Aviation Investigation Final Report

Location:	Prescott Valley, Arizona	**Accident Number:**	LAX00FA213
Date & Time:	June 1, 2000, 10:05 Local	**Registration:**	N414PS
Aircraft:	Cessna 414A	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported hearing a loud noise and feeling his ears pop while the twin-engine airplane was in cruise flight about 12,900 feet. Radar data revealed that the airplane was on a relatively straight and level flight track until approximately 1 hour prior to the accident, when it initiated a spiraling descent to the left. The airplane continued toward the accident site on an erratic flight path, with the altitude varying between 6,000 and 9,000 feet. The pilot reported having trouble seeing his instruments and felt confused. He thought he was landing at an airport New Mexico near his ranch, but landed on a road in Arizona and struck light poles. Witnesses at the accident site stated that the pilot appeared impaired and confused, but did not smell of alcohol. The pilot left the accident site, and was not tested for alcohol or carbon monoxide poisoning. He reported that he did not consume any drugs or alcohol prior to, or during the flight, but did report smoking three packs of cigarettes a day and also smoked cigars. Examination of the pressurization and cabin air systems revealed that a fractured clamp that could have prevented the cabin from maintaining pressurization. In addition, there was evidence of engine exhaust by-products in some components of the airplane's pressurization system that should not have been exposed to engine exhaust. The source of the engine exhaust infusion into the pressurization system could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's physical impairment due to the cumulative effects of carbon monoxide from engine exhaust by-products, carbon monoxide from heavy tobacco use, and the loss of an undetermined amount of cabin pressurization. A factor in the loss of pressurization was a fractured clamp.

Findings

Occurrence #1: MISCELLANEOUS/OTHER
Phase of Operation: CRUISE

Findings
1. (C) AIR COND/HEATING/PRESSURIZATION - LOSS,PARTIAL
2. (C) PHYSICAL IMPAIRMENT(CARBON MONOXIDE) - PILOT IN COMMAND
3. (C) MISCELLANEOUS,BOLT/NUT/FASTENER/CLAMP/SPRING - FRACTURED

Occurrence #2: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: LANDING

Findings
4. OBJECT - UTILITY POLE

Factual Information

HISTORY OF FLIGHT

On June 1, 2000, about 1015 mountain standard time, a Cessna 414A, N414PS, was substantially damaged when it impacted light poles in a housing development during an off-airport landing near Prescott Valley, Arizona. The pilot and his two dogs were not injured. The airplane was registered to Prop Jocks, Inc., of Los Angeles, California, and was being operated as a personal flight by the pilot under 14 CFR Part 91. The cross-country flight originated at Van Nuys Airport (VNY), Van Nuys, California Van Nuys, California, at 0821, with an intended destination of Las Vegas Municipal Airport (LVS), Las Vegas, New Mexico. Visual meteorological conditions prevailed at the time of the accident, and an instrument flight rules flight plan was filed and activated for the flight.

The pilot was flying to Las Vegas to check on his ranch home, which was surrounded by wildfires. He reported that he was in cruise flight at 13,000 feet mean sea level (msl) when he heard a loud sound. His ears "popped" and his dogs began barking. Concerned that he had lost pressurization, he looked for a suitable landing site. He reported being confused and had a hard time seeing his instruments. After seeing what he believed was an airport below, he circled the field to the left and initiated an approach from the west. On short final, he noticed a truck parked on the left side of what he believed was a runway near the approach end, and lengthened his approach to clear the vehicle by 4 or 5 feet.

Just prior to touchdown, the airplane's right wing struck a light pole, and lost about a 4-foot outboard section. The airplane then touched down, bounced, and touched down again. It crossed an intersection, and struck a stop sign and another light pole. The airplane then veered right, off the paved portion of the roadway, and struck an electrical utility box with outboard section of the extended left flap. The airplane came to rest, facing south, about 200 yards from the first impact point.

The pilot shut down the airplane, and he and his dogs exited without assistance.

Four witnesses, who were working in the housing development, originally reported to local law enforcement personnel that they were at lunch during the accident and had not observed it. Later that day, one of the witnesses stated to another law enforcement officer that he had a "confession to make," and told the officer that he had witnessed the accident and had spoken with the pilot, but the pilot then walked to the road and obtained a ride from a passerby.

On June 6, 2000, local law enforcement personnel received a report that the witnesses had seen and spoken with the pilot in more detail, so officers spoke with them again. All four witnesses recanted their first statement, then submitted written accounts. In their accounts,

all four witnesses reported that the airplane was maneuvering overhead, then lined up with the road near their worksite. The airplane crossed over a truck that was parked on the road, by about 5 feet, touched down on the road and bounced back into the air approximately 5-7 feet, and impacted a light pole with its right wing, separating the outboard wing section. The airplane then touched down again and impacted a second light pole with the right wing, removing another section of wing. The airplane rotated to the right approximately 180 degrees, and came to rest in a field.

According to one of the witnesses, he drove over to the airplane to check on the pilot. The witness drove around the airplane looking for fuel leaks, and when he found none, he parked next to the airplane's cabin door, which was open. Two dogs were wandering around outside the airplane, and the pilot was pacing back and forth through the airplane. When the witness asked the pilot if he was all right, the pilot answered that he was, but he seemed to be unaware that his airplane had impacted poles during the landing.

The pilot subsequently asked the witness if the wildfires had reached his ranch. The witness stated that he didn't know where the pilot's ranch was, and the pilot pointed to a nearby hill and said, "right over there, in the canyon." The witness was not aware of any ranch in that area. The pilot then asked the witness if he could put some beer that his brother left in the airplane, in the witness' truck. The witness agreed, and believed that the pilot retrieved the beer out of the wing compartment, which he remembered being warm. The witness then told the pilot to get him and his coworkers if he needed help with anything, and left.

The witness then returned to his coworkers, who then elected to return to the airplane with him. One of the other witnesses asked the pilot if he was all right, to which he replied, "yeah, I can't believe this happened." One of the witnesses then asked the pilot if something went wrong with the airplane, to which, the pilot replied, "everything went haywire up there." Another witness asked what happened, and the pilot said, "I don't know, I land here almost every other day." They all reported that the pilot seemed impaired, and unaware as to his whereabouts. Two of the witnesses indicated that they smelled alcohol in the airplane, but not on the pilot.

According to the witnesses, the pilot appeared to be looking for something in the airplane. One of the witnesses offered to help. The pilot stated that he was looking for a bottle of wine, which the witness found beneath one of the aft seats. Both the pilot and the witness then exited the airplane with the bottle of wine, which was 1/3 full. Another witness put the wine bottle in his toolbox. The pilot then asked the witnesses to make up a story about what they had seen. They agreed to tell people that they were away at lunch when the accident occurred, and that they saw the pilot and his two dogs walk to the road and hitch a ride.

Three of the four witnesses returned to work and one stayed with the pilot. The pilot asked the remaining witness if he was in New Mexico, and was told that he wasn't. The remaining witness then offered to drive the pilot into town.

The witness drove the pilot to the witness's house at 1130, where the pilot called the Federal

Aviation Administration (FAA) and cancelled his flight plan, then called his wife and his flight instructor. At 1330, the witness took the pilot to the accident site, but upon seeing the police and media, the pilot requested that the witness take him to a hotel.

About 1500, the pilot was contacted by police via cell phone. According to the police statement, the pilot told authorities that he "experienced a pressurization problem."

About 1615, the witness dropped the pilot off at a hotel.

The witness indicated that the pilot appeared impaired at the accident site, but at no time did he smell alcohol on the pilot. He added that he purchased a pack of cigarettes for the pilot before taking him to the hotel.

At 2015, the pilot met with law enforcement personnel, and told them that he thought he had a pressurization problem, and descended to land. He found what he thought was an airport and landed. He noticed people on the "runway" and attempted to land on the remaining runway. He told the officers that he did not remain at the accident site earlier in the day because he did not want to "make a spectacle out of the event."

AIR TRAFFIC CONTROL INFORMATION

A review of radar data revealed that the airplane was on a relatively straight and level flight track, at 12,900 feet, until 43 nautical miles east of the Needles VOR. At 0904, the airplane initiated a spiraling descent to the left. The radar data then depicted a very erratic flight path for about 1 hour, during which, the airplane's altitude varied between 6,000 and 9,000 feet. At 1012, the airplane, which had been flying south-southeast, began a descending right turn toward the accident site.

PERSONNEL INFORMATION

The private pilot was rated in single engine, multi-engine, and instrument airplanes. He was issued a second-class medical certificate on August 28, 1998, with a limitation to "have available glasses for near vision." The pilot reported a total of 979.8 flight hours, of which, 810 hours were flown in the same make and model as the accident airplane.

AIRCRAFT INFORMATION

The airplane was manufactured in 1978, and had accumulated a total of 4,757.6 hours at the time of the accident. A review of the maintenance records revealed that the airplane underwent its last annual inspection on September 3, 1999, at an airplane total time of 4,631.2 hours. The twin-engine airplane was powered by two turbocharged, liquid-cooled Continental TSIOL-550-D engines and two McCauley 3-bladed propellers. The airplane was modified with numerous supplemental type certificate systems, none of which altered the heating or pressurization systems.

The pilot indicated in his written statement that he had noticed a "discrepancy in our differential/cabin altitude" a few weeks prior to the accident flight, and that his mechanics had replaced some ducts as a result of that discrepancy.

A review of the airplane's maintenance records revealed that on April 1, 2000, mechanics "installed new pressurization ducts from left and right wings to engine."

The pilot added that another pilot flew the airplane (apparently after the last discrepancy) and experienced "an incredibly loud noise that went on forever and sounded like the airplane was coming apart." The pilot did not mention if any repairs or inspections were conducted after that event, and no additional maintenance entries were noted concerning the pressurization or heating system after the April 1st entry.

The airplane incorporated a cabin air system and a cabin pressurization system. The cabin air system provided cabin heating, ventilation, and defrosting. The cabin air system consisted of an air inlet in the nose, a cabin fan, a gasoline combustion-type heater, pressurization air temperature controls, and controllable heat outlets in the cabin. Air supplied by the pressurization system could be heated, and ducted to the pilot and passenger compartments.

The airplane's combustion heater utilized the same aviation gasoline as the engines, but ported through a heater solenoid valve. If the pilot selected heated air, an ignition coil, located in the heater body, would activate, and fuel would then be supplied to an injector through the solenoid valve. The fuel would be ignited by the coil and burned, and the heater exhaust would be routed overboard.

The heater combustion chamber was completely separate from the ventilation system to prevent exhaust gases from contaminating the cabin air. Vented air would be routed through a heater shroud, which surrounded the heater body. The air between the shroud and heater body would be warmed, and sent into the cabin. The heater's fuel solenoid valve would cycle on and off, to supply fuel for the heater as needed according to the temperature selected via the thermostat control, adjusted by the cabin heat knob located in the cockpit.

The pressurization system consisted of two engine turbochargers, their respective flow limiters, heat exchangers that shared ducting through the cabin, a pressure regulator valve (also known as the outflow valve) and cabin pressure dump valve (also known as the safety valve). The pressurization controls consisted of right and left pressurization air controls, a ram dump control, a cabin pressurization switch, a cabin rate-of-climb indicator, and a combination cabin altimeter and differential pressure indicator.

During normal pressurized flight, air enters the system through a ram air scoop on the side of the engine nacelle. In the case where a blockage occurs in the ram air supply, air for the system is supplied through the induction system's alternate air door, which takes it's air supply from within the nacelle. The air is filtered through the induction system main air filter and

compressed by the engine turbochargers. The clean compressed air is then directed through a controller, a venturi-type flow limiter, and to a ram air-cooled heat exchanger to reduce the temperature of the pressurized air entering the cabin. The pressurized air is then routed into the cabin air system through a flapper type check valve and distributed throughout the cabin via the overhead fresh air and heater outlets at a controlled temperature. The pressurization system could have provided cabin pressurization above 8,000 feet, with the cabin altitude maintained at 8,000 feet at all airplane altitudes between 8,000 and 23,120 feet.

During unpressurized operations, pressurized air would have been dumped overboard by means of two solenoid activated pressurization air dump valves located in the wing roots adjacent to the heat exchangers. The pressure regulator valve, which would automatically controlled the cabin air outflow, was located in the aft cabin pressure bulkhead. The cabin pressure dump valve was also located in the aft cabin pressure bulkhead, and acted as a safety valve to prevent a maximum differential pressure of 5.3 psi to prevent the airplane from being pressurized on the ground, and to allow the pilot to "dump" the cabin pressure if needed in flight.

The airplane's wing baggage compartment was aft of the engine nacelle, and was inaccessible in flight.

WRECKAGE AND IMPACT INFORMATION

The airplane was intact and undamaged, with the exception of the right wing outboard of the wing flap. Examination of the airplane revealed that a clamp, which connected a rubber hose between the plenum chamber and the upper plenum (aft of the nose baggage heater), had separated. The rubber hose remained in place between the plenum chamber and the plenum, but there was evidence of blow-by around the hose.

The airplane cabin had a strong odor of tobacco products.

TESTS AND RESEARCH

On June 5, 2002, the wreckage was examined at a salvage facility. The door seal and outflow valve exhibited dark brown, tar-like deposits. The dump valves were closed, the cabin altitude controller was set at a cabin altitude of 7,500 feet, and an airplane altitude was set at 22,000 feet. The cabin rate-of-climb indicator was missing from the cabin rate control, and the outflow valve exhaust housing was contaminated with a dark colored residue; however, it did appear to seat properly, and the safety valve appeared new and clean, and properly seated.

On June 6, 2002, the cabin altitude controller, outflow valve, and safety valve were examined and functionally tested. All of the components were tested with only nominal variations when compared to new units. According to the testing facility, none of the variations would have resulted in an operational complaint.

The cabin altitude controller's inlet filter was approximately 75-percent blocked. The contamination appeared to be by-products of cigarette and/or cigar smoke; however, the contamination was not tested.

The airplane's turbochargers were examined and were both found to rotate freely, no internal or external leakage was noted, and no damage was noted.

The heater was examined at a test facility under FAA supervision. According to the inspector, the heater was activated and operated with an erratic fuel pressure, resulting from inconsistent burning in the combustion chamber. The unit took 4-5 minutes to shut down due to an improperly functioning fuel solenoid valve. The unit was also missing sealant in various areas; however, no carbon monoxide was detected in the heater discharge air.

No anomalies were noted with the cabin air or pressurization systems that would have prevented their operation with the exception of the fractured clamp near the heater. Representatives from the airplane manufacturer and pressurization component manufacturer opined that the absence of the clamp could have prevented the pressurization system from maintaining the desired cabin pressure.

The stainless steel clamp was sent to the Safety Board Materials Laboratory for further examination. An energy dispersive x-ray spectroscopy examination of the fractured clamp revealed chlorine and zinc along with other elements. Further examination of the clamp's fracture surface under a scanning electron microscope revealed radial marks that emanated from corrosion cavities at the inside diameter of the clamp. The fracture face contained multifaceted features typical of intergranular features.

The Safety Board investigator-in-charge swiped debris from the following items in the pressurization system with cotton swabs:

- right engine controller to venturi duct
- right wing pressurization inlet tube at the flapper valve
- right engine fresh air inlet
- left controller to venturi duct
- left wing pressurization inlet tube at the flapper valve
- left engine fresh air inlet
- heater to plenum connection
- cabin air recirculation tube at front of heater

The swabs were sent to the Materials Laboratory for examination. Visual examination with the aid of a bench binocular microscope revealed that the debris was oily and black in color. The spectra from each sample contained the following elements: carbon, oxygen, aluminum, silicon, chlorine, potassium, calcium, titanium, and iron. In addition, two samples (from the left and right controller to venturi connections) contained small peaks of the elements lead and bromine, which are elements consistent with the residue of aviation fuel exhaust. In normal

operations, these connections would not be exposed to engine exhaust.

PATHOLOGICAL INFORMATION

Toxicological tests for carbon monoxide, cyanide, ethanol, and drugs were not performed on the pilot. Local law enforcement personnel asked the pilot if he had consumed any alcohol, prescription drugs, and/or illicit drugs prior to, or during the flight. The pilot reported that he had not.

The pilot reported that he smoked approximately 3 packs of cigarettes a day and also smoked cigars. According to an American Lung Association fact sheet relating to carbon monoxide poisoning, dated September 2000, smoke can contain extremely high levels of carbon monoxide as well as 200 other poisons. The Environmental Protection Agency also listed cigarette smoke as a source of carbon monoxide. Carbon monoxide poisoning has been associated with the following side effects:

Somatic/physical symptoms - fatigue, dizziness, vertigo

Cognitive/memory impairments - attention and concentration problems, multi-tasking problems, verbal and/or visual deficits, word finding problems, word order problems, short-term memory problems, loss of intellectual capacity, slowed cognitive processing.

Sensory & motor disorders - slower fine motor speed/coordination, decreased gross motor strength, and speaking disorders.

Pilot Information

Certificate:	Private	**Age:**	47,Male
Airplane Rating(s):	Single-engine land; Multi-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 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	August 28, 1998
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	November 16, 1998
Flight Time:	980 hours (Total, all aircraft), 810 hours (Total, this make and model), 825 hours (Pilot In Command, all aircraft), 14 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N414PS
Model/Series:	414A 414A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	414A0056
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	September 3, 1999 Annual	**Certified Max Gross Wt.:**	7087 lbs
Time Since Last Inspection:	126.4 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	4757.6 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	Installed, not activated	**Engine Model/Series:**	TSIOL-550-A
Registered Owner:	Prop Jocks, Inc.	**Rated Power:**	350 Horsepower
Operator:	Patrick W. Swayze	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PRC,5045 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	10:53 Local	**Direction from Accident Site:**	310°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots / 20 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.01 inches Hg	**Temperature/Dew Point:**	28°C / -1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Van Nuys, CA (VNY)	**Type of Flight Plan Filed:**	IFR
Destination:	Las Vegas, NM (LVS)	**Type of Clearance:**	IFR
Departure Time:	07:21 Local	**Type of Airspace:**	Class G

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:**	34.599998,-112.25

Administrative Information

Investigator In Charge (IIC):	Crispin, Robert
Additional Participating Persons:	Dean Hennies; Federal Aviation Administration; Scottsdale, AZ Michael Cummins; Honeywell; Phoenix, AZ Gary L Lynn; RAM Aircraft Modifications; Waco, TX John Stewart; Cessna Aircraft Company; Wichita, KS Tom Moody; Cessna Aircraft Company; Wichita , KS John T Kent; Teledyne Continental Motors; Mobile , AL
Original Publish Date:	February 20, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=49329

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.