



National Transportation Safety Board Aviation Accident Final Report

Location:	EAGLE MOUNTAIN, CA	Accident Number:	LAX93FA149
Date & Time:	03/11/1993, 2020 PST	Registration:	N2656N
Aircraft:	CESSNA 421C	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	3 Fatal

Flight Conducted Under: Part 91: General Aviation - Positioning

Analysis

A CESSNA 421 CRASHED AFTER AN INFLIGHT BREAKUP. INVESTIGATION DISCLOSED THAT THE LEFT OUTBOARD PORTION OF THE ELEVATOR ASSEMBLY (INCLUDING THE BALANCE WEIGHT) SEPARATED FIRST, RESULTING IN EMPENNAGE FLUTTER & SUBSEQUENT IN-FLIGHT BREAKUP OF THE EMPENNAGE. THE LEFT ELEVATOR OUTBOARD HINGE & SUPPORT STRUCTURE EXHIBITED EVIDENCE OF HINGE OVERTRAVEL. THE LEFT HORIZONTAL STABILIZER FRONT SPAR HAD FAILED DOWNWARD; RIVETS THAT ATTACHED THE LEFT OUTBOARD HINGE TO THE REAR SPAR OF THE LEFT STABILIZER HAD SHEARED; AND THE LEFT ELEVATOR CENTER HINGE HAD BEEN PULLED OFF THE REAR SPAR. ABOUT 100 FLIGHT HOURS BEFORE THE ACCIDENT, MAINTENANCE WAS PERFORMED TO REPAIR THE LEFT ELEVATOR BALANCE WEIGHT (WHICH WAS LOOSE) & TO REPAIR A DAMAGED STIFFENER IN THE CENTER STRUCTURE OF THE HORIZONTAL STABILIZER. HOWEVER, WHEN EXAMINED AFTER THE ACCIDENT, THE BALANCE WEIGHT WAS TIGHT & THE REPAIR TO THE STIFFENER WAS INTACT.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: FAILURE OF THE LEFT ELEVATOR FOR UNDETERMINED REASON(S), WHICH RESULTED IN FLUTTER AND FAILURE OF THE EMPENNAGE, AND SUBSEQUENT UNCONTROLLED COLLISION WITH THE TERRAIN.

Findings

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

Findings

1. (C) FLIGHT CONTROL,ELEVATOR - UNDETERMINED
2. FLIGHT CONTROL,ELEVATOR ATTACHMENT - OVERLOAD
3. (C) STABILIZER - FLUTTER
4. (C) STABILIZER - FAILURE,TOTAL

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: UNKNOWN

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

History of the Flight

On March 11, 1993, at about 2020 hours Pacific standard time (PST), a Cessna 421C, N2656N, collided with mountainous terrain after an inflight break up 10 miles southwest of Eagle Mountain, California. The pilot was conducting a visual flight rules return flight under Title 14 CFR Part 91 to its home base at Avi Suquilla Airport, Parker, Arizona, after completing an air ambulance flight under Title 14 CFR Part 135. The pilot had filed and activated a company flight plan. The airplane, operated by Critical Air Medicine, San Diego, California, was destroyed by impact and the post-impact fire. The certificated commercial pilot and two flight nurses were fatally injured. The flight originated at Bermuda Dunes, California, at 2000 hours. Night visual meteorological conditions prevailed.

The pilot notified the operator's dispatcher via telephone that the airplane was departing the Bermuda Dunes Airport and informed the dispatcher of the estimated time of arrival at Parker, Arizona. This was the last known record of communications with the pilot.

When the airplane failed to arrive at its destination and after a brief telephone search to locate it, the operator reported the airplane overdue. The operator initiated a ground and aerial search within two hours. The accident area was overflown on several occasions by search aircraft during the evening of the accident. The search was eventually suspended until daylight the following day. Search personnel located the airplane wreckage at 1200 hours PST on March 12, 1993. There were no survivors or witnesses to the accident.

Search pilots reported no turbulence or any other significant weather in the accident area on the evening of the accident. The pilots reported winds at the Bermuda Dunes Airport as calm after the initial search was suspended due to the darkness.

Pilot Information

The pilot held a commercial pilot certificate which was issued on June 16, 1992, with airplane single and multi-engine land, instrument - airplane, and a rotorcraft - helicopter rating. The pilot also held a flight instructor certificate with airplane single and multiengine ratings. The most recent second class medical certificate was issued to the pilot on August 4, 1992, and contained no limitations.

Safety Board investigators reviewed the pilot's company's training and flight records. The flight hours reflected on page 3 of this report were obtained from the pilot's company flight records. The pilot had accrued 3,250 hours total flight hours of which 1,200 hours were flown in multiengine airplanes. The pilot had accrued 500 hours in the accident airplane make and model. The pilot had successfully completed a pilot proficiency check as required by Title 14 CFR Part 135 two months before the accident; the flight check satisfied the biennial flight review requirements of current applicable federal air regulations. The flight check was flown in a Cessna 414 airplane.

Aircraft Information

The airplane, a Cessna 421C, serial number 421C-0714, was manufactured in 1979, and had accumulated a total time in service of 4,869 hours. Examination of the maintenance records revealed that the most recent inspection was completed on March 3, 1993, 10.7 flight hours before the accident.

Two Continental GTSIO-520L piston engines were installed on the airplane. The left engine was installed on January 6, 1992, and had accrued a total time in service of about 3,984 hours. The maintenance records note that a major overhaul was accomplished by Medallion Engines, Inc., Las Vegas, Nevada, on December 31, 1991, about 743 hours before the accident.

The right engine was installed on November 24, 1992, and had accrued a total time in service of about 3,063 hours. The maintenance records note that a major overhaul was accomplished by Medallion Engines, Inc.,

Las Vegas, Nevada, on November 11, 1992, about 210 hours before the accident.

Fueling records at the Avi Suquilla Airport, Parker, Arizona, established that the airplane was last fueled on March 11, 1993, with the addition of 49.8 gallons of 100LL octane aviation fuel.

Meteorological Information

The closest official weather observation station is Thermal, California, which is located 25 nautical miles southwest of the accident site. The elevation of the weather observation station is 117 feet below MSL.

At 2052 hours, a scheduled record surface observation was reporting in part: Sky condition and ceiling, 20,000 feet thin broken; Visibility, 20 statute miles; Temperature, 58 degrees Fahrenheit; Dewpoint, 37 degrees Fahrenheit; Winds, 300 degrees at 5 knots; Altimeter, 30.07" inHg.

Wreckage and Impact Information

The accident site is located about 10 nautical miles southwest of Eagle Mountain, California, in desert mountainous terrain. The mountains feature steep slopes and faceted ridges. The slope of the terrain in the vicinity of the accident location averages 42 to 65 degrees.

The wreckage was widely dispersed. A horizontal line of site between components was restricted by the relief of the terrain. The distance between locations of the airplane components was influenced to a greater degree by relief than the horizontal distance between the components. Tertiary damage to some parts was evident from sliding downslope in some cases and was more pronounced than the primary failures.

Examination of an aeronautical chart disclosed that the accident site was on a direct line between the Bermuda Dunes and Parker Airports. Radar data supplied to the Civil Air Patrol by the FAA revealed a VFR airplane climbing from 10,000 feet MSL. While passing 11,500 feet MSL, the airplane made an abrupt climbing right turn and then disappeared from radar. The Civil Air Patrol used the radar data to find the accident airplane. There was no information to substantiate the identity of the data belonging to the accident airplane.

The fuselage, engine nacelles, and inboard wings came to rest in a ravine north of an east/west ridge that separated it from the rest of the wreckage. The sequence of the remaining wreckage were the elevators, horizontal stabilizers, upper rudder, and the outboard section of the wings.

The wreckage was dispersed along a 1.5 nautical mile path in a northerly direction. There was a symmetrical separation of both horizontal stabilizers and elevators and both wings outboard of the engine nacelles. The top of the ridge south of the main wreckage site was noted from Geological Survey Charts to be about 2,830 feet MSL and the impact location was measured to be about 2,600 feet MSL.

The fuselage came to rest, upright, in the bottom of a steep ravine oriented in a northerly direction from the east/west ridge. The nose of the airplane was upslope and oriented to the south. Fire had destroyed the interior of the cabin and cockpit. The upper 50 percent of the fuselage above the cabin and cockpit was missing. Molten aluminum was found on top of some of the interior components such as seat frames.

The right wing separated from its respective wing-to-fuselage attach fitting. The engine control and aileron cables were found dangling from the fuselage with their outboard ends broken and exhibited extensive fraying and necking down signatures. The inboard section of the left wing and nacelle remained attached to the fuselage. The left turbocharger and left main landing gear strut were visible in the nacelle. The wing skin above the left main landing gear tire had a hole burnt through exposing the left main landing gear strut which was retracted in the wing. The left main gear tire was burnt.

The left engine separated from the wing with its cowling still attached. The engine came to rest, inverted, east of the fuselage about 75 feet above the fuselage on a 40 degree slope. The propeller remained attached. Two of the propeller blades were turned in the hub toward the feather position. The third blade was bent aft under the engine and appeared to have broken out of the hub; the blade exhibited longitudinal scoring on the cambered side.

The right engine was found about 120 feet downslope from the fuselage in the ravine. The engine remained attached to a portion of the right wing. The turbocharger and right main landing gear was visible. The propeller was separated and found about 15 feet further downslope. All three propeller blades were turned in the hub parallel to the direction of flight. One blade exhibited leading edge nicks and gouges and longitudinal scoring.

At the most southern point of the wreckage path, parts of the airplane's elevator were found on the southern slope of a steep 2,450 foot MSL high hill. The right horizontal stabilizer was found on the north slope at the same hill with other portions of the elevator.

A north-south spur climbs to 3,016 feet MSL, north of the right stabilizer, where it joins an east/west ridge line. The left horizontal stabilizer was found on the western slope of the spur. The upper portion of the rudder was found further north on the east side of the spur with fragments of the elevator. The elevator trim tab was found further to the north on the east slope of the spur before it joins the east/west ridge.

The outboard section of the left wing was found on the southern slope of the east/west ridge east of the point where the north-south spur joins the spur ridge. The aileron remained attached.

The outboard section of the right wing was found on the northern slope of the east/west ridge north of the point where the north-south spur joins the spur ridge. The aileron was missing.

Medical and Pathological Information

Post mortem examinations were conducted by the Riverside County Coroner's Office on March 16, 1993, with specimens retained for toxicological examination. According to the coroner's report, the cause of death for the pilot was attributed to multiple traumatic injuries.

Specimens retained during the post mortem examinations were sent to the Federal Aviation Administration's Civil Aeromedical Institute for analysis. The results of the toxicological analysis revealed negative results for routine drug, alcohol, and carbon monoxide tests.

Tests and Research

Horizontal and Vertical Stabilizer, Rudder, and Elevator Examination

The horizontal and vertical stabilizer, rudder, and elevator were examined on March 31, 1993, at Fowler, Inc., Gardena, California. The major pieces were arranged on the floor arrayed in positions similar to the installed geometry on the airplane.

The left rear spar of the left horizontal stabilizer was separated from the stabilizer. The left tip of the separated rear spar was bent upward and aft. The elevator hinges remained attached to the left rear spar except for the left outboard and left center hinges. Rivets that attach the left outboard hinge to the rear spar were sheared and the hinge remained attached to the left outboard section of the elevator that included the counter weight. The left elevator center hinge was pulled off the rear spar of the left horizontal stabilizer.

The left elevator outboard hinge exhibited evidence of full divergence.

The sheet metal skin on the upper and lower surface of the elevator was deformed in a manner consistent with hinge over travel.

According to Cessna Aircraft Company, the left hinge failed first and ensuing flutter tended to cause symmetrical failure of the tail. A copy of the Cessna Aircraft Company report is included as part of this report.

Critical Air Medicine Maintenance

The Critical Air Medicine maintenance program incorporates the Cessna Aircraft Company recommended procedures for service and maintenance. The maintenance program is approved by the Federal Aviation Administration as part of Critical Air Medicine's On-Demand Air Taxi Certificate. Federal Aviation Regulations (FARS) require the airplane to have a complete inspection every 100 hours of operation. Scheduled maintenance inspections are conducted using Cessna Progressive Care Program intervals, inspection checklists and forms. The Cessna Progressive Care Program conforms to the requirements of the FARS.

Review of the accident airplane's maintenance records did not reveal any unresolved discrepancies before the accident flight. Review of recent maintenance inspection records revealed the Critical Air Medicine maintenance inspectors were discovering discrepancies during inspections. The discrepancies were corrected by the company's mechanics in accordance with the Cessna Maintenance Manual for the airplane. The inspections were then checked by a company inspection authority as outlined in Critical Air Medicine's maintenance program.

On January 15, 1993, about 100 flight hours before the accident, Critical Air Medicine initiated an operations 1 and 2 inspection, a 100/200 hour inspection, and a special 600 and 800 hour special inspections on the accident airplane. The inspection lists the airplane's elevator and areas of the horizontal stabilizer as inspected items.

During the inspection of the elevator, the left elevator balance weight was found loose and the horizontal stabilizer center lateral stiffener/rib was found warped with a developing crack. The weight was tightened and the lateral stiffener was repaired in accordance with Cessna Aircraft Maintenance Manual by Critical Air Medicine's maintenance personnel.

On February 28, 1993, 10.7 flight hours before the accident, Critical Air Medicine initiated an operations 3 and 4 inspection, a 100 hour inspection and special 500 and 1500/500 hour

special inspections on the accident airplane. The inspection again lists the airplane's elevator and areas of the horizontal stabilizer as inspected items. The inspections did not disclose any recurring or further deficiencies with the elevator.

The left elevator balance weight and the horizontal stabilizer stiffener were examined by Safety Board investigators after reviewing the aircraft maintenance inspection records. The left elevator balance weight was found to be tight. The repair to the horizontal stabilizer stiffener was intact.

Autopilot

The airplane was equipped with a King KFC 200 flight Control System installed by King Avionics on November 19, 1979, per Supplemental Type Certificate (STC) SA1246CE. Examination of the aircraft wreckage after it had been recovered from the accident site revealed that most of the autopilot's components were destroyed as a result of impact forces or post impact fire. Three components of the yaw system were considered testable after the visual examination.

The yaw components were sent to Beechcraft West, Van Nuys, California, on March 31, 1993, for bench tests. The results of the tests did not reveal any evidence that would have contributed to the accident. Details of the testing protocol and results were documented by the autopilot manufacturer at the request of the Safety Board. A copy of the autopilot manufacturer's technical report is included in this report.

Additional Information

Wreckage Release

The wreckage was released to the representatives of the owner on May 19, 1993.

Pilot Information

Certificate:	Commercial	Age:	37, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine	Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	08/04/1992
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	3250 hours (Total, all aircraft), 500 hours (Total, this make and model), 3000 hours (Pilot In Command, all aircraft), 100 hours (Last 90 days, all aircraft), 35 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	Registration:	N2656N
Model/Series:	421C 421C	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	714
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:	03/03/1993, AAIP	Certified Max Gross Wt.:	7450 lbs
Time Since Last Inspection:	11 Hours	Engines:	2 Reciprocating
Airframe Total Time:	4869 Hours	Engine Manufacturer:	CONTINENTAL
ELT:	Installed	Engine Model/Series:	GTSIO-520-L
Registered Owner:	CRITICAL AIR MEDICINE	Rated Power:	375 hp
Operator:	CRITICAL AIR MEDICINE	Operating Certificate(s) Held:	On-demand Air Taxi (135)
Operator Does Business As:		Operator Designator Code:	IBUA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night/Dark
Observation Facility, Elevation:	TRM, 117 ft msl	Distance from Accident Site:	25 Nautical Miles
Observation Time:	2052 PST	Direction from Accident Site:	232°
Lowest Cloud Condition:	Thin Broken / 20000 ft agl	Visibility	20 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	5 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	300°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	14° C / 3° C
Precipitation and Obscuration:			
Departure Point:	BERMUDA DUNES, CA (UDD)	Type of Flight Plan Filed:	Company VFR
Destination:	PARKER, AZ (P20)	Type of Clearance:	None
Departure Time:	2000 PST	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	3 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	3 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC): THOMAS H WILCOX **Report Date:** 06/24/1994

Additional Participating Persons: MICHAEL H MONROE; RIVERSIDE, CA
HARRY R METZ; SAN DIEGO, CA
SCOTT R BOYLE; MOBILE, AL
CLAUDE UNDERWOOD; WICHITA, KS

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/>.

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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](#).