Aviation Investigation Final Report

Location:	VALLEY PARK, Missouri	**Accident Number:**	CHI93FA149
Date & Time:	April 29, 1993, 14:00 Local	**Registration:**	N4939M
Aircraft:	CESSNA 421B	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation		

Analysis

TWO FOREIGN PILOTS TOOK OFF VFR TO REMAIN IN THE VICINITY OF AN AIRPORT ON THE OUTSKIRTS OF A METROPOLITAN AREA. NO RECORD WAS FOUND TO SHOW THE AIRPLANE HAD BEEN FUELED EITHER BEFORE OR AFTER THE PRECEEDING FLIGHT. THE FLIGHT CREW CONTACTED AN AREA APPROACH CONTROL & REQUESTED AN ILS APPROACH TO TEST THEIR ILS EQUIPMENT WITHOUT SPECIFYING AN AIRPORT. APPROACH CONTROL ISSUED & THE FLIGHT CREW ACCEPTED VECTORS TO ANOTHER AIRPORT FOR WHICH THE PILOTS HAD NO APPROACH PLATE OR AIRPORT INFORMATION. VECTORS TOOK THE AIRPLANE ABOUT 25 MILES FROM THE DEPARTURE AIRPORT. THE FLIGHT CREW REQUESTED TO PROCEED BACK TO THE DEPARTURE AIRPORT. A SHORT TIME LATER, THE FLIGHT CREW DECLARED AN EMERGENCY DUE TO LOW FUEL, THEN RADAR CONTACT WAS LOST. WITNESSES AT A LANDFILL HEARD AN INTERMITTENT SOUND FROM THE ENGINE(S). THE AIRPLANE CAME INTO THEIR VIEW WITH ONE ENGINE RUNNING, THEN THE ENGINE SOUND CEASED. THEY INDICATED THE AIRPLANE WENT OUT OF CONTROL & CRASHED, BUT ONE ENGINE ACCELERATED JUST BEFORE IMPACT. A SMALL FIRE WAS CONFINED TO THE LEFT WING.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: IMPROPER PLANNING/DECISION BY THE PILOT, WHICH RESULTED IN FUEL EXHAUSTION, DUE TO AN INADEQUATE SUPPLY OF FUEL, AND THE PILOT'S FAILURE TO MAINTAIN CONTROL OF THE AIRPLANE DURING APPROACH TO AN EMERGENCY LANDING. A RELATED FACTOR WAS: FAILURE OF THE PILOT TO REFUEL THE AIRPLANE BEFORE FLIGHT.

Findings

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

Findings
1. ALL ENGINES
2. (C) PLANNING/DECISION - IMPROPER - PILOT IN COMMAND
3. (F) REFUELING - NOT PERFORMED - PILOT IN COMMAND
4. (C) FLUID,FUEL - EXHAUSTION
5. (C) FUEL SUPPLY - INADEQUATE - PILOT IN COMMAND

Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Occurrence #3: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: APPROACH

Findings
6. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: LANDING

Factual Information

HISTORY OF FLIGHT

On April 29, 1993, about 1400 central daylight time (CDT), a Cessna 421B airplane, N4939M, operated by Private-Wing Flugreisen GmbH of Hesweiler, Germany, descended to ground collision near Valley Park, Missouri shortly after declaring an emergency for fuel. The airplane was destroyed and the two pilots aboard fatally injured. Marginal visual meteorological conditions existed over the area. The airplane originated from Spirit of St. Louis airport (SUS) in Chesterfield, Missouri at 1322 for a local check flight after maintenance and operated under 14 CFR 91.

On April 28, the accident pilots flew the airplane about 30 minutes with a local mechanic aboard. The first pilot asked the mechanic to explain the airplane fuel supply and distribution. For that flight, the mechanic obtained an area map from his company office and returned it afterward. No record was found of the airplane's having been fueled before or after the flight.

About 1030 on the accident date, the pilots obtained a weather brief at the FAA flight service station on the airport for a flight to New Jersey that afternoon. No flight plan was filed.

The pilots told maintenance personnel they intended a flight around the airport. N4939M contacted SUS ground control about 1315 to taxi. The flight departed VFR on runway 26R, and was cleared off tower frequency at 1327. At 1334, N4939M requested from tower to switch frequency.

At 1335, the flight contacted St. Louis approach control (TRACON), reporting "about 8 miles to the east" without naming an airport or landmark. The low west sector controller told N4939M to maintain VFR and assigned a discrete transponder code. The flight requested "ILS for a test flight" without naming an airport. The controller identified the airplane's radar position as 7 miles southwest of St. Louis-Lambert International airport (STL), and assigned heading 150 degrees. At 1337, N4939M asked for "radar vectors for the ILS." The controller responded, "...heading 150 for the ILS, Downtown-Parks," referring to St. Louis Downtown-Parks airport (CPS), in Cahokia, Illinois.

The controller asked the aircraft type, and N4939M answered it intended an ILS followed by VFR to land. Two minutes later N4939M requested ILS, full stop. As the airplane neared a sector boundary at 1341, the controller handed it off to another frequency and controller.

The flight contacted the low north sector controller who requested N4939M acknowledge the automatic terminal information service (ATIS) broadcast "November" for Downtown-Parks. N4939M acknowledged and requested "a GCA if possible, due to bad indications." The

controller understood the caller wanted TCA (terminal control area) clearance and asked why. N4939M responded, "we do not have a good indication on the ILS." The controller explained the airplane was being vectored to the ILS approach for runway 30L at CPS, and TCA clearance was not necessary. N4939M acknowledged.

At 1346, the controller attempted 4 times to hail N4939M with no response, then relayed an alternate frequency by way of another aircraft. On regaining contact with N4939M at 1348, the controller issued an intercept heading to place the airplane 5 miles from the approach outer marker; N4939M explained it had been unable to reach the controller due to radio problems. The controller inquired if N4939M were VFR, and the flight requested clearance to Spirit of St. Louis "the shortest way." The controller redirected the airplane toward SUS. At 1351, N4939M asked heading and distance to SUS.

At 1352, the controller passed the airplane back to the low west sector controller. After contact, N4939M stated it had "a problem on the generator, would like direct to land." At 1356, N4939M requested "the shortest final you can give us," and distance to the field.

At 1359:39, N4939M declared emergency for fuel. The controller reported SUS was 7 miles ahead and pointed out Weiss airport, 5 miles east. At 1400:16, N4939M transmitted it would be "out of fuel anytime." At 1400:23, the controller broadcast radar contact had been lost. Nothing further was heard from N4939M.

A witness 5 miles south of the crash site saw a twin-engine airplane headed north-northwest 1000 feet above ground. She was drawn by the engine sound. She stated the engines did not cough or sputter, but seemed "just shut off." The nose dipped, engine noise resumed and the airplane leveled. She stated the sequence occurred 3 times as she watched. The airplane turned through north toward east and receded out of view behind rising terrain.

Three witnesses at a landfill excavation heard intermittent engine noise approaching from the northwest. The airplane came into view with one engine running, then all engine sound ceased. The airplane turned sharply left and dropped nose low. The witnesses described a complete revolution in left yaw. Just above the ground, the left engine accelerated and continued turning briefly after ground collision.

PERSONNEL INFORMATION

The first pilot held a German airline transport pilot certificate with type ratings for Cessna 303/406/421/425 and Dornier 228, and instrument rating. He was a German Air Force pilot through 1986, then a civilian pilot for hire since his separation. No record was found of his having an FAA airman certificate. He attended undergraduate pilot training at Sheppard AFB in Wichita Falls, Texas from April 1971 to May 1972, followed by 7 months training in fighters at Luke AFB, Phoenix, Arizona. The operator engaged the first pilot as a consultant for an airplane purchase and as ferry pilot based on his representations of U.S. credentials and his experience in the accident model. The pilot's log was not obtained. The Accident

Investigation Bureau of Luftfahrt Bundesamt reported his flight experience totaled 5850 hours as pilot in command. An acquaintance estimated he had 3000 hours military flight experience.

The second pilot was an officer on active duty in the German Air Force. His January 1993 application for an FAA airman's medical certificate listed his occupation as weapons system operator on the Tornado, a two-seat, single-piloted military jet. He attended undergraduate navigator training at Mather AFB, Sacramento, California in 1983; outside that curriculum, he obtained a U.S. private pilot certificate while there. In the past two years he began flying as pilot in the Dornier 28, a twin-engine airplane operated by the German Air Force. Luftfahrt Bundesamt reported he had 110 hours in that model.

In January 1993, the second pilot applied for a commercial pilot certificate at the FAA flight standards district office in Las Vegas, Nevada while visiting Nellis AFB. The certificate, with instrument rating and multiengine airplane endorsement, was issued on the basis of military competency without flight or written examination. He held a German commercial pilot certificate, instrument rating and type rating for the Dornier 28. A pilot log showed 634 hours combined military and civil flight experience as pilot. Luftfahrt Bundesamt reported he had 1383 hours as copilot/observer through 1990.

The second pilot was among 4 partners who formed Private-Wing Flugreisen GmbH, a business offering charter air transportation. The business operated a Cessna 172. N4939M was Private-Wing's first airplane purchase.

From various witness interviews and statements, the first pilot flew in the accident airplane on these occasions: a sales demonstration in November or December 1992, a flight after maintenance on April 23, and on April 28. The second pilot flew in the accident airplane on April 28.

Backgrounds of the above air traffic controllers are described in the appended statements of their interviews.

AIRCRAFT INFORMATION

The airplane was manufactured in 1974 and the model is called Golden Eagle.

The registered owner, J. D. Chastain Enterprises, sold the airplane in December 1992 or January 1993 to a brokerage, Eagle Air International, acting for the operator. A bill of sale and an application for registration under new ownership had not been filed in the FAA aircraft record before the accident.

In January 1993, a pilot for Eagle Air attempted to ferry the airplane. The airplane returned to the airport with a mechanical failure of the left engine. A maintenance facility at the airport, Phoenix Aviation, was engaged for repairs.

The right engine was removed March 20, 1993 for loose bolts attaching crankshaft gears. The engine was disassembled at an engine facility, repaired and reassembled. The engine was reinstalled and ground run.

A replacement engine was installed in the left nacelle April 19. The engine produced low power when ground run and was removed. The pilots took it to the vendor, Standard Aircraft Parts in North Carolina. They returned with the engine, which was installed and ground run satisfactorily. Various maintenance and an annual inspection were completed April 23.

A Phoenix pilot and the accident first pilot flew the airplane about 40 minutes on April 23. The Phoenix pilot recalled the fuel quantity was 119 gallons before flight. The right engine and both propellers had 502 hours since major overhaul at annual inspection. The combined flight times from April 23 and 28 were about 1.2 hours. Duration of engine ground runs while the airplane underwent maintenance was not recorded and resulting fuel consumption could not be calculated.

Main tanks at either wingtip hold 50 gallons useable fuel each. Auxiliary fuel tanks in the wing leading edges hold 48 gallons useable each. A locker tank in the left engine nacelle holds 26 gallons. Total fuel capacity is 228.5 gallons; 6.5 gallons are unusable. The left and right auxiliary tanks feed respective engines directly and do not replenish the main tanks. The locker tank feeds the left main tank through an electric transfer pump when selected. The left and right main tanks feed respective engines and may crossfeed the opposite engine if selected at the fuel selector handle.

The airplane was fitted with an aftermarket fuel meter capable of providing low fuel warning at 60 and 30 minutes of fuel remaining. The unit was independent of the airplane's fuel quantity measuring system (still installed), but sampled fuel flow to derive fuel consumed. Its presentation and warning capability were dependent on pilot input for initial fuel load. The pilot of the April 23 flight stated he did not program the meter with fuel onboard, but zeroed the indications and used it only to show fuel consumed on his flight: 37 gallons. Whether the accident pilots were familiar with its operation is unknown. The airplane was equipped with LORAN.

METEOROLOGICAL INFORMATION

The weather observed at SUS at 1350 CDT was 6 miles visibility in fog beneath scattered clouds at 2000 feet, broken clouds at 2800, and an overcast at 6500. Rain began at the field at 1314 and ended at 1333. Wind was from 240 degrees at 8 knots. The observation current when the airplane taxied was a broken ceiling at 1800 feet.

Weather at STL at 1350 was 4 miles visibility in light rainshowers beneath broken clouds at 2400 feet and an overcast at 4500 feet. Rain began at 1341.

AIDS TO NAVIGATION

An ILS approach is available only to runway 08R at SUS. Runway 26L is served by a localizer approach. Both runways are served by VOR and NDB approaches. The ILS frequency is 111.9, the NDB 227 and the VOR 110.8.

COMMUNICATIONS

ATIS information "Charlie" broadcast at the airplane's taxi and departure from SUS and informed the instrument approach in use was Localizer 26L. N4939M told SUS ground control it had "Charlie." Information "Delta," commencing at 1350 CDT, informed the same approach was in use.

A transcript of voice communication between N4939M St. Louis TRACON is appended.

AERODROME INFORMATION

Spirit of St. Louis airport is 17 miles west-southwest of Lambert/St. Louis International airport (STL). Approach and departure control are provided by St. Louis TRACON, located at STL. There is no radar at SUS; a Brite scope in the tower cab repeats radar information from TRACON. ATIS broadcasts on 134.8. Instrument approach procedures for the airport are published in TERPS volume NC-2. Airport information is published in the FLIP directory volume NC.

St. Louis Downtown-Parks airport sits east of the Mississippi River, in Illinois. Distance to SUS is 26 miles. The airport is served by ILS and NDB approaches. Approaches are published in TERPS volume EC-3. Airport information is published in the FLIP directory volume EC.

WRECKAGE AND IMPACT INFORMATION

The airplane wreckage sat upright, heading 200 degrees at the east edge of a large landfill excavation. Imprints and paint marks on the soil forward and left of the wreckage indicated an impact heading near 160 degrees. Terrain sloped down to the south and was uneven due to extensive excavation at many levels. The pit was surrounded by trees, and a residence sat 100 yards north of the wreckage.

The airplane nose struck in the crease of a roadcut. Crush on the forward fuselage was roughly perpendicular to the longitudinal axis. The windscreen and cabin roof above the cockpit shattered, laying the cockpit open. The right wing tip tank, which struck the dirt road, was crushed about 30 degrees off the long axis.

The left wing lay inverted 25 feet to the left front of the wreckage. Control cables appeared parted in tension; control continuity existed either side of the separation. The right wing remained attached but displaced up and rearward at the wingroot; control continuity existed to the cockpit. The empennage tore from the fuselage and displaced up and left; it remained

attached by cables, and control continuity remained.

Landing gear and flaps appeared retracted. The aileron trim actuator was extended as in full left wing down trim. The elevator trim actuator extended slightly above neutral.

Limited fire damage was confined to left wing in the vicinity of the main, auxiliary and locker tanks.

The left fuel selector handle was found between positions for left auxiliary tank and left main tank; the selector valve in the wingroot was midway between the corresponding detents. The right selector handle was between positions for right auxiliary and crossfeed from the left main; the valve was positioned between the corresponding detents, closer to the auxiliary.

No fuel scent was apparent about the wreckage. The right main tank was torn and crushed, but remained loosely attached to the wingtip. The left main was torn and partly reduced by fire. The right auxiliary tank contained no fuel. The left wing skin covering that auxiliary tank ruptured and the bladder was fire damaged. The locker tank in the left engine nacelle was fire damaged.

TERPS volume NC-3, was found in the cockpit. No other volume, airport directory or area map was found. A flight manual was not found.

Radios and navigation equipment were tuned to frequencies for low west and low north approach control, SUS tower, SUS ILS and SUS NDB.

The right engine canted 15 degrees outboard in its nacelle. The propeller remained attached; two blades appeared undamaged and one folded under the engine. The blades remained at low pitch. No soot, oil or fuel stain was apparent on the nacelle, engine or cowling. The fuel injection manifold retained fuel. A line from the manifold to the number 6 injector appeared cracked at the B-nut connection to the manifold and separated in two pieces at removal from the engine.

The left engine remained in its nacelle with fire damage outboard and behind the firewall. The engine underside appeared untouched by fire. The propeller separated through its shaft; the flange remained on the propeller. The blades were misshapen with multiple bends. A trough filled with mud and loose earth was excavated under the left engine, where a propeller would swing an arc.

MEDICAL AND PATHOLOGICAL INFORMATION

No record was found of a U.S. medical certificate for the first pilot. His medical status with his home state is not known. He wore prescription glasses. The autopsy report remarked preexisting cardiomegaly with left ventricular hypertrophy. Toxicological tests were negative.

The second pilot held a second class medical certificate issued January 19, 1993 without limitation. The FAA airman medical record showed no remarkable medical history, and the pilot declared no prescription medication on the certificate application. The autopsy report remarked no preexisting disease. Toxicological tests were negative.

The autopsies for both pilots were performed by the Medical Examiner's Office of St. Louis County, 6039 Helen Avenue, St. Louis, Missouri, 63134.

FIRE

Witnesses recounted no smoke or flame before ground collision. They described black smoke, then a small fire, erupting on the left wing or engine after impact. A witness estimated the time from accident to arrival of fire-fighting equipment at the scene was 10 minutes. Fire fighters found the left wing fractured and smoldering at their arrival. They dragged it a short distance from the airplane.

Fire involved the left main tank, left auxiliary tank and outboard left engine nacelle behind the firewall toward the locker tank. Limited molten metal flow was oriented in the vertical. A small area of sod at the left wing impact was scorched. The inboard left wing, fuselage and right wing were untouched by fire. Sooting was characteristic of ground fire, with areas in ground contact free of deposit.

TESTS AND RESEARCH

Reconstructed radar data (appended) show the airplane descending from 2000 feet MSL after 1356 CDT. The airplane's last encoded altitude was 1300 feet, and it tracked northwest toward SUS when last visible on radar.

The above described fuel meter was examined to determine whether it retained indications in nonvolatile memory: none was found. The unit appeared in bench tests to be capable of operation. The report of examination is appended.

The fuel line from the right engine fuel manifold to number 6 injector was examined (report appended). The end fitting brazed on the stainless steel line separated through the fitting, not involving the tube. A crack through 50 degrees of arc, oriented as with tension stress from torsion, appeared to initiate fatigue which propagated through 130 degrees of arc. The remaining surface appeared as tensile overload.

ADDITIONAL INFORMATION

GCA refers to a ground controlled approach in which a radar controller provides final approach azimuth guidance and (if available) glide slope guidance. Referring to TERPS volumes NC-2 (Missouri) or EC-3 (Illinois), the nearest published GCA availability is in Springfield, Illinois, 80 miles away. Scott AFB, Belleville, Illinois (40 miles east-southeast of SUS and 15 miles east of

CPS), has GCA. As a military field, its airport and approach information are not published in civilian editions of FLIP or TERPS.

Pilot Information

Certificate:	Foreign; Military	**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:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Unknown Unknown	**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5850 hours (Total, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	**Registration:**	N4939M
Model/Series:	421B 421B	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:		**Serial Number:**	421B0632
Landing Gear Type:	Retractable -	**Seats:**	6
Date/Type of Last Inspection:	April 23, 1993 Annual	**Certified Max Gross Wt.:**	7450 lbs
Time Since Last Inspection:	2 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	3726 Hrs	**Engine Manufacturer:**	CONTINENTAL
ELT:	Installed	**Engine Model/Series:**	GTSIO-520-H
Registered Owner:	J. D. CHASTAIN ENTERPRISES	**Rated Power:**	385 Horsepower
Operator:	PRIVATE WING FLUGREISEN GMBH	**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SUS ,463 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	13:50 Local	**Direction from Accident Site:**	320°
Lowest Cloud Condition:	Scattered / 2000 ft AGL	**Visibility**	6 miles
Lowest Ceiling:	Broken / 2800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	18°C / 15°C
Precipitation and Obscuration:	N/A - None - Fog		
Departure Point:	CHESTERFIELD (SUS)	**Type of Flight Plan Filed:**	None
Destination:	(SUS)	**Type of Clearance:**	
Departure Time:	13:22 Local	**Type of Airspace:**	

Airport Information

Airport:	SPIRIT OF ST LOUIS SUS	**Runway Surface Type:**	
Airport Elevation:	463 ft msl	**Runway Surface Condition:**	
Runway Used:	26	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	38.549392,-90.47953(est)

Administrative Information

Investigator In Charge (IIC):	Vallaster, J
Additional Participating Persons:	JUNE L TONSING; ST. ANN , MO J N SOWERS; ST. ANN , MO
Original Publish Date:	August 30, 1994
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=9158