Aviation Investigation Final Report

Location:	Luna, New Mexico	**Accident Number:**	DEN07LA082
Date & Time:	April 9, 2007, 11:59 Local	**Registration:**	N953CD
Aircraft:	Cirrus SR22	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

According to the pilot, he was climbing from 15,000 feet to 16,000 feet to avoid building thunderstorms and snow showers. The pilot reported that he was in instrument meteorological conditions when the airspeed indication started to decrease and then the airspeed and altimeter readouts, within the primary flight display, went to "hash marks." The pilot stated that he manually overrode the autopilot to initiate a descent, and turned the pitot heat on. The pilot report that shortly thereafter the airspeed indication returned. The pilot sensed that he was in a descent and "pulled back" to slow the airplane down and the attitude indicator went "haywire." The terrain warning system activated and the pilot elected to activate the ballistic recovery parachute on the airplane. The airplane impacted trees and came to rest inverted at the top of several trees, resulting in substantial damage. In later telephone conversations with the pilot, he was asked about the position of the pitot heat, during the course of the flight. The pilot stated that he was not continuously in the clouds and the pitot heat remained off. He stated further that initially, he might have inadvertently turned the icing protection system on instead of the pitot heat. The switches are right next to each other. An examination of the primary flight display, and multi-function display revealed a loss of air data, due to pitot tube icing. An examination of the remaining airplane systems revealed no anomalies.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot's failure to activate the pitot heat while flying in the clouds and visible moisture, resulting in pitot tube contamination and the subsequent loss of air data for the primary flight display. Contributing to the accident was the icing conditions, and the pilot's subsequent spatial disorientation.

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: CRUISE - NORMAL

Findings
1. (F) WEATHER CONDITION - ICING CONDITIONS

Occurrence #2: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE - NORMAL

Findings
2. (C) ANTI-ICE/DEICE SYSTEM,PITOT HEAT - NOT ACTIVATED
3. (C) ANTI-ICE/DEICE SYSTEM - NOT SELECTED - PILOT IN COMMAND
4. (F) SPATIAL DISORIENTATION - PILOT IN COMMAND
5. (C) FLIGHT/NAV INSTRUMENTS - NOT OPERATING

Occurrence #3: MISCELLANEOUS/OTHER
Phase of Operation: DESCENT - EMERGENCY

Findings
6. MISC EQPT/FURNISHINGS,PARACHUTE/DRAG CHUTE - ACTIVATED

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

Findings
7. OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On April 9, 2007, at 1159 mountain daylight time, a Cirrus SR22, N953CD, piloted by a private pilot, sustained substantial damage when it impacted trees, 16 miles north of Luna, New Mexico. Visual meteorological conditions prevailed at the time of the accident. The personal flight was being conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91, on an instrument flight rules flight plan. The pilot was not injured. The cross-country flight originated at Tucson, Arizona, and was en route to Englewood, Colorado.

According to several telephone conversations with the pilot, he said he was climbing from 15,000 feet to 16,000 feet to avoid building thunderstorms and snow showers. The pilot reported that he was in instrument meteorological conditions when the airspeed indication started to decrease and then the airspeed and altimeter readouts, within the primary flight display, went to "hash marks."

The pilot stated that he manually overrode the autopilot to initiate a descent, and turned the pitot heat on. The pilot report that shortly thereafter the airspeed indication returned. The pilot sensed that he was in a descent and "pulled back" to slow the airplane down and the attitude indicator went "haywire." The terrain warning system activated and the pilot elected to activate the ballistic recovery parachute on the airplane. The airplane impacted trees and came to rest inverted at the top of several trees. The empennage separated from the airplane. The outboard portion of the right wing was crushed aft and had partially separated.

In a written statement, submitted by the pilot, he wrote that the airplane was "getting hit by snow pellets." He stated that he "turned the TKS [ice protection system] on to maximum and set the windshield defroster to its highest setting." The pilot contacted air traffic control and requested another altitude to "get out of the clouds", as he was "in light icing." The pilot wrote that when he completed a routing change, he noted that the numbers on the airspeed indicator were red. The pilot stated that he "immediately pushed the nose down." Shortly thereafter, the airspeed indication when to "hatch marks." He stated that the "altitude indicator also gave no indication of altitude and appeared to have completely failed." The pilot wrote that a cross check of the back-up airspeed indicator showed no readings.

The pilot wrote that he "cycled the TKS switches and turned on the pitot heat." He sensed he was in a descent and was "gaining a lot of airspeed." The pilot stated that he "pulled back on the stick" and observed his "back-up airspeed indicator needle jump" and the "PFD airspeed indicator started to read 159." The pilot wrote that the terrain warning "sounded" and he elected to activate the parachute.

The pilot provided a drawing of the Primary Flight Display, as he observed it. The pilot illustrated the attitude indicator as an empty circle with "no triangle." The pilot also illustrated a small block of hatch marks where the airspeed reading would normally be, in addition to a "red X" where the altimeter reading would be.

PERSONNEL INFORMATION

The pilot, age 32, held a private pilot certificate with an airplane single engine land and instrument ratings which was issued on March 25, 2007. He was issued a third class airman medical certificate on September 21, 2006. The certificate contained no limitations.

According to the Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1) submitted by the pilot, he had logged a total of 340 hours total time. The pilot reported that he had logged 193 hours in the make and model of the accident airplane. In addition, the pilot had logged 54 hours of instrument flight time; 5 hours of which were in actual instrument meteorological conditions.

The pilot obtained Cirrus transition training through the Aspen Flying Club and attended some Cirrus training through the University of North Dakota. The training he attended through the university was as a spectator and not a student.

AIRCRAFT INFORMATION

The accident airplane, a Cirrus Design Corporation SR22 (serial number 1766), was manufactured in 2005. It was registered with the Federal Aviation Administration (FAA) on a standard airworthiness certificate for normal operations. A Teledyne Continental Motors engine, rated at 310 horsepower at 2700 rpm, powered the airplane. The engine was equipped with a 3-blade, variable pitch, Hartzell propeller.

The airplane was registered to JCT 3 Leasing LLC, operated by the pilot, and was maintained under a 100-hour inspection program. A review of the maintenance records indicated that an annual/100 hour inspection had been completed on March 6, 2007, at an airframe total time of 534 hours. The airplane had flown 57.6 hours between the last inspection and the accident.

METEOROLOGICAL INFORMATION

Doppler weather radar in Albuquerque (ABX), New Mexico, and Coconino County (FSX), Arizona (approximately 140 nautical miles (nm) northeast and 136 nm northwest of the accident location, respectively) scanned the accident area at 1151:38 and 1152:40. The radar beam for ABX was centered over the accident location at 22,500 feet mean sea level (msl), with a beam width of 12,400 feet. The radar beam for FSX was centered over the accident area at 23,200 feet msl with a beam width of 12,000 feet. Data indicated reflectivity values of zero to 10 dBz in the accident area around the accident time.

Aviation area forecasts were issued for New Mexico the day of the accident. The forecast for the northern mountains and western New Mexico was as follows: sky condition broken 9,000 feet to 10,000 feet; cloud tops at 17,000 feet; widely scattered light rain showers. Starting at 1200 (local) to 1500, sky condition scattered to broken at 10,000 feet, broken 14,000 feet; widely scattered light rain showers; light thunderstorms; cumulonimbus tops to flight level (FL) 350. The outlook was for visual flight rules (VFR).

The forecast for the southern mountains and west was as follows: sky condition, scattered at 14,000 feet, scattered ceilings. The forecast, starting at 1200 to 1500, called for sky condition scattered 11,000 feet, scattered 15,000 feet; isolated rain showers; light thunderstorms; cumulonimbus tops to FL 350. The outlook was for VFR.

Airman's Meteorological Information (AIRMET) for icing (ZULU) was issued for areas in New Mexico, including the accident airplane's route of flight. AIRMET ZULU was for a forecast area from 30 miles east/southeast of Grand Junction VOR (JNC) to 40 east/southeast of Pueblo to Roswell to Truth or Consequences to Saint Johns and back to JNC. The AIRMET stated to expect moderate icing between 10,000 feet and 17,000 feet. The route of flight was just south of AIRMETs for instrument flight rules (IFR) and mountain obscuration (SIERRA). The AIRMET for IFR stated to expect ceilings below 1,000 feet with visibility below 3 statute miles due to mist. The AIRMET for mountain obscuration stated to expect mountains to be obscured by clouds, mist, and fog. Significant meteorological information (SIGMET) or center weather advisories had not been issued for the time of the accident.

The closest official weather observation station was Saint Johns (SJN), Arizona, located 43 nm northwest of the accident site. The elevation of the weather observation station was 5,736 feet msl. The routine aviation weather report (METAR) for SJN, issued at 1154, reported winds, 310 degrees at 15 knots, gusting 23 knots; visibility, 10 statute miles; sky condition, few clouds at 3,800 feet, scattered clouds at 4,500 feet, broken clouds at 8,500 feet; temperature, 16 degrees Celsius (C); dewpoint, 06 degrees C; altimeter, 29.92.

According to the pilot, he obtained a weather briefing from the Denver Automated Flight Service Station, the morning of the accident. The pilot stated that he was aware of the AIRMET for icing.

FLIGHT RECORDERS

The accident airplane was equipped with an Avidyne EXP5000 Primary Flight Display (PFD) (serial number 2043434) and an Avidyne EX5000 Multi-Function Display (MFD). The PFD and the flash memory device from the MFD were sent to the NTSB Vehicle Recorders Lab in Washington D.C. for download. The avionics computing resource card, from the PFD, was removed and sent to Avidyne for extraction of flight data associated with this accident. The information was downloaded on April 24, 2007, under the auspices of the National Transportation Safety Board. A cockpit displays group was convened on May 7, 2007.

According to the cockpit displays factual report "the PFD unit includes a solid state Air Data and Attitude Heading Reference System and displays aircraft parameter data including altitude, airspeed, attitude, vertical speed, and heading. The PFD unit has external pitot/static inputs for altitude, airspeed, and vertical speed information. Each PFD contains two flash memory devices mounted on a riser card. The flash memory stores information the PFD unit uses to generate the various primary flight data displays."

"The PFD samples and stores several data streams in a sequential fashion; when the recording limit of the PFD is reached, the oldest record is dropped and a new record is added. Data from the attitude and heading reference system (AHRS) is recorded at a rate of 5Hz. Air data information such as pressure altitude, indicated airspeed, and vertical speed are recorded at 1Hz. Global Positioning System (GPS) and navigation display and setting data are recorded at a rate of .25Hz, and information about pilot settings of heading, altitude, and vertical speed references are recorded when changes are made."

"The MFD unit is able to display the pilot checklist, terrain/map information, approach chart information and other aircraft/operational information depending on the specific configuration and options that are installed. One of the options available is a display of comprehensive engine monitoring and performance data."

"Each MFD contains a compact flash memory card located in a slot on the side of the unit. This memory card contains all of the software that the MFD needs to operate. Additionally, this card contains all of the checklist, approach charts, and map information that the unit uses to generate the various cockpit displays."

"During operation, the MFD display receives information from several other units that are installed on the aircraft. Specifically, the MFD receives GPS position, time and track data from the aircraft's GPS receiver. The MFD also receives information from the aircraft concerning altitude, engine and electrical system parameters, and outside air temperature. This data is also stored on the unit's compact flash memory card."

"The MFD generates new data files for each power-on cycle. Similar to the PFD, the oldest record is dropped and replaced by a new recording once the storage limit has been reached. MFD data are sampled every six seconds, and is recorded to memory once every minute. If an interruption of power occurs during the minute between MFD memory write cycles, data sampled during that portion of a minute are not recorded. The last MFD recording on the accident flight occurred approximately 46 seconds before the apparent moment of impact, and approximately 1 minute and 20 seconds prior to the loss of power to the PFD on the accident flight."

According to the downloaded data, PFD power on and the start of PFD data recording for the accident flight occurred at approximately 1032. Prior to the first recorded indication of a deviation from stabilized level flight, at approximately 1154:57 (approximately 4,977 seconds after PFD startup), the recorded GPS, AHRS, and AirData information appear to be nominal.

The position and altitude data recorded in the PFD and MFD during this time appear consistent with available radar data.

After 1154:57, the recorded data indicated a decrease in indicated airspeed, eventually to zero at approximately 1155:34, followed by a decrease in pitch attitude and altitude. Approximately 9 seconds after indicated airspeed decreased to zero, altitude, altitude rate, and indicated airspeed, validity bits changed from "normal" to "failwarn". The "failwarn" indication continued for approximately 16 seconds. According to information provided by Avidyne Corporation, a "failwarn" indication for these data should result in the removal of these parameters from the PFD display, and the indications replaced by red X's.

During the period in which the validity bits indicate "failwarn" the recorded MFD data indicate a loss of pressure altitude information while the PFD continued to record pressure altitude data and altitude rate. Altitude and attitude rate data continued to be recorded in the PFD during the time in which the validity bits indicate "failwarn", and appear to be plausible and consistent with radar position/altitude data. Information provided by Avidyne Corporation indicates that the air data being recorded in the MFD are being passed from, and originate in the same sources as, the PFD. Since the validity bits for these data indicated "failwarn" they would not have displayed on the PFD and the indications replaced by red X's, and not passed to the MFD to be displayed/recorded. However the data continued to be recorded in the PFD log file because that recording is not filtered based on validity bit status. The "failwarn" indication in the PFD log file for these data means that the accuracy may be in question even if the values appear reasonable.

During the recorded decrease in indicated airspeed, and validity bit "failwarn" indications in the PFD, GPS data continued to be recorded and indicated an increase in groundspeed corresponding to the recorded decrease in pitch attitude. Between 1155:44 and 1155:50, the recorded current load on alternator 1 increased from 11 to 17 amps. Data provided by Cirrus Design Corporation indicate that selecting pitot heat "on" results in an approximate 5-amp increase in alternator current load. At approximately 1155:56 (approximately 23 seconds after decreasing to zero, 15 seconds after the recorded validity bits indicate "failwarn" and 2 seconds before validity bits return to "normal") the recorded data returned to an indication of non-zero airspeed. Approximately 18 seconds after loss of data, the MFD began recording pressure altitude again for 48 seconds, followed by a loss of recorded pressure altitude data for the remainder of the recording.

The recorded data in the PFD related to the AHRS system (aircraft attitude, acceleration, magnetic heading, and associated rates) indicate validity bits values of "normal" until approximately 72 seconds after the initial decrease in indicated airspeed to zero. "Failwarn" indications for these validity bits should result in the electronic attitude and direction display indications being replaced by red X's. The recorded acceleration data in the PFD indicate a positive g-loading of approximately 2.2gs 4 seconds prior to the change in recorded AHRS validity bits in the PFD from "normal" to "failwarn". Following this recorded g-loading, the recorded data indicate a decrease in descent rate from greater than 5,000 fpm to

approximately 1,500 to 2,000 fpm. According to data provided by Cirrus Design Corporation, this loading and subsequent descent rate is consistent with BRS deployment.

Pitch, magnetic heading, roll, altitude, airspeed, and associated rate values recorded in the PFD remain essentially constant after approximately 11:59:16. The last record in the PFD occurred approximately 5,294 seconds after PFD power on, corresponding to an estimated local time of 1200:14.

WRECKAGE AND IMPACT INFORMATION

The accident site was located in forested, mountainous terrain. A GPS receiver reported the coordinates of the main wreckage as 34 degrees 2.29 minutes north latitude, and 108 degrees 54.13 minutes west longitude. The accident site was at an elevation of 8,051 feet msl.

MEDICAL AND PATHOLOGICAL INFORMATION

No FAA toxicological tests were performed.

SURVIVAL ASPECTS

The Cirrus SR22 is equipped with dynamically certified seats per CFR Part 23.562. The seat bottoms have an integral aluminum honeycomb core, designed to crush at impact to absorb downward loads. There was no notable deformation of the seat. The crushing on the seat core initiated centrally and was less than five percent.

The two front seats were equipped with a 4-point harness and an airbag. The left seat harness was found latched. The airbags did not deploy. An examination of the deployment mechanisms revealed no anomalies.

TESTS AND RESEARCH

The wreckage was recovered on April 10, 2007, and relocated to a storage facility in Phoenix, Arizona, for further examination. The Safety Board IIC and representatives from Am Safe Aviation and Cirrus Design Corporation examined the wreckage on April 18, 2007.

The fuselage, to include the cabin and instrument panel, and engine assembly exhibited chipped paint and superficial surface scraping. The front windscreen was fragmented. The right aft portion of the fuselage had a large hole, approximately 12 inches in diameter. The Kevlar fuselage strap covers were missing; however, the Kevlar straps remained attached at the respective strap attach points. The left cabin door, rocket motor, and Cirrus Airframe Parachute System (CAPS) cover were missing and were not recovered. The right cabin door remained attached and was unremarkable.

Examination of the two static ports revealed no external contamination. No visible damage

was noted inside of the cabin. The Kolsman window on the altimeter was set to 29.96. All of the switches, directly below the instrument panel were in the "off" toggle position. No circuit breakers were extended.

The engine remained attached to the fuselage at the engine mounts. The propeller blades were arbitrarily labeled "A", "B", and "C" for identification purposes only. Blade A was bowed forward 30 degrees and exhibited leading edge polishing. The tip of blade B was curled aft and exhibited leading edge polishing. Blade C was bowed aft 25 degrees and exhibited 45-degree cordwise scratching, and leading and trailing edge nicks.

The left wing was removed from the fuselage for transportation purposes. The wing tip separated and was fragmented and the inboard leading edge was crushed aft and fragmented. The outboard leading edge was unremarkable. The aileron separated and was bent. The flap separated partially at the outboard attach point and was buckled at mid-span. Control continuity was confirmed.

The pitot tube separated from the left wing. Power was applied to the pitot tube and the unit became warm and then hot to the touch. The front hole of the pitot tube was contaminated with dirt. When air pressure was applied to the tubing for the pitot system, the airspeed needle inside of the cabin moved. Calibration was not confirmed.

The right wing was removed from the fuselage for transportation purposes. Approximately two feet of the outboard portion of the wing separated and was fragmented. The inboard leading edge of the wing was crushed aft and fragmented. The aileron separated and the trailing inboard edge of the flap was crushed forward and wrinkled. Control continuity was confirmed. Examination of the aileron trim revealed it was in the neutral position.

The empennage separated from the fuselage; however, the control cables remained attached through to the fuselage. The cables were cut for transportation purposes. The outboard edge of the left elevator was wrinkled and the bottom of the rudder was crushed up. The right elevator was wrinkled at mid-span. The horizontal and vertical stabilizers were unremarkable. Control continuity was confirmed. Examination of the elevator pitch trim revealed a full nose up position.

ADDITIONAL INFORMATION

In later telephone conversations with the pilot, he was asked about the position of the pitot heat, during the course of the flight. The pilot stated that he was not continuously in the clouds and the pitot heat remained off. He stated further that he might have inadvertently turned the TKS (ice protection system) on instead of the pitot heat. The switches are located right next to each other.

Parties to the investigation include the FAA, as represented by an inspector in the Albuquerque Flight Standards District Office and an investigator from Washington, D.C., Cirrus Design

Corporation, Avidyne, and Amsafe Aviation.

The wreckage was released to a representative of the owner on August 7, 2007.

Pilot Information

Certificate:	Private	**Age:**	32,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:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	September 1, 2006
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 1, 2007
Flight Time:	340 hours (Total, all aircraft), 193 hours (Total, this make and model), 259 hours (Pilot In Command, all aircraft), 38 hours (Last 90 days, all aircraft), 29 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cirrus	**Registration:**	N953CD
Model/Series:	SR22	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1766
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	March 1, 2007 100 hour	**Certified Max Gross Wt.:**	3400 lbs
Time Since Last Inspection:	57.6 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	591.2 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-550-N
Registered Owner:	JCT 3 Leasing LLC	**Rated Power:**	310 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:	KSJN,5743 ft msl	**Distance from Accident Site:**	43 Nautical Miles
Observation Time:	10:54 Local	**Direction from Accident Site:**	310°
Lowest Cloud Condition:	Few / 3800 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 8500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	15 knots / 23 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.92 inches Hg	**Temperature/Dew Point:**	16°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tuscon, AZ (AVQ)	**Type of Flight Plan Filed:**	IFR
Destination:	Englewood, CO (APA)	**Type of Clearance:**	IFR
Departure Time:	09:52 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	34.038055,-108.902221

Administrative Information

Investigator In Charge (IIC):	Kaiser, Jennifer
Additional Participating Persons:	Aaron Robinson; FAA FSDO; Albuquerque, NM Mark Manning; Cirrus Design Corp.; Deluth, MN Mike Haycraft; Amsafe; Phoenix, AZ Fred Barber; Avidyne; MA
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Investigation Class:	Class
Note:	
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