered. The attitude indicator's remote gyro rotor was examined and no rotational scuffing was observed on the rotor and shroud. The turn and slip indicator's turn needle had a full right deflection. The rotor case was missing, the rotational scuffing was not observed on the rotor. The remote heading indicator gyro rotor and case did not have rotational scuffing on their surfaces. Both airspeed indicator faces were examined and needle transfer marks were found at the 185 and 200 knot position.

One of the power inverters associated with the attitude and heading gyro instruments had a brown colored material covering part of its circuit board. The second inverter did not have this substance on its circuit board. The AC power annunciator bulb was removed from N242TC's overhead instrument panel. Examination of the bulb with a 15 power magnifying glass revealed a broken filament.

The National Transportation Safety Board's (NTSB) Materials Laboratory Division examined the vacuum powered attitude indicator rotor and case. Inspection of the rotor revealed scuffing and denting completely around the circumference of the rotor at the location of the vane cut outs.

During the engine teardown approximately three ounces of a clear liquid with a yellow tint was removed from the left engine fuel control. The engine fuel filter housing contained a cloudy, gray globular shaped substance approximately one half inch in surface area and one eighth inch in thickness. A white colored deposit was found on the pressurizing valve spring and cover.

The teardown of both engines revealed that the type and degree of damage were consistent with engine rotation and operation at the time of ground collision. Internal components of both engines exhibited the following damage: 1) Rotational scoring was observed on the propeller shafts. 2) Ring gear support alignment dowels were displaced from their normal positions. 3) First and third stage turbine rotor blade-tips were rubbed. 4) Rubbed turbine rotor blade platforms and stator vane platforms. 5) Rotational scoring to the rear curvic couplings with corresponding turbine oil-scavenge bearing seal bolt head rubs. An engine teardown report is appended to this report.

Both propellers were attached to their engines. One blade from the right propeller had separated from its hub. Approximately six inches of one blade had separated from its blade. The blades of both propellers had irregular spanwise bending. The left propeller had one blade bent 90 degrees aft approximately 18 inches from the spinner. No pre-impact discrepancies were noted on either propeller during the dis-assembly and inspection process.

#### MEDICAL AND PATHOLOGICAL INFORMATION

The autopsy of the pilot-in-command and co-pilot was conducted by the Eaton County, Michigan, medical examiner. The causes of death for both pilots was, according to the medical examiner, blunt traumatic injuries.

Toxicology examinations were conducted on both pilots by the Federal Aviation Administration's Civil Aeromedical Institute in Oklahoma City, Oklahoma. Evidence of carbon monoxide and cyanide in the pilot-in-command was not found due to the lack of a suitable sample. Verapamil, 0.283 (ug/ml), was detected in the kidney. The tests showed 27.000

(mg/dl) of ethanol detected in the kidney fluid, 45.000 (mg/dl) ethanol detected in the muscle fluid, and 2.000 (mg/dl) isobutanol detected in the muscle fluid. The co-pilot's toxicology report was negative.

## TESTS AND RESEARCH

Both inverters associated with the main attitude and heading indicators were tested. Inverter serial number 5025 exhibited shutdowns at irregular time intervals. Inverter serial number 4528 exhibited no operational interruptions.

The NTSB's Materials Laboratory Division examined samples of the white colored substance found on the left engine pressurizing valve spring and cover. The substance was tested and found to contain mostly carbon with some silicon, oxygen, sulphur, and small amounts of chlorine, potassium, and calcium.

The clear liquid with a yellow tint that was found in the left engine fuel control was tested and found to be Jet A aviation kerosene. The gray colored mass found in the fuel filter housing was tested and found to contain cellulose fibers combined with thin, uniform sized, glass fibers. Interspersed with these components were darker colored materials generally classified as polyester-urethane synthetic material. The test report is appended to this report.

## ADDITIONAL DATA

Shortly after the accident site was identified the Lansing, Michigan, Fire Department sprayed fire preventing foam over the entire scene. The chemical used to produce the fire suppressing foam is called "Chemguard 3%/6% AR-AFFF" according to the Lansing, Michigan, Fire Department Fire Chief. The chemical composition of this agent is made up from: rhamsen gum, diethylene glycol butyl ether, dowicil, DeTeric LP, forafac, and water.

The wreckage was released to Mr. Ronald Brokob of Superior Aviation Incorporated, Lansing, Michigan.

## Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	53, 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>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2 Valid Medical--w/ waivers/lim.	<b>Last FAA Medical Exam:</b>	03/05/1993
<b>Occupational Pilot:</b>	<b>Last Flight Review or Equivalent:</b>		
<b>Flight Time:</b>	8790 hours (Total, all aircraft), 8347 hours (Pilot In Command, all aircraft)		

## Aircraft and Owner/Operator Information

Aircraft Make:	AERO COMMANDER	Registration:	N242TC
Model/Series:	690A 690A	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	11219
Landing Gear Type:	Retractable - Tricycle	Seats:	11
Date/Type of Last Inspection:	03/29/1993, Continuous Airworthiness	Certified Max Gross Wt.:	10250 lbs
Time Since Last Inspection:		Engines:	2 Turbo Prop
Airframe Total Time:	4373 Hours	Engine Manufacturer:	GARRETT
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	TPE-331-5
Registered Owner:	EXECUTIVE AIRCRAFT, INC.	Rated Power:	715 hp
Operator:	MIDWEST FLYING SERVICE, INC.	Operating Certificate(s) Held:	On-demand Air Taxi (135)

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	Condition of Light:	Day
Observation Facility, Elevation:	LAN, 861 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	1110 EDT	Direction from Accident Site:	180°
Lowest Cloud Condition:	Unknown / 300 ft agl	Visibility	1.5 Miles
Lowest Ceiling:	Broken / 300 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	7 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	330°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	12° C / 11° C
Precipitation and Obscuration:			
Departure Point:		Type of Flight Plan Filed:	IFR
Destination:	BATTLE CREEK, MI (BTL)	Type of Clearance:	IFR
Departure Time:	1117 EDT	Type of Airspace:	Class E

## Wreckage and Impact Information

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

## Administrative Information

Investigator In Charge (IIC):	FRANK S GATTOLIN	Report Date:	10/20/1994
Additional Participating Persons:	JOHN MILLER; GRAND RAPIDS, MI RONALD FARWIG; GRAND RAPIDS, MI PETER B BAKER; PHOENIX, AZ ROGER G STALLKAMP; PIQUA, OH		
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:pubinq@ntsb.gov">pubinq@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> .		

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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](#).