



National Transportation Safety Board Aviation Accident Final Report

Location:	Antlers, OK	Accident Number:	DFW07FA004
Date & Time:	10/15/2006, 1303 CDT	Registration:	N55JS
Aircraft:	Aero Commander 690A	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	4 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

Approximately 37 minutes after departing on a 928-nautical mile cross-country flight under instrument flight rules, the twin-engine turboprop airplane experienced an in-flight break-up after encountering moderate turbulence while in cruise flight at the assigned altitude of FL230. In the moments preceding the break-up, the airplane had been flying approximately 15 to 20 knots above the placarded maximum airspeed for operations in moderate turbulence. The airplane was found to be approximately 1,038 pounds over the maximum takeoff weight listed in the airplane's type certificate data sheet (TCDS). The last radar returns indicated that the airplane performed a 180-degree left turn while descending at a rate of approximately 13,500 feet per minute. There were no reported eyewitnesses to the accident. The wreckage was located the next day in densely wooded terrain. The wreckage was scattered over an area approximately three miles long by one mile wide. An examination of the airframe revealed that the airplane's design limits had been exceeded, and that the examined fractures were due to overload failure.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to reduce airspeed while operating in an area of moderate turbulence, resulting in an in-flight break up. Contributing factors were the pilot's decision to exceed the maximum takeoff weight, and the prevailing turbulence.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE

Findings

1. (F) WEATHER CONDITION - TURBULENCE
 2. AIRFRAME - OVERLOAD
 3. (C) DESIGN STRESS LIMITS OF AIRCRAFT - EXCEEDED - PILOT IN COMMAND
 4. (F) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND
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Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings

5. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On October 15, 2006, approximately 1303 central daylight time, an experimental Aero Commander 690A twin-engine turboprop airplane, N55JS, was destroyed following an in-flight breakup while in cruise flight near Antlers, Oklahoma. The airline transport rated pilot, airline transport rated co-pilot, and both passengers sustained fatal injuries. The airplane was registered to and operated by the pilot. Instrument meteorological conditions prevailed and an instrument flight rules flight plan was filed for the 14 Code of Federal Regulations Part 91 personal flight. The 928-nautical mile cross-country flight departed the Wiley Post Airport (PWA), near Oklahoma City, Oklahoma, approximately 1225, and was en route to the Executive Airport (ORL), near Orlando, Florida. The reported purpose of the flight was for the occupants to attend the National Business Aviation Association's annual convention.

According to line crew personnel, on the morning of the accident they had been instructed to pull the airplane from its hangar and to service the main fuel tanks for an approximate 1000 departure. About 0800, one of the line crew proceeded to the airplane's hangar intending to pull the airplane outside for fueling. When he arrived at the hangar he found 4 or 5 employees, installing the airplane's interior, servicing the landing gear struts with nitrogen, and completing "other miscellaneous orders." He was informed that the airplane was not yet ready to be fueled.

Around 0900 the airplane was brought out to the flight line. About this time the line crew was instructed, by one of the ServiCenter managers, that in addition to servicing the airplane's main fuel tanks, the "slipper" fuel tanks should also be completely filled with fuel. The line crew proceeded by servicing the airplane as requested with 489 gallons of Jet A fuel.

The line crew reported that both pilots arrived around 1000. One pilot performed a preflight inspection of the airplane while the other called flight service for a weather briefing. According to the McAlester Flight Service Station, the pilot contacted them by telephone at 1050 and received a full weather briefing. Following the briefing the pilot filed an IFR flight plan from PWA to ORL. The cruise altitude requested for the flight was 27,000 feet MSL. The pilot stated the flight would take three hours and thirty minutes and there would be four persons on board.

The pilots received their IFR clearance at 1215 and were cleared for takeoff at 1225. Approximately 37 minutes after departure, radar information revealed N55JS was flying on a southeasterly heading at a cruise altitude of 23,100 feet mean sea level (MSL). At 1302, radar control tracking indicated the airplane performed a left 180-degree turn while descending at a rate of approximately 13,500 feet per minute. The last radar contact was at 1303 while at 15,100 feet MSL. The airplane was located the next morning by local law enforcement personnel, scattered across a densely wooded area.

There were no reported witnesses to the accident.

PILOT INFORMATION

There were two airline transport pilots (ATP) onboard the airplane at the time of the accident. According to line personnel, the pilots were occupying the front two seats during departure. The pilot seated in the front left seat had called flight service for the weather briefing and had

filed the flight plan. The flight plan listed the individual seated in the right seat as the pilot-in-command for the flight.

A review of information on file with the FAA Airman's Certification Division, Oklahoma City, Oklahoma, revealed the right seat pilot held an airline transport pilot certificate for airplane multi-engine land. The pilot also held a commercial certificate with ratings for airplane single-engine land, and instrument airplane. In addition, the pilot held a flight instructor certificate for airplane single-engine land, multi-engine land, and instrument airplane. The pilot held a second-class medical certificate issued on July 27, 2006, with no restrictions. The pilot's personal flight records were not located during the course of the investigation; however, on August 6, 2006, the pilot reported having logged 6,450 hours total time of which 150 were in the same make and model of airplane, with 80 hours in the previous 90 days.

A review of information on file with the FAA Airman's Certification Division, revealed the left seat pilot held an airline transport pilot certificate with ratings for airplane multiengine land. The pilot also held a commercial certificate with ratings for glider, airplane single engine land, and instrument airplane. The pilot held a third-class medical certificate issued on October 13, 2005, with restrictions. The pilot's personal flight records were not located during the course of the investigation; however, on August 6, 2006, the pilot had reported having logged 6,500 hours total time of which 2,000 were in the same make and model of airplane, with 50 hours in the previous 90 days.

AIRCRAFT INFORMATION

The 1974-model experimental Aero Commander 690A, serial number 11195, was a high wing, semi-monocoque airplane, with a retractable landing gear, and was configured for eight occupants. The airplane was powered by two Honeywell Aerospace TPE331-10T-515K turboprop engines which were driving five bladed composite MT-Propellers.

According to the airframe logbook, the airplane's most recent 150 hour periodic inspection was completed on December 16, 2005, at an airframe total time of 7,923 hours. Investigators were not able to locate the airplane's Hobbs meter during the course of the investigation and were unable to determine the airplane's total time at the time of the accident; however, the airframe logbook listed the total time as 7,943.7 hours on October 6, 2006.

The engine maintenance records revealed that the left and right engines had been last inspected in accordance with a Periodic 150 hour inspection on October 16, 2005. At the time of inspection the left engine had accumulated approximately 4,491.1 hours, and the right engine 4,904.1, since overhaul. At last inspection each engine had accumulated 35 hours since the last hot section inspection.

A review of the airframe maintenance records revealed that "slipper type" external fuel tanks were installed on October 6, 2006, in accordance with a supplemental type certificate (STC). These external tanks consist of two externally mounted fuel tanks attached to the airplane's wing just outboard of both engine nacelles. Each of the two "slipper" tanks can hold 50 gallons of fuel for a combined total of 100 gallons. With both tanks full the added weight of fuel to the airplane would be 670 lbs.

The airplane was awarded an experimental certificate on October 11, 2006, for the purpose of "Market Survey." This was due to the installation of two, five bladed composite propellers that did not meet the airplane's original type design. No pre impact anomalies were noted with either propeller during the investigation.

Along with the experimental certificate, 26 limitations were placed on the airplane by the Federal Aviation Administration (FAA). Limitation number 11 stated, "No person may be carried in this aircraft during flight unless that person is essential to the purpose of flight."

Investigators performed weight and balance calculations using fueling records and the airplane's weight and balance statement dated the day of the accident, October 15, 2006. The calculations were performed using the FAA's standard weight of 170 pounds for each of the four occupants, 200 pounds estimated weight for luggage and loose equipment, and an estimated fuel burn off of 50 pounds consumed before takeoff.

According to the airplane's Type Certificate Data Sheet (TCDS), the airplane's maximum takeoff weight was 10,250 pounds. The total takeoff weight of the accident airplane was estimated at 11,288 pounds. The center of gravity (CG) was estimated to be within limits.

METEOROLOGICAL INFORMATION

At 1252, the weather observation facility at Atoka Municipal Airport (AQR), near Atoka, Oklahoma, located 28 nautical miles northwest from the site of the accident reported wind from 080 degrees at 3 knots, visibility 1.75 statute miles, heavy rain, scattered clouds at 1,600 feet, overcast ceiling at 2,200 feet, temperature 57 degrees Fahrenheit, dew point 57 degrees Fahrenheit, and barometric pressure setting of 29.84 inches of Mercury.

Weather data showed that widespread occasional light to moderate upper-level non-convective turbulence was present through the south-central region of the United States at the time of the accident. This turbulence was due, in part, to a strong jet stream moving eastward. The jet stream, along with an upper disturbance, caused an outbreak of scattered moderate to heavy thunderstorms over Oklahoma and northeastern Texas. Additionally, severe thunderstorms were occurring over the Texas panhandle.

The observed upper air soundings for Norman, Oklahoma, and Fort Worth, Texas, at 1900 indicated vertical wind shear of about 10 knots per thousand feet around 23,000 feet. In addition, analysis of soundings data showed light to moderate turbulence was possible in those areas at and above 23,000 feet.

Around the time of the accident pilot weather reports (PIREP) from Oklahoma and Texas indicated widespread light to moderate upper level turbulence due to wind shear. About 44 minutes after the accident a PIREP from a pilot of an Embraer 145 near McAlester, Oklahoma, about 50 miles north of the accident site, reported moderate turbulence, and moderate mixed icing at FL280.

An AIRMET for occasional moderate turbulence above 24,000 feet was valid for the region at the accident time. A review of the pilot's weather briefing transcript revealed that the pilot was informed of this AIRMET.

COMMUNICATIONS

A review of radio communications between N55JS and air traffic control revealed the following:

At 1225:03 the pilot was cleared for takeoff from Wiley Post Airport (PWA), near Oklahoma City, Oklahoma.

At 1232:34 the pilot first contacted the Fort Worth Air Traffic Control Center (ATCC) and was instructed to climb and maintain flight level (FL) 230 (23,000 feet).

At 1239:15 the pilot contacted Fort Worth Center on a new frequency as requested and reported climbing through FL190 for FL230. Fort Worth Center informed the pilot that at FL240 and above he could expect continuous light and occasional moderate chop and asked if the ride was smooth at their present altitude. The pilot responded, "it's relatively smooth down here."

At 1239:33 Fort Worth Center suggested that the pilot might want to reconsider his filed altitude (FL270) but informed him that he could climb and maintain FL270. The pilot responded, "how about we just hang out at 230 and see how it rides for us?"

At 1243:23 Fort Worth Center asked N55JS how the ride conditions were going. The pilot responded that they had smooth conditions and that they had a trace of icing passing through FL200.

At 1253:27 Fort Worth Center contacted the pilot and instructed him to change frequencies. Fort Worth Center repeated the frequency three more times; however, the pilot read back the wrong frequency each time and told Fort Worth Center, "got a lot of squelch here."

At 1255:17 the pilot contacted Fort Worth Center on the new frequency and said, "we're level at FL230 and we're having a lot of squelch through the radio." Fort Worth Center responded that their radar showed N55JS was entering an area of heavy precipitation which extended for about the next thirty miles. The pilot responded, "roger five juliet sierra."

At 1257:52 Fort Worth Center instructed the pilot to change frequencies. After Fort Worth Center's third attempt the pilot responded, "ah go ahead sir I've had a lot of squelch here can hear you now." Fort Worth Center again instructed the pilot to change frequencies.

At 1302:01 the pilot acknowledged the frequency change and said, "thank you."

There was no other known recorded communications with the pilot of N55JS.

At 1303 radar contact was lost.

WRECKAGE AND IMPACT INFORMATION

The wreckage was located on October 16, 2006, in densely wooded terrain at latitude 34 degrees 10.845 minutes north and longitude 95 degrees 42.437 minutes west, at an elevation of approximately 575 feet MSL. The wreckage was scattered over an area approximately three miles long by one mile wide. The airplane was broken into four large sections. The sections consisted of the fuselage forward cabin area, the aft fuselage, the left wing, and the right wing. The right engine remained attached to the right wing, and the left engine was located about 3,050 feet from the left wing.

The wreckage was recovered to Air Salvage of Dallas, near Lancaster, Texas. Representatives from the NTSB, Twin Commander Aircraft, and Honeywell Aerospace further examined the wreckage on October 25, 2006.

The major sections were accounted for during the examination except for the outboard half of the left elevator, the rudder tip cap and balance weight, and eight of the ten propeller blades. Control continuity could not be established due to the fragmentation of the wreckage; however, the separation signatures were found to be consistent with the control surfaces being installed and operational at the time of the break-up.

The wing structure was recovered in four major sections. Those sections included the center section, 23 feet of the left wing, 13 feet of the right wing and a 10 foot outboard section of the right wing. The left wing was generally in one piece from the fuselage to the tip. The left wing forward spar damage indicated separation in a downward direction with tension separation of the upper spar cap and compressive buckling of the lower spar cap. The left wing rear spar was consistent with separation in a downward direction.

The right wing was recovered in two major pieces; one extending from the fuselage to the inboard end of the aileron and the other extending from the inboard end of the aileron to the tip. The inboard right wing rear spar and forward spar lower cap separated at right wing station 24. The forward spar damage was consistent with separation in a downward direction with tension separation of the upper spar cap and compressive buckling of the lower spar cap. The right rear wing spar, like the left rear wing spar, did not show the same degree of damage but was consistent with separation in a downward direction. The outboard right wing also exhibited damage consistent with separation in a downward direction.

The wing center section from left wing station 24 to right wing station 24 was recovered with the rear spar, lower wing skin, chordwise ribs, and forward spar lower cap complete. The damage was consistent with downward separation of the left and right wings.

The empennage structure was recovered in eight major pieces. The horizontal stabilizer and mounting structure was located approximately one and a quarter miles from where the aft section of the fuselage came to rest. The outer one third of the left and right horizontal ends were found separated. Both elevators were found separated from the horizontal stabilizer. The outboard half of the left elevator was not recovered.

The vertical stabilizer was located approximately two miles from the aft fuselage. The rudder was found separated and the rudder tip cap and attached balance weight were not recovered. The empennage had separated from the aft fuselage just forward of the horizontal stabilizer. The deformation of the aft fuselage was consistent with separation of the empennage in a downward direction.

According to a NTSB metallurgist, all of the fracture surfaces examined exhibited an angled, dull, grainy appearance consistent with overload failure. There was no indication of any pre-existing damage on any of the pieces examined.

The engine data plate identified the left engine as a model TPE331-10T-515K, serial number P-79308. The gearcase was found fractured at the inlet. There was damage to the leading edge of one first-stage compressor impeller blade. The oil bypass indicator was in the retracted position. The fuel pump housing was fractured at the fuel pump/gearcase flange and at the fuel control/fuel pump flange. The engine oil filter housing was found separated from the gearcase. There were metal spray deposits on the suction side of the third-stage turbine stator vanes. There were also rotational scoring signatures on the third-stage turbine blade tip shroud.

The engine data plate identified the right engine as a model TPE331-10T-515K, serial number P-79370C. The gearcase was found fractured at the inlet. The oil bypass indicator was found in the retracted position. The fuel pump housing was fractured at the fuel pump/gearcase flange. The starter/generator was found separated from the gearcase. The starter/generator drive shaft was bent, but complete. There were metal spray deposits on the suction side of the third-stage turbine stator vanes. There were also rotational scoring signatures on the third-

stage turbine blade tip shroud.

The damage observed on both engines was consistent with the engines producing power at the time of the accident.

MEDICAL AND PATHOLOGICAL INFORMATION

The Office of the Chief Medical Examiner of Oklahoma City, Oklahoma, performed an autopsy on the right seat pilot on October 17, 2006, and the left seat pilot on October 19, 2006. The cause of death for both pilots was listed as blunt force trauma.

The FAA, Toxicology Accident Research Laboratory, located in Oklahoma City, Oklahoma, conducted toxicological testing on both pilots.

TEST AND RESEARCH

Twin Commander Aircraft Corporation Service Bulletin No. 220, dated February 1, 1995, MANDATORY REDUCTION IN SPEED DURING TURBULENCE states, "there have been two accidents involving Model 690 series aircraft resulting in loss of the aircraft, due to encountering turbulence while descending at high airspeed....Excessive airspeed in turbulence can cause structural damage or loss of the aircraft.

Review of the PILOT'S OPERATING HANDBOOK, SECTION III EMERGENCY PROCEDURES, FLIGHT IN MODERATE TO SEVERE TURBULENCE, states, "If moderate to severe turbulence cannot be avoided, the following procedure is recommended: Avoid control action which could give rapid changes in attitude, altitude, or airspeed; whenever possible achieve steady flight conditions prior to entry into turbulence. Flaps should be fully retracted and autopilot disengaged. Slow to VA speed in severe turbulence, or turbulence penetration speed in moderate turbulence, keep pilot control movements to a minimum and fly a straight course through the turbulence, as far as practicable concentrating on attitude and disregarding altitude.

WARNING: Failure to slow to VA can result in structural damage or loss of airplane due to the magnitude of the gust loads or loss of control."

The following placards were installed in the cockpit of the accident airplane:

"WARNING ABRUPT CONTROL MOVEMENTS ABOVE MANEUVERING SPEED CAN RESULT IN SERIOUS STRUCTURAL DAMAGE"

"WARNING MAXIMUM AIRSPEED IN MODERATE TURBULENCE 180 KTS, MAXIMUM AIRSPEED IN SEVERE TURBULENCE OR ABRUPT CONTROL MOVEMENT 148 KTS AT MAX WEIGHT."

At FL230, using a temperature lapse rate of 2 degrees per thousand feet, 180 knots indicated airspeed (KIAS) is equivalent to approximately 260 knots true airspeed (KTAS). Additionally, 148 KIAS is equivalent to 216 KTAS.

N55JS's true airspeed was calculated following the accident from gathered radar information. Oklahoma City radar sweeps were recorded every 12 to 13 seconds. Between the times of 1258:13 and 1302:50, N55JS was observed to exceed 260 KTAS, during 15 out of 24 radar sweeps. The airspeeds in excess of 260 KTAS varied from 275.7 KTAS to 307 KTAS. N55JS was lost from radar at 1303.

ADDITIONAL INFORMATION

The wreckage was released on May 23, 2007, to a representative of the owner's insurance company.

Pilot Information

Certificate:	Airline Transport; Flight Instructor	Age:	48, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	Yes
Medical Certification:	Class 2 Without Waivers/Limitations	Last FAA Medical Exam:	07/01/2006
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	6450 hours (Total, all aircraft), 150 hours (Total, this make and model)		

Co-Pilot Information

Certificate:	Airline Transport; Commercial	Age:	71, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 With Waivers/Limitations	Last FAA Medical Exam:	10/01/2005
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	6500 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Aero Commander	Registration:	N55JS
Model/Series:	690A	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Experimental	Serial Number:	11195
Landing Gear Type:	Retractable - Tricycle	Seats:	8
Date/Type of Last Inspection:	12/01/2005, Condition	Certified Max Gross Wt.:	10300 lbs
Time Since Last Inspection:		Engines:	2 Turbo Prop
Airframe Total Time:	7943 Hours as of last inspection	Engine Manufacturer:	Honeywell Aerospace
ELT:	Installed, not activated	Engine Model/Series:	TPE33110T515K
Registered Owner:	On file	Rated Power:	776 hp
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	Condition of Light:	Day
Observation Facility, Elevation:	AQR, 590 ft msl	Distance from Accident Site:	28 Nautical Miles
Observation Time:	1252 CDT	Direction from Accident Site:	315°
Lowest Cloud Condition:	Scattered / 1600 ft agl	Visibility	1.75 Miles
Lowest Ceiling:	Overcast / 2200 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	3 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	80°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.84 inches Hg	Temperature/Dew Point:	14° C / 14° C
Precipitation and Obscuration:	Heavy - Thunderstorms - Rain		
Departure Point:	OKLAHOMA CITY, OK (PWA)	Type of Flight Plan Filed:	IFR
Destination:	ORLANDO, FL (ORL)	Type of Clearance:	IFR
Departure Time:	1230 CDT	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	2 Fatal	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 Fatal	Latitude, Longitude:	34.180833, -95.707222

Administrative Information

Investigator In Charge (IIC):	Timothy J LeBaron	Report Date:	12/20/2007
Additional Participating Persons:	Robert Giguere; Federal Aviation Administration; Oklahoma City, OK Raymond Dickey; Twin Commander Aircraft; Arlington, WA Marlin J Kruse; Honeywell Aerospace; Phoenix, AZ		
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 pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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](#).