Aviation Investigation Final Report

Location:	Allendale, South Carolina	**Accident Number:**	ATL03LA094
Date & Time:	May 16, 2003, 17:58 Local	**Registration:**	N29ME
Aircraft:	Kerner Lancair IV	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was operating the airplane on an IFR flight plan into instrument meteorological conditions in an area of known thunderstorms with severe turbulence. The airplane disappeared from radar coverage and was located in a wheat field by Sheriff Department personnel. The airplane sustained an in-flight airframe breakup. Airframe components recovered from the accident site were submitted to the NTSB Material Laboratory for examination. The examination revealed all failures were due to overload. Examination of the airframe revealed the airframe design limits were exceeded. The pilot received several preflight briefings through the use of the DUAT system. The products used forecasted thunderstorm activity along the route of flight and the pilot received Convective SIGMET's and Central Weather Advisories warning of developing thunderstorms.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadvertent flight into adverse weather ,thunderstorms, that resulted in the design limits of the airplane being exceeded.

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: MANEUVERING

Findings

1. (C) WEATHER CONDITION - TURBULENCE(THUNDERSTORMS)
2. (C) FLIGHT INTO ADVERSE WEATHER - INADVERTENT - PILOT IN COMMAND

Occurrence #2: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. (C) AIRFRAME - OVERLOAD
4. DESIGN STRESS LIMITS OF AIRCRAFT - EXCEEDED - PILOT IN COMMAND

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

Findings
5. AIRCRAFT CONTROL - NOT POSSIBLE

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
6. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On May 16, 2003, at 1758 eastern daylight time, a Kerner Lancair IV, N29ME, registered to Moser Aviation LLC, operating as a 14 CFR Part 91 personal flight, broke up in-flight in the vicinity of Allendale, South Carolina. Instrument meteorological conditions prevailed at flight altitude and an instrument flight rules flight plan was filed. The airplane was destroyed. The commercial pilot and three passengers were fatally injured. The flight originated from Portland, Indiana, on May 16, 2003, at 1452 central daylight time.

A witness stated he was sitting in his yard. It was thundering but had not started to rain. He heard an airplane approaching his location traveling towards Allendale from Columbia, South Carolina. He looked up but could not see the airplane due to the cloud cover. The engine sounded like it was at full power and then decreased to idle power. He then heard a sound described as an explosion. He looked in the direction of the sound and observed the cabin area of the airplane come out of the clouds with the wings falling to the ground behind the airplane.

Review of communications between the pilot of N29ME and Jacksonville center revealed the pilot contacted Jacksonville center at 1730, at cruise altitude of 17,000 feet. The pilot requested to deviate to the left for weather. The controller instructed the pilot to stay on his present heading until clear of traffic. The controller asked the pilot if he was weather radar capable. The pilot stated he had a storm scope but it was not working. The controller informed the pilot there was a broken line of weather extending from the northwest to the southeast. He informed the pilot if he wanted to deviate to his right he should fly a heading of 200-degrees magnetic for about 30 to 40 miles. If he wanted to deviate to his left, he should fly a heading of 120 to 125-degrees for about 70 miles. The pilot elected to go to the right. The flight was cleared to 13,000 feet and then direct to Buford, South Carolina. The pilot informed the controller he would proceed direct in about 5 miles. At 1749, the flight was cleared to 11,000 feet and the pilot acknowledged the clearance. There was no other recorded communication between the pilot and Jacksonville center. At 1755:07, the aircraft was observed on radar at 11,100 feet. At 1755:19, the aircraft was at 11,000 feet. The last recorded mode "C" transponder was at 1755:31, at 11,700 feet.

PERSONNEL INFORMATION

Review of information on file with the FAA Airman's Certification Division, Oklahoma City, Oklahoma, revealed the commercial pilot was issued a commercial pilot certificate on May 24, 2002, with ratings for airplane single engine land, and instrument airplane. The pilot held a third class medical certificate issued on May 5, 2003, with the restriction, "must have available glasses for near vision." The pilot's biennial flight review was conducted on May 24, 2002.

Review of the pilot's logbook revealed he had logged 834.8 total flight hours. The pilot had logged 109.3 hours in the Lancair IV of which 84.2 were as pilot-in-command.

AIRCRAFT INFORMATION

According to friends of the family the aircraft logbooks were kept in the airplane. Attempts to locate the aircraft logbooks were unsuccessful. The Hobbs meter was destroyed and no airframe or engine time could be determined. Review of refueling records revealed the airplane was topped off on May 16, 2003, with 23.9 gallons of 100 low lead fuel.

METEOROLOGICAL INFORMATION

The accident site was located south of a stationary front. Marginal visual flight rule conditions were depicted over North and South Carolina, and extended over the area in the vicinity of the accident site. The 1500 Weather Depiction chart in the vicinity of the accident site indicated a severe thunderstorm with rain had occurred within the hour and visibility was reduced to 3 miles in rain, with a ceiling overcast at 2,000 feet.

The infrared satellite imagery depicted several areas of enhanced clouds associated with convective activity over South Carolina and eastern Georgia, with the accident site on the western edge of one of those areas. The visible imagery depicted the accident site approximately 12 miles from a defined cumulonimbus cloud with overshooting cloud tops, and under a layer of cirrostratus type clouds associated with the convective activity. Cloud tops of 34,000 feet were identified over the accident site and up to 41,000 feet over the area of overshooting tops 12 miles to the east.

The Charleston WSR-88D radar depicted a large area of echoes with reflectivities to 55 to 60 dBZ or extreme intensity echoes immediately east and rapidly developing echoes over the accident site. Echoes ranged from 5 to 15 dBZ at the time of the breakup to 50-55 dBZ or intense to extreme intensity 12-minutes later. The rapid change in altitude correlated with the developing echoes, which would be characterized by updrafts in the building thunderstorm. Echo tops at the time of the accident were identified from 15,000 to 25,000 feet, with echoes to 40,000 feet 6 miles east. The radar data indicates that the accident airplane had descended into an area of developing thunderstorm cell, and was in instrument meteorological conditions (IMC) at the time of the in-flight breakup.

The closest weather reporting facility was Orangeburg Municipal Airport, Orangeburg, South Carolina, located 33 miles northeast of the accident site at an elevation of 195 feet msl. The Orangeburg, South Carolina, special weather observation at 1729 was, wind from 350 degrees at 4 knots, visibility 1 3/4 miles with thunderstorms in the vicinity , light rain and mist, ceiling broken at 1,300 feet, second broken layer at 1,900 feet, and a third broken layer at 3,400 feet, temperature 23 degrees C, dew point temperature 22 degrees C, altimeter 29.99 inches of Mercury (Hg). Remarks: automated observation system, lightning distant all quadrants, thunderstorm ended at 2059Z and began again at 2124Z, precipitation in the last hour 0.20

inches.

The thunderstorm complex to the east of the accident produced 69 cloud-to-ground lightening strikes in the 15 minute period prior to the accident. A cluster of strikes was located from 9 to 15 miles east-northeast through east of the accident site however, no lightening strikes were recorded over the route to the north or over the location of the in-flight breakup.

The pilot received several pre-flight weather briefings through the use of the DUAT system. Forecast thunderstorm activity was present along the pilots route of flight. Convective SIGMETs and Center Weather Advisories warnings were present alerting the pilot to the development of thunderstorms over South Carolina.

WRECKAGE AND IMPACT INFORMATION

The main wreckage of the airplane was located in a wheat field in the vicinity of highway US278 and Pat Lane near Allendale, South Carolina.

Examination of the crash site revealed the engine assembly and propeller were located inverted in the ground. Two propeller blades were not damaged. The remaining propeller blade was bent aft. The engine assembly separated from the airframe and was connected to the main cabin area by wiring bundles. The cabin area was located directly behind the engine assembly. There was no smell of fuel at the crash site. The nose gear was separated from the airframe. The crash debris line was located on a heading of 062-degrees magnetic, at an elevation of 223 feet, and began .75 miles from a secondary road (S-3-289) located in Allendale County.

The cabin area was located on a heading of 268-degrees magnetic. The forward cabin area was separated from the forward windshield bond line aft to the rear edge of the main cabin door. The empennage was separated at the aft edge of the pressure bulkhead and forward left edge of the baggage door. The top of the main cabin roof adjacent to the rear pressure bulkhead was damaged. A 45-degree diagonal imprint was located on the left side of the empennage 7-inches aft of the lower corner of the baggage door opening. An impact mark was present 3-inches aft of the left side access panel opening forward edge and the vertical stabilizer and rudder assembly separated from the empennage. The remaining empennage was fragmented into numerous pieces. The flight control tubes from the control column aft to the center bell crank and outboard to the left and right wings were broken. The rudder cables broke aft of the internal rudder bell crank in the tail section. The fuel selector valve was located on the right main fuel tank. The left and right main landing gear were extended.

The right wing was located 3,737 feet down and on the crash debris line, and .25 miles southwest of the secondary road. The right wing separated at the forward spar seven inches outboard of the centerline of the fuselage. Four feet four inches of the forward spar was not recovered. The rear spar separated five feet three inches outboard of its attach point. Four feet three inches of the right wing upper skin outboard of the wing root separated and was not

recovered. Six feet of the leading edge of the right wing outboard of the wing root was separated and not recovered. The right wing surface had numerous punctures and the right wing winglet was delaminated along the vertical axis. The speed brakes were in the retracted position. The right aileron remained attached to its attachment points. The right flap separated at the outboard flap track and was located 75-feet right of the right wing. The inboard flap track separated at the rear spar and the flaps were in the retracted position. The control linkage was confirmed from the wing inboard to the bell crank where it broke. The right main fuel tank was ruptured.

Pieces from the right wing front spar near the wing root, outboard piece at the outboard fracture, and the right wing rear spar piece with the fracture near the attachment were forwarded to the NTSB Material Laboratory for further examination. The examination revealed the fractures of the right wing front spar near the wing root failed in upward bending of the wing with respect to the fuselage. The fracture of the right wing spar revealed upward bending and aft with respect to the fuselage. In addition the spar revealed twisting of the wing (leading edge up) with respect of the fuselage. The outboard fracture of the wing spar revealed upward bending of the wing tip with respect to the inboard portion of the wing. There was no evidence of fatigue or long-term progressive damage observed.

The vertical stabilizer and rudder assembly separated from the empennage. The vertical stabilizer was located 621 feet down the crash debris line, 1,319 feet right of the crash debris line, and .75 miles from the secondary road. A 45-degree diagonal imprint was located on the left side of vertical stabilizer extending from the top of the vertical stabilizer downward twenty-four inches. The rudder assembly separated from the upper, middle, and lower hinge blocks. The upper hinge block was attached to the vertical stabilizer sternpost. The middle and lower hinge blocks were not located. The sternpost had delaminated in the vicinity of the middle and lower hinge blocks.
The rudder assembly was forwarded to the NTSB Materials Laboratory for further examination. The examination revealed no evidence of fatigue, lighting strikes or long-term progressive damage.

The left and right horizontal stabilizers were located 3,621 feet down the crash debris line, 292 right of the crash debris line, and .25 miles southwest of the secondary road. The left and right horizontal stabilizers separated from the horizontal stabilizer-mounting cradle. The left horizontal stabilizer was damaged on the leading edge 17-inches outboard of the centerline of the fuselage extending outboard four feet eight inches. Three 45-degree skin puncture marks were located on the upper surface of the horizontal stabilizer two feet two inches, two feet seven and a half inches, and four feet two inches outboard of the center line of the fuselage. The lower surface of the left horizontal stabilizer had three 45-degree punctures one feet eight inches, two feet three inches and four feet three and a half inches outboard of the center line of the fuselage. The left elevator was not damaged. The left elevator trim tab top skin was attached to the hinge line and the lower skin surface was delaminated and missing. The right horizontal stabilizer was damaged on the lower surface 2 feet 8 1/2 inches and 3 feet 9-inches outboard of the centerline of the fuselage. The right elevator was not damaged.

The left wing section was located 3,591 feet down the crash debris line, 62 feet left of the crash debris line, and .32 miles from the secondary road. The left wing separated at the wing root. The forward spar separated through the main spar bolt. The rear spar separated at the attach point, and fifty-eight inches of the rear spar extending outboard from the wing root was missing. The wing separated eight feet ten inches outboard of the wing root. The outboard five feet eight inches of the wing and winglet was not recovered. The upper skin of the left wing was delaminated at a 45-degree angle two feet eight inches outboard of the wing root. The speed brakes were in the retracted position. The leading edge of the left wing was missing four feet seven inches outboard of the wing root and extended outboard to seven feet seven inches and inboard to the forward spar. The left flap separated from the left wing at the hinge point in three sections, and the flaps were in the retracted position. The aileron separated from the attach point and 3 feet of the outboard aileron was not recovered. The control linkage was confirmed from the left wing inboard to the bell crank where it broke. The left main fuel tank was ruptured.

Pieces from the left wing front spar near the wing root, inboard piece and outboard fracture, and left wing rear spar piece with the fracture near the attachment were forwarded to the NTSB Material Laboratory for further examination. The fracture of the left wing front spar at the root occurred in upward bending of the wing with respect to the fuselage, and the fracture surfaces exhibited twisting of the leading edge spar (leading edge up) with respect to the fuselage. The fracture occurred at the position of the main fuselage bolt. The fracture of the left wing rear spar revealed upward bending of the wing with respect to the fuselage and wing aft. The outboard fracture of the left wing front spar revealed upward bending and twisting (leading edge up) of the wing tip with respect to the inboard portion of the wing. There was no evidence of fatigue or long-term progressive damage observed.

Examination of the engine assembly revealed the engine cowling, engine case halves, induction tubing, throttle body, and magnetos, were fractured. All engine driven accessories were found attached or partially attached to the engine with the exception of the vacuum pump and air conditioner compressor. The engine oil sump was deformed upward along the full length of the oil sump. Visual inspection of the internal engine components revealed no anomalies. There was no discoloration present on the engine components and an oil film was present. The engine oil filter was removed and no metallic particles were present. The valve train push rods were bent and precluded hand rotation of the crankshaft. Fuel was present in the airframe fuel strainer, fuel distribution manifold, and the fuel screens were not contaminated. The right turbocharger rotated freely by hand. The left turbocharger rotated through about 1/4 turn and the waste gate valve linkage was broken.

The vacuum pump, turn and bank indicator, and directional gyro were not recovered and could not be examined.

Examination of the altimeter revealed the case was damaged. The factory seal was not installed, and the data plate was present. The bezel and bezel glass were not located. The

barometric knob and shaft were broken. The pointer's were not recovered. The sector pivot's were broken. The balance assembly did not separate from the sector assembly. No tension was present on the hairspring to the sector and sector pointer, and the sector was disengaged from the hairspring wheel. The pivots on the hairspring were not broken. Two of the three screws on the top plate had sheared and play was present on top of the plate bridge. Both diaphragms were damaged.

Examination of the airspeed indicator revealed the case and bezel were damaged. The bezel glass was not damaged. The factory seal was not installed and the data plate was present. The static port and ram port were broken. Disassembly of the airspeed indicator revealed the sector pivot's were broken. The diaphragm was not damaged. No tension was present on the hairspring and the hand staff was damaged.

Examination of the vertical speed indicator revealed the case and bezel were damaged and the factory seal was not installed. The bezel glass was not recovered. Disassembly of the vertical speed indicator revealed the aneroid flexible tube was connected to the port fitting and the diaphragm was damaged. The top plate was bent with the hairspring attached to the top plate.

Examination of attitude gyro revealed the case and bezel were damaged. The bezel glass was broken. A factory seal was not installed, and the data plate was recovered. Disassembly of the attitude gyro revealed the yoke assembly was broken, and scoring was present on the gyro and rotor housing.

The damaged Sierra Flight Systems navigation systems were forwarded to the Seattle Flight Standards District Office for further analysis by Regan Designs, Coeur-D"Alene, Idaho. The data cards were removed and the systems were downloaded after replacing damaged components. Review of information downloaded from the Sierra Flight Systems navigation system revealed the airplane was at 11,676 feet at 1755:31. The airplane climbed up to 12, 236 feet at 1755:46, and entered a left spiraling dive. The last data point at 1756:01 shows a tightening left hand spiral dive with a true airspeed of 253, and a positive 3.75 G's.

MEDICAL AND PATHOLOGICAL INFORMATION

A professor in pathology and lab medicine, from the South Carolina Medical University, conducted a postmortem examination of the commercial pilot on May 17, 2003. The cause of death was "massive total body trauma." The Forensic Toxicology Research Section, Federal Aviation Administration, Oklahoma City, Oklahoma performed postmortem toxicology of specimens from the pilot. The specimens were not tested for carbon monoxide and cyanide. The specimens were negative for alcohol, basic, acidic, and neutral drugs.

A professor in pathology and lab medicine, from the South Carolina Medical University, conducted a postmortem examination of the male passenger on May 17, 2003. The cause of death was "full body blunt force trauma." No toxicology specimens were requested.

A resident pathologist, from the South Carolina Medical University, conducted the postmortem examinations on the two female passengers on May 18, 2003. The cause of death was "full body blunt force trauma." No toxicology specimens were requested.

ADDITIONAL INFORMATION

The wreckage was released to Atlanta Air Recovery, Griffin, Georgia, on April 23, 2004.

Pilot Information

Certificate:	Commercial	**Age:**	50,Male
Airplane Rating(s):	Single-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 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	May 5, 2003
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 22, 2002
Flight Time:	835 hours (Total, all aircraft), 109 hours (Total, this make and model), 678 hours (Pilot In Command, all aircraft), 28 hours (Last 90 days, all aircraft), 23 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Kerner	**Registration:**	N29ME
Model/Series:	Lancair IV	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	200
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	3000 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Continental
ELT:	Not installed	**Engine Model/Series:**	IO-550-ES
Registered Owner:	Greg A. Moser	**Rated Power:**	300 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	OGB,1753 ft msl	**Distance from Accident Site:**	40 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	190°
Lowest Cloud Condition:	Few / 900 ft AGL	**Visibility**	5 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	23°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Portland, IN (PLD)	**Type of Flight Plan Filed:**	IFR
Destination:	Buford, SC (73J)	**Type of Clearance:**	IFR
Departure Time:	14:52 Local	**Type of Airspace:**	Class E

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	33.047222,-81.313888

Administrative Information

Investigator In Charge (IIC):	Smith, Carrol
Additional Participating Persons:	Laurin J Kaasa; Columbia FSDO; West Columbia, SC Ralph K Wetherell; Teledyne Continental; Vernon, CT Robert F Wolstenholme; Lancair; Redmond, OR
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Last Revision Date:	
Investigation Class:	Class
Note:	
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