National Transportation Safety Board
Aviation Accident Factual Report

Location:	SPARKS, NV	**Accident Number:**	LAX95FA029
Date & Time:	11/01/1994, 1306 PST	**Registration:**	N421WB
Aircraft:	CESSNA 421A	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Serious, 4 Minor
Flight Conducted Under:	Part 91: General Aviation - Business		

HISTORY OF FLIGHT

On November 1, 1994, at 1306 hours Pacific standard time, a Cessna 421A, N421WB, crashed into two condominiums at Sparks, Nevada, during an emergency landing caused by a total loss of power on both engines. The crash site is about 2 miles northwest of the Reno Tahoe International Airport near the centerline of runway 16L. The pilot was on final approach to runway 16L and was completing the first leg of an instrument flight rules business flight to Palm Springs, California. The airplane, registered to and operated by Keys Family Limited Liability Corporation, Corbett, Oregon, was destroyed by impact and the resulting postimpact fire; two condominiums and a parked automobile were destroyed and one condominium sustained substantial damage. The certificated airline transport pilot and one passenger sustained minor injuries; two passengers sustained serious injuries; and two occupants of the condominiums received minor injuries. Visual meteorological conditions prevailed. The flight originated at Troutdale Airport, Portland, Oregon, at 1036 hours.

National Transportation Safety Board investigators interviewed the pilot on November 2, 1994, at the crash site. The pilot said that he filed and activated an instrument flight rules (ifr) flight plan for the flight. After departing Troutdale Airport, the Federal Aviation Administration (FAA) air route traffic control center sector controller cleared the flight to 17,000 feet mean sea level (msl).

About 1 1/2 hours into the flight, the pilot said he switched the fuel selector valves to the auxiliary position. About 1 hour later, the pilot said he returned the fuel selector valves to the main tank position.

The en route portion of the flight was routine. When the flight approached Reno International Airport, the sector controller ultimately cleared the flight to descend for landing. When the flight was about 5 miles northwest of the airport and established on the final approach course for runway 16L, the pilot encountered visual meteorological conditions and canceled his ifr flight plan.

Moments later, the right engine began to sputter, miss, and quit. The pilot said he switched the fuel selector valves to various positions and turned on the fuel boost pump to the high-flow position. During this time, the left engine quit. The pilot attempted to start both engines, but without success. The pilot told the local controller that both engines quit and that the airplane was going down.

The pilot did not say that he used the checklist before commencing the approach.

Safety Board investigators interviewed the two passengers, who occupied the rear seats, at Washoe County Hospital, Reno, Nevada, in the evening on November 1, 1994. The passengers said that they became aware of the situation when both engines quit. They did not see the pilot switching the fuel selector valves until after the engines quit.

Safety Board investigators conducted a telephone interview with the right front seat passenger, the owner of the airplane, on November 2, 1994. He said that the flight was routine until both engines quit. About 1 hour after the flight departed Troutdale Airport, the pilot announced that he was going to switch the fuel selector valves to the auxiliary tanks and that they should not worry if the engines "coughed."

The right front seat passenger said that he did not see the pilot switch the fuel selector valves until both engines quit. He said, however, that he went into the cabin after the pilot switched the tanks and discussed some business with the rear seat passengers. He returned to the right front seat when the flight began the descent for landing.

The consensus of several ground witnesses was that both engines began to sputter, backfire, and then quit moments before the crash.

Safety Board investigators reviewed the recorded communications medium between the FAA, Reno Air Traffic Control Tower and N421WB. The local controller cleared the flight to land and cautioned the pilot about wake turbulence from the preceding Boeing 737 at 1304:23 hours. At 1304:58 hours, the local controller again cleared the flight to land. At 1305:31 hours, Safety Board investigators heard a squealing sound when the local controller was talking to another aircraft.

At 1305:47 hours, the pilot of N421WB reported, " . . . we're going down." There were no further communications between N421WB and the local controller. At 1305:58 hours, Safety Board investigators heard the sound of an emergency locator transmitter.

According to the FAA Troutdale Airport Traffic Control Tower records, the flight departed Troutdale Airport at 1036 hours.

CREW INFORMATION

The pilot holds an airline transport pilot certificate with airplane single- and multiengined land

ratings. He also holds a certified flight instructor certificate with airplane single-engine, multiengine, and instrument - airplane ratings. The pilot also held a second-class medical certificate issued on February 22, 1993; the certificate contained a "Must have available glasses for near vision" limitation endorsement. The second-class medical certificate is valid for 12 calendar months; thereafter, it reverts to a third-class medical certificate that is valid for 24 calendar months after the date of issue.

According to federal air regulations, a pilot cannot conduct commercial operations (fly for hire) without a valid second-class medical certificate. The pilot said he was employed by the operator as a private client advisor. His duties do not require him to fly the airplane. He said that he flew the airplane for the operator on a personal basis and that he does not receive any monetary or other compensation for his company flying activities.

The pilot told Safety Board investigators that his flight hours logbook was in the airplane. The flight hours reflected on page 3 of this report were obtained from the pilot's recollection of his total hours. He said he accrued 7,000 flight hours, of which 5,000 flight hours were flown in multiengine airplanes. He accrued 65 hours in the accident airplane make and model which were accrued during the 90 days preceding the accident.

The pilot said he received his biennial flight review in January 1993.

AIRCRAFT INFORMATION

According to the FAA, the airplane was registered to Keys Family Limited Liability Corporation on August 19, 1994. The owner of the corporation, the right seat passenger said he leased the airplane to two other companies that he owns.

Safety Board investigators examined the airplane's maintenance logbooks on January 11, 1995. The airframe logbook review revealed that an FAA designee reissued an FAA standard airworthiness certificate on March 18, 1994. The airplane had previously been certificated by the Canadian Civil Aeronautics Administration.

On March 17, 1994, an airframe and powerplant mechanic with inspection authorization completed an annual inspection on the airplane and engines. The airplane accrued 7,499.7 hours at the time of the inspection. There were no deferred maintenance discrepancies noted.

At the time of the annual inspection, the left engine accrued 1,068.1 hours since major overhaul (SMOH). The right engine accrued 740.6 hours SMOH. On June 30, 1994, the right engine underwent a major overhaul due to a crack at the No. 4 cylinder crankcase. The airplane accrued 7,509 hours when the engine was overhauled.

The airplane's recording hobbsmeter was destroyed by impact and the postimpact fire. Safety Board investigators were unable to determine the airplane's total flight time at the time of the accident.

WRECKAGE AND IMPACT INFORMATION

The crash site is at 1855/1859 Merchant Street, Sparks, Nevada. The airplane came to rest, right-side-up, facing on a northerly heading (all headings/bearings in this report are oriented toward magnetic north) in the 1855 Merchant Street's condominium garage. The airplane went through the upper structure of the condominium.

A broken pole, found about 10 feet north of the northwest corner of the condominium, and the wreckage examination revealed the airplane's right wing struck the pole in a nose-up, wings-level attitude while flying on a 160-degree heading. After the initial impact, the airplane rotated to the right about its vertical axis and struck the roof of the northeast corner of the building. The airplane fell vertically through the roof and came to rest in the garage.

The postimpact fire incinerated the entire fuselage and the major sections of both wings. Safety Board investigators found wing remnants in the debris. All of the airplane's major components and flight controls were accounted for and found in the main wreckage area. Safety Board investigators established continuity of the empennage flight controls to the cabin/cockpit area.

Safety Board investigators found both main landing gears retracted in their respective wheel wells. They also found a 6-foot section of the broken pole impinged against the right rear engine mount.

The right fuel selector was found in the debris. The fuel handle was found positioned between the right main fuel tank and the off position. The left fuel selector was destroyed by the postimpact fire.

Safety Board investigators found the elevator trim tab extended 1.6 inches. This extension corresponds to a 5-degree tab-up/nose-down position. The rudder tab actuator was found extended 1.7 inches that corresponds to a 10-degree left tab position/nose right. The aileron tab actuator was not found.

ENGINE EXAMINATION

Both engines sustained extensive postimpact fire damage and had separated from their respective attach fittings. Safety Board investigators did not disassemble the engines. The examination was conducted at the crash site.

Right Engine:

Safety Board investigators established continuity of the gear and valve train assembly. The upper spark plugs exhibited normal operating signatures. The fuel manifold sustained postimpact fire damage and its diaphragm was charred. The micron filter screen, however, was free of contaminates. The fuel pump coupler was found intact.

The propeller assembly remained attached to the engine crankshaft. All of the blades sustained extreme postimpact fire damage, but remained attached to the hub assembly. Two of the three propeller blades melted, leaving 1 1/2 foot stubs which remained attached to the hub assembly.

Left Engine:

The left engine manifold valve was destroyed by the postimpact fire. Safety Board investigators were unable to establish continuity of the gear and valve train assembly. The upper spark plugs exhibited normal operating signatures; the No.s 1 and 3 upper spark plugs were found oil and water soaked. The left propeller assembly separated from the engine crankshaft. Two of the three blades exhibited "S" twisting and leading/ trailing edge gouge marks. The remaining blade root was found inside the hub. The outer portion of the blade was missing.

FIRE

The Sparks Fire Department responded to the accident site at 1307 hours and arrived at the site at 1311 hours. Fire Department personnel reported that they did not encounter any problems in suppressing the fire. The fire fighting personnel contained the fire to the two condominiums. The fire was extinguished by 1341 hours.

MEDICAL AND PATHOLOGICAL INFORMATION

Three of the four airplane occupants were treated at the Washoe Medical Center for broken bones and released. The remaining occupant required surgery. The pilot volunteered to undergo toxicological examinations for drugs and alcohol. The toxicological examinations were negative for drugs and alcohol.

TESTS AND RESEARCH

A Cessna Aircraft Company representative reported that the fuel in the auxiliary tanks reported by the pilot (15 gallons in each auxiliary fuel tank) would have an endurance range of 21 minutes.

The Cessna 421A Owner's Manual before landing checklist requires the pilot to select each engine's main tank. It also states, in part:

The fuel selector valve handles should be turned to LEFT MAIN for the left engine and RIGHT MAIN for the right engine, during takeoff, landing, and all normal operations.

The following is a synopsis of the Cessna 421 fuel system. See item 15.02, Excerpts of Cessna 421 Service Manual Fuel System, for a detailed fuel system description.

The Cessna 421 service manual shows that the standard fuel system consists of an integrally sealed (wet) tank mounted to each wing tip and two interconnected auxiliary tanks (synthetic rubber cells) mounted within each wing. The accident airplane has two electrically-operated fuel pumps mounted in each main tip tank; the auxiliary fuel pump and the fuel transfer pump. The auxiliary fuel pump, mounted in the bottom of the main tank, provides fuel pressure for priming during engine starting and, if manually selected, supplies fuel to the engine in an emergency. The fuel transfer pump is mounted on the aft side of the tip tank rear bulkhead. The pump transfers fuel from the nose section of the main tank to the center baffle area. Fuel is then picked up and routed to the engine by either the engine-driven and/or the auxiliary fuel pump. The fuel transfer pump prevents the possibility of fuel starvation to the engine during steep angles of descent or bank.

Each auxiliary fuel pump feeds fuel to the fuel selector valve. The valve, located outboard of each engine nacelle, routes fuel to their respective engine-driven fuel pump. A vapor return line is installed from the engine-driven fuel pump to the main tank to return unused fuel.

A fuel line is installed from each auxiliary fuel cell to the fuel selector valve. The auxiliary fuel cells are equipped with an in-line fuel pump for vapor clearing. The auxiliary tanks do not contain a separate vapor return line and the excess fuel is also returned to the main tanks.

The airplane's service manual and pilot's operating handbook require that the airplane be flown on the main fuel tank for at least 60 minutes or until 30 gallons of fuel remain in each main tank before switching to the auxiliary fuel tanks.

The pilot told Safety Board investigators in a telephone interview conducted on February 9, 1995, that he spoke with a Cessna Aircraft Company engineer concerning fuel starvation. The pilot initially would not divulge the engineer's name to the Safety Board. The engineer told him that water in the fuel could freeze the fuel filters that would block fuel from entering their respective engine-driven fuel control servos.

The pilot speculated that water was trapped in the auxiliary fuel tank during the fueling operation. He said that the in-flight turbulence caused the water to mix with the fuel in a suspended state. This suspended water eventually blocked the fuel in the drain valve below the fuel selector valve.

A Cessna Aircraft Company engineer told Safety Board investigators that the Cessna 421A fuel system design would preclude freezing of the filters' phenomena. He said that any water in the main fuel tanks would be drainable during the preflight inspection (water is heavier than fuel). If the water quantity is extensive and not drained prior to flight, the water could cause a loss of power for that respective engine. This, however, would occur at the beginning stage of the flight.

Safety Board investigators researched the FAA Service Difficulty Reports (SDR) and the NTSB Accident Databases for any fuel icing phenomena occurrences involving Cessna 421 airplanes. Neither of the databases contained any mechanical malfunctions nor accidents attributable to

fuel icing.

A Cessna Multi-Engine Service Letter, ME73-25, addresses the use of fuel additives for cold weather operation. The service letter requires strict adherence to the recommended preflight draining instructions as required by the pilot's operating handbook. Compliance with the draining instructions will eliminate any free water accumulations from the tank sumps.

The service letter also states, in part, that fuel icing can be encountered with a combination of:

. . . 1) use of certain fuel, with 2) high humidity conditions on the ground, 3) followed by flight at high-altitude and low temperature (flight levels of 20,000 feet msl or above and temperatures of -20 degrees F or below). Under these unusual conditions, small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the fuel injection system. This occurrence has been verified on the Model 421 series aircraft . . . .

The service letter does not show that icing would accumulate in sufficient quantity to block the fuel filters.

Safety Board investigators determined that the accident flight was conducted at 17,000 feet msl. The prevailing temperature at 17,000 feet msl, using the standard adiabatic lapse rate of -3.5 degrees F/1,000 feet, was about 12.5 degrees F.

ADDITIONAL INFORMATION

Safety Board investigators released the wreckage to the insurer's aircraft retriever on November 3, 1994.

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	**Age:**	59, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	02/22/1993
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	7000 hours (Total, all aircraft), 65 hours (Total, this make and model), 65 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	**Registration:**	N421WB
Model/Series:	421A 421A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Provisional; Normal	**Serial Number:**	421A0099
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	03/17/1994, Annual	**Certified Max Gross Wt.:**	6800 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	CONTINENTAL
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	GTSIO-520-D
Registered Owner:	KEYS FAMILY LIMITED LIABILITY	**Rated Power:**	375 hp
Operator:	KEYS FAMILY LIMITED LIABILITY	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	RNO, 4412 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	1312 PST	**Direction from Accident Site:**	155°
Lowest Cloud Condition:	Unknown / 0 ft agl	**Visibility**	20 Miles
Lowest Ceiling:	Broken / 7500 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	10 knots / 20 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	150°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	14°C / -4°C
Precipitation and Obscuration:			
Departure Point:	PORTLAND, OR (TTD)	**Type of Flight Plan Filed:**	IFR
Destination:	PALM SPRINGS, CA (PSP)	**Type of Clearance:**	VFR
Departure Time:	1036 PST	**Type of Airspace:**	Class D

Airport Information

Airport:	RENO TAHOE INTERNATIONAL (RNO)	**Runway Surface Type:**	Asphalt
Airport Elevation:	4412 ft	**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced Landing; Full Stop

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Serious, 1 Minor	**Aircraft Fire:**	On-Ground
Ground Injuries:	2 Minor	**Aircraft Explosion:**	None
Total Injuries:	2 Serious, 4 Minor	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	A. D LLORENTE
Additional Participating Persons:	BLAISE L WINTER; RENO, NV R. S BOYLE; ARVADA, CO BRIAN F FINNEGAN; WICHITA, KS
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.ntsb.gov/pubdms/.