



National Transportation Safety Board Aviation Accident Final Report

Location:	POLACCA, AZ	Accident Number:	LAX99LA240
Date & Time:	07/01/1999, 1850 MST	Registration:	N5943M
Aircraft:	Cessna 421B	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 Minor

Flight Conducted Under: Part 91: General Aviation - Positioning

Analysis

During the initial climb after takeoff, both engines lost power and the pilot force landed in the desert. The airplane was on a positioning flight following a right engine change because of a previous engine failure, which had occurred about 1 month prior to the accident. The airplane had remained parked on the ramp at the airport without security. The operator said that they usually provided security for airplanes parked in remote locations due to past incidents of vandalism and fuel theft, but did not do so on this occasion. The pilot of the accident airplane did not visually check the fuel quantity; instead, he relied on the fuel gauges. He did not open the cowlings on either engine but relied on the mechanic's word that the aircraft was ready for flight. After takeoff, when he changed the left fuel selector from the main to the auxiliary tank, the engine quit. He turned toward the runway, switched the fuel selector back to the main tank, and turned the left fuel boost pump switch to high. The left engine fuel flow was near zero and there was no effect with the boost pump. He then noticed that the right engine was losing power. He did not feather either propeller. When he determined he would not reach the runway, he stalled the airplane into bushes to cushion the landing. Postaccident examination revealed that there was no fuel found in either the left or right main tip tanks. The left tip main tank was broken open during the forced landing with no evidence of fuel spray on the surrounding vegetation. Aircraft recovery personnel found 18 gallons of fuel in the left auxiliary tank and 23 gallons of fuel in the right auxiliary fuel tank. The right engine air induction tube was disconnected at the inlet flange to the fuel/air metering control unit. Fuel consumption calculations on the preceding flights and ground runs failed to account for approximately 74 gallons of fuel. Both engines operated to manufacturer's specifications during postaccident examinations in test cells. Fuel analysis of samples from the various tanks contained high particulate contamination consisting of rust, dirt, iron, and flakes of aluminum.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate preflight inspection, which failed to determine the fuel supply in each fuel tank, and his mismanagement of the fuel supply, which resulted in fuel starvation.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - NONMECHANICAL
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings

1. (C) 1 ENGINE
 2. (C) FLUID,FUEL - STARVATION
 3. (C) AIRCRAFT PREFLIGHT - INADEQUATE - PILOT IN COMMAND
 4. (C) FUEL SUPPLY - NOT VERIFIED - PILOT IN COMMAND
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Occurrence #2: LOSS OF ENGINE POWER(TOTAL) - NONMECHANICAL
Phase of Operation: MANEUVERING - TURN TO LANDING AREA (EMERGENCY)

Findings

5. FLUID,FUEL - STARVATION
 6. 2 ENGINES
 7. AIRCRAFT PREFLIGHT - INADEQUATE - PILOT IN COMMAND
 8. (F) FUEL SUPPLY - NOT VERIFIED - PILOT IN COMMAND
 9. INDUCTION AIR DUCTING - DISCONNECTED
 10. MAINTENANCE,INSTALLATION - IMPROPER - COMPANY MAINTENANCE PERSONNEL
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Occurrence #3: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings

11. TERRAIN CONDITION - NONE SUITABLE
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Occurrence #4: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - EMERGENCY

Findings

12. OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On July 1, 1999, at 1850 hours mountain standard time, a Cessna 421B, N5943M, collided with the ground during an emergency descent near Polacca, Arizona. According to the pilot, he experienced a loss of power in both engines during the initial climb after takeoff. The commercial pilot received minor injuries. The airplane was substantially damaged. The airplane was owned and operated by Scenic Aviation of Blanding, Utah, and was on a positioning flight under 14 CFR Part 91 when the accident occurred. Visual meteorological conditions prevailed and a flight plan had not been filed. During the flight, the pilot planned to obtain company flight following. The flight was originating at the time of the accident.

According to the operator, on June 2, about 1 month prior to the accident, the right engine failed and the pilot had landed at Polacca. The airplane remained parked on the ramp while a new engine was obtained. According to the pilot, the engine had failed because of a mechanical malfunction of the accessory-drive gear. In the days preceding the accident, company mechanics changed the right engine.

On the afternoon of July 1, 1999, the pilot said the company dispatcher notified him that the airplane was ready for flight. In a telephone interview, the pilot told the Safety Board investigator that he did a preflight inspection of the airplane prior to departure. He stated he did not "stick" the fuel tanks, nor did he visually check to verify the fuel quantity. The pilot said he sampled fuel from both the main tanks and the aux tanks. He also said he did not open the cowling on either engine, but took the mechanic's word for it that the airplane was ready for flight.

The pilot reported that the fuel gauges onboard the airplane read as follows:

Left main tank: 15 gallons Left auxiliary tank: 25 gallons Right main tank: 25-30 gallons
Right auxiliary tank: 15 gallons

The pilot stated that he did one run-up in the parking area of the airport and that everything appeared to be within limits. He stated that the engine start and warm-up was normal. He stated that he performed a standard run-up while he was on the tarmac area. He said that he taxied down to the end of the runway and performed another partial run-up, this time he again checked the magnetos and propellers. He estimated that 6-10 minutes had elapsed during the startup to completion of the second engine run-up.

He said he was climbing out and had reached 800-1,000 feet above ground level (agl) and was setting climb power when he changed the left fuel selector from the main to auxiliary tank. The engine lost power and quit. He then switched back to the main tank on the left engine and turned the left fuel boost pump switch to "high." He stated that there was no effect and after about 10 seconds, he returned the pump to low. He stated that the left engine fuel flow was down "near zero" and he put the left boost pump on high with no change in fuel flow.

As the pilot was going through the abnormal procedures checklist for engine failure, he said he noticed that the right engine was also losing power. He noticed that the right manifold pressure was only 23-24 inches and decreasing. The pilot stated he never changed the right engine fuel selector position during the power loss. He said he verified that he had mixture, props, and throttles full forward, and noticed that the left manifold pressure gauge was reading

"about 15 inches of pressure, and the right manifold pressure gauge was reading less than 25 inches."

The pilot said he did not feather either propeller as he attempted to make it back to the airport because he was hoping that he could regain some engine power. He maneuvered to land on some bushes when it became apparent to him that he was not going to make the runway. He said he was getting a "stall/buffet" as he landed off airport. The pilot stated that he realized that he was not going to be able to make it back to the airport, so he deliberately selected a clump of Tamarisk bushes to cushion his landing.

AIRPLANE RECOVERY

Recovery personnel arrived on scene the following day. They reported that the left main tip tank was ripped in half and there was no evidence of any fuel spray on nearby shrubs. No fuel found in the left main tank. Approximately 18 gallons of fuel was removed from the left auxiliary tank.

Eight ounces of fuel was in the intact right main tank. According to the recovery personnel, the right auxiliary tank was undamaged and they off-loaded approximately 23 gallons of fuel. The right engine air induction tube was found disconnected at the inlet flange to the fuel/air metering control unit. The clamp, which held the air hose on, was tight. Both fuel selector handles were in their respective main tank selections.

PERSONNEL INFORMATION

Review of Federal Aviation Administration (FAA) Airman Records disclosed that the pilot held a commercial pilot certificate, with airplane ratings for single engine land, multiengine land, and instruments. His most recent second-class medical certificate was issued on May 26, 1999, without limitations.

According to all sources of information, the pilot had accrued a total flight time of about 8,800 hours, with 2,400 hours in multiengine aircraft, and 1,200 hours in the Cessna 421B.

The company had employed the pilot for approximately 6 months. His most recent flight checks, in accordance with the provisions of 14 CFR Part 135, were completed in May 11, 1999, in a Cessna 421. Additionally, the pilot was recommended by the chief pilot as a company instructor in the Cessna 421B and C model after a company check ride was completed on May 12, 1999.

MAINTENANCE HISTORY

A review of the aircraft maintenance logbook revealed that on July 1, 1999, company mechanics installed a Western Skyways remanufactured engine GTSIO-520-H, S/N 128347, in the right-hand position. The log noted that they had replaced the engine mount bushings with new ones; installed all new fuel and oil hoses; and installed an overhauled propeller governor. All operational checks were found "normal" as noted in the logbook. An Airframe and Powerplant mechanic, who is also an IA who did work on the airplane prior to calling for the pilot, said that they worked on only the right engine. All the engine runs were completed on the day of the accident. He said that the mechanics performed five ground-run's totaling approximately 13 minutes. Additionally, he said that they performed a full power ground run for about 7-8 minutes. He stated that the fuel selectors were all on the main tanks during the engine runs. The mechanics checked the fuel quantity on the auxiliary tanks by looking at the gauges, and then returned the fuel selector to the main tanks. They did not do a specific

preflight inspection of the airplane. They did do a thorough inspection on the right engine. He stated that they did not "stick" or visually check the fuel, and did not pop the cowling on the engines.

Another pilot, who works for the company, submitted a statement concerning the amount of fuel onboard the airplane before the accident. He stated that on June 2, 1999, after completion of an air ambulance flight from Chinle to Tucson, Arizona, he wanted to verify the fuel gauges were reading correctly in the airplane. He said he noted the gauge readings on the main (tip) and auxiliary tanks, and confirmed the readings as the line crewman topped each tank. He said he determined that both the main and auxiliary fuel gauges were reading correctly, (within 1-2 gallons). He said he did not check the nacelle tanks.

The pilot provided fuel consumption calculations estimating there was about 70 gallons of useable fuel at the time of the accident departure. A total of 41 gallons of fuel was found in the auxiliary fuel tanks during the recovery of the airplane wreckage.

COMPONENT EXAMINATION

The fuel indicating system was not intact and could not be checked for accuracy or continuity. The left-hand inboard auxiliary fuel tank sensor was found out of its respective bracket lying down in the bottom of the tank.

The right engine air induction tube was found disconnected at the inlet flange to the fuel/air metering control unit. With the clamp in its discovered location, the air intake hose could not be fitted on the turbocharger air inlet. The hose could be fitted at the top, which would leave a 1/4-inch gap at the inlet underside.

Both engines were sent to the TCM factory in Mobile, Alabama, and run in test cells on September 9, 1999 under the supervision of the Safety Board. The left engine (S/N 150873) started immediately and was then warmed up. The engine was then shutdown to check for leaks. Afterwards, the engine would not start immediately and the starter adapter was found to have a broken spring. The engine was restarted after replacement of the adapter spring. The engine pulled rated power at full throttle and parameters were within TCM specifications.

The right engine (S/N 218374-R) was also placed in a test cell on September 9, 1999. The engine started immediately and was warmed up to idle. When the power was advanced, the engine belched black smoke and died. The mixture was found to be excessively rich due to a maladjusted fuel pump aneroid. The engine was run close to full throttle and achieved 2,180 rpm, 217 pounds per hour fuel flow, and 35 inches manifold air pressure. The engine ran close to TCM specifications after adjusting the fuel pump aneroid.

ADDITIONAL INFORMATION

Fuel recovered at the crash site was analyzed. The analysis performed by a laboratory in Phoenix, Arizona concluded that the fuel condition was "abnormal" on all samples, with the particulate contamination "high" with major dirt, traces of rust, iron, and two flakes of aluminum detected in the left auxiliary tank. The test performed on the fuel recovered from the right main tip tank revealed two pieces of possible tank lining material found in the sample, as well as traces of fibers and fragments of possible glass. The distillation and water content tests were normal. Attached to the report is the complete fuel analysis.

A captain at the local tribal police department provided information concerning security at the airport. He stated that tribal security performs a drive-by every night to check on security at

the airport. The operator of the airplane did not arrange to provide security for the airplane that remained on the airstrip for over a month. The operator stated that their policy was to try and provide security to the airplanes due to incidents of vandalism and fuel theft in the past. There was no vandalism visible to the accident airplane.

The investigator released the airplane to the registered owner following the conclusion of the investigation on March 23, 2000.

Pilot Information

Certificate:	Commercial	Age:	53, 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:	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	05/26/1999
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	8800 hours (Total, all aircraft), 1200 hours (Total, this make and model), 8500 hours (Pilot In Command, all aircraft), 130 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N5943M
Model/Series:	421B 421B	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	0316
Landing Gear Type:	Retractable - Tricycle	Seats:	5
Date/Type of Last Inspection:	07/01/1999, AAIP	Certified Max Gross Wt.:	7450 lbs
Time Since Last Inspection:	12 Hours	Engines:	2 Reciprocating
Airframe Total Time:	4056 Hours	Engine Manufacturer:	Continental
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	GTSIO 520
Registered Owner:	SCENIC AVIATION INC.	Rated Power:	375 hp
Operator:	SCENIC AVIATION INC.	Operating Certificate(s) Held:	On-demand Air Taxi (135)
Operator Does Business As:		Operator Designator Code:	DYVA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Dusk
Observation Facility, Elevation:	KFL, 7011 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	1856 PDT	Direction from Accident Site:	0°
Lowest Cloud Condition:	Clear / 0 ft agl	Visibility	10 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	16 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	240°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	34° C / 4° C
Precipitation and Obscuration:			
Departure Point:		Type of Flight Plan Filed:	None
Destination:	BLANDING, UT (BDG)	Type of Clearance:	None
Departure Time:	1850 MST	Type of Airspace:	Class E

Airport Information

Airport:	POLACCA AIRSTRIP (4PH)	Runway Surface Type:	
Airport Elevation:	5547 ft	Runway Surface Condition:	
Runway Used:	0	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced Landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Minor	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	DEBORAH L CHILDRESS	Report Date:	04/06/2001
Additional Participating Persons:	JOHN ELLER; SCOTTSDALE, AZ FRED LEEPER; WICHITA, KS MIKE GRIMES; LANCASTER, CA		
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](#).