Aviation Investigation Final Report

Location:	Lyme, New Hampshire	**Accident Number:**	IAD05LA114
Date & Time:	August 3, 2005, 14:03 Local	**Registration:**	N49646
Aircraft:	Convair BT-13A	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During the takeoff the airplane became airborne half way down the runway, "leveled off" and accelerated in a northerly direction, then began to climb. After leveling off once more at approximately 300 feet above ground level, the airplane suddenly appeared to roll to the right, and descend in a nose down attitude into a cornfield fatally injuring the pilot and his passenger. All major components of the airplane were accounted for at the accident site. A post-crash fire had consumed the majority of the fuselage and no preimpact mechanical failures with the engine or airplane were evident, however; no evidence of the engine producing power at impact was present. The surviving portions of the fuel system were devoid of fuel or fuel residue. During the investigation it was revealed that, the right main fuel tank unlike the left, was designed with a standpipe, which was plumbed to the outlet connection to provide a reserve fuel supply. Under normal conditions fuel would cease to be drawn from the tank when the fuel level became even with the top of the standpipe. The reserve fuel supply would always remain in the lower portion of the right tank until the pilot selected the "reserve line" which would draw fuel from a sump in the lowest part of the right tank. Printed guidance stated, that "when tanks are full take off on the right main tank," otherwise "take off on the fullest tank." A placard was installed on the airplane that read: "CAUTION: Unless Right Tank is full, use Reserve or Left Tank for Takeoff and Landing." Examination of the fuel selector revealed that the handle's pointer corresponded to a position in the R.H. MAIN quadrant area of the fuel selector placard, and a horizontal gouge was evident on the left side of the placard, that corresponded to selection of the fuel source as the right main tank.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's improper fuel management which resulted in an incorrect fuel selector position, fuel

starvation, and subsequent loss of engine power. A factor in the accident was the pilot's failure to maintain adequate airspeed and inadvertent stall.

Findings

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

Findings
1. (C) FUEL MANAGEMENT - IMPROPER - PILOT IN COMMAND
2. FUEL TANK SELECTOR POSITION - INCORRECT
3. (C) FLUID,FUEL - STARVATION

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

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

Findings
4. (F) AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
5. STALL - INADVERTENT

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
6. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On August 3, 2005, about 1403 eastern daylight time, A Convair BT-13A, N49646, was destroyed during impact with terrain, while departing from a private airstrip in Lyme, New Hampshire. The certificated airline transport pilot and passenger were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the personal flight conducted under 14 CFR Part 91, destined for North Canaan Aviation Facilities Airport (CT24), North Canaan, Connecticut.

According to witness statements, during the takeoff, the airplane became airborne half way down the runway, "leveled off" and accelerated in a northerly direction, then began to climb. After leveling off once more at approximately 300 feet above ground level, the airplane suddenly appeared to roll to the right, and descend in a nose down attitude into a cornfield.

PERSONNEL INFORMATION

The pilot held an airline transport pilot certificate with multiple ratings including airplane single-engine-land. His most recent FAA first-class medical certificate was issued on April 7, 2005. According to his pilot logbooks, he had accrued 13,584 total hours of flight experience, and 77 hours in make and model of airplane.

AIRCRAFT INFORMATION

According to maintenance records, the airplane was manufactured in 1945. The airplane received an annual inspection on May 20, 2005, and at the time of the inspection, had 3,205.9 hours of operation.

METEOROLOGICAL INFORMATION

A weather observation taken about 10 minutes prior to the accident at the Lebanon Municipal Airport (LEB), Lebanon, New Hampshire, located approximately 14 nautical miles south of the accident site, recorded the winds from 340 degrees at 9 knots, visibility 10 miles, a few clouds at 4,300 feet, temperature 88 degrees Fahrenheit, dew point 64 degrees Fahrenheit, and an altimeter setting of 29.94 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The accident occurred during the hours of daylight. The wreckage was located at 43 degrees, 51.77 minutes north latitude, 72 degrees, 10.29 minutes west longitude, at an elevation of

about 456 feet msl.

The airplane came to rest in a field approximately 2/10 of a mile north of the departure end of runway 35, and about 26 feet above it.

All the major components of the airplane were accounted for at the accident site.

No debris path was evident, however; 20 feet forward of the main wreckage was a depression in the ground that matched the outline of the right wing leading edge and right front side of the engine cowling.

A post-crash fire consumed the majority of the fuselage. The right wing was found inverted and displaced aft from its mounting location. Crush and compression damage was evident along the outer portions of the leading edge. An approximately 4 foot long by 3 foot wide burn pattern, was visible on its upper surface and multiple holes had burned through above the area of the right fuel tank.

A crush line was visible on the forward right side of the engine cowling and was measured as being at a 30-degree angle, perpendicular to the longitudinal axis of the airplane. The nose section forward of the firewall was partially canted to the right, along with the fuselage tube structure and empennage. The left wing, empennage, and all associated flight control surfaces displayed differing degrees of damage. The flap-operating unit, surviving portions of the left hand torque tube assembly and flap drive mechanism tube assembly, correlated to the flaps 10-degree position. Flight control continuity was confirmed from the ailerons to the surviving inboard portions of the wings and from the elevator and rudder panels to the approximate location of the cockpit.

Examination of the surviving cockpit controls and instruments revealed that the throttle control was in the maximum power position, the mixture control was full rich, and the propeller control was set to high RPM. The primer handle was in and locked. The attitude indicator indicated a 40-degree right bank and the directional gyro indicated 354 degrees.

No chordwise scratching or leading edge gouging was noted on either of the propeller blades. Impact damage was exhibited on only one blade, which was bent halfway along its length in a rearward direction. Burnishing of the outer portion of the blade face was present and a depression was noted on the right front side of the engine cowling that corresponded to the back of the opposite blade.

Powerplant and Fuel System Examination

The engine exhibited impact and post-crash fire damage and the No. 2 cylinder head was separated at the barrel/cylinder head junction. The impeller for the supercharger was eroded by fire but the blades exhibited no preimpact failures. Both magnetos were fire damaged and the engine mount was fractured. Continuity of the intake system and exhaust system could not

be confirmed due to fire damage, however; continuity of the valve train, and crankshaft was confirmed. An examination of the cylinders, pistons and piston rods revealed no preimpact failures and all spark plug electrodes were intact and appeared normal on the cylinders that were not compromised internally by fire.

The surviving portions of the fuel system were examined. The carburetor was removed and disassembled. The outside was fire damaged and had burned through to the float bowl, however; the internal portion of the float bowl was clean, and exhibited no evidence of fire damage to the float, needle valve or inside of the float bowl. The fuel pump was devoid of fuel or fuel residue and the fuel unit, which combined the functions of a fuel strainer and emergency fuel pump was also devoid of fuel or fuel residue.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot by the Office of the Chief Medical Examiner, State of New Hampshire.

Toxicological testing of the pilot was conducted at the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma.

TESTS AND RESEARCH

The fuel supply for the accident airplane was carried in two integral tanks each having a capacity of approximately 60 gallons.

A review of the Erection and Maintenance Instructions for the BT-13 revealed that each tank was comprised of a compartment formed by the front and rear wing beams, upper and lower skin cover sheets and the chordwise bulkheads, which formed the tank ends. The right tank, however; contained a standpipe, which was plumbed to the outlet connection to provide a reserve fuel supply of approximately 17 gallons, the plumbing of which was arranged so that under normal conditions fuel would cease to be drawn from the tank when the fuel level became even with the top of the standpipe. The reserve fuel supply therefore would always remain in the lower portion of the right tank until the pilot selected the "reserve line" which would draw fuel from a sump in the lowest part of the right tank.

Proper Order For Using The Fuel Tanks

According to the Army Air Forces Training Command Instructors' Manual, in the chapter on "Fuel Procedure" which began on page 31, it emphasized in the "Before Take-Off" section to make all "warm-ups and preflights" on the reserve tank, as in reality, there was no separate reserve tank in the airplane, and fuel would be drawn directly from the bottom of the right tank. It went on to say that "when tanks are full take off on the right main tank," otherwise "take off on the fullest tank."

In this chapter it also stated that tanks should be used in a definite order and listed a recommended procedure, "if take off is on the right tank, fly until it is 10 gallons below the left tank" and then "switch to the left tank and fly until it is ten gallons below the right tank" at which time the pilot would switch to "reserve" and alternate back and forth between "reserve" and the left fuel tank. It also stated to "always keep these tanks within ten gallons of each other,"

Airworthiness Directive 49-07-03

In 1949 an Airworthiness Directive (49-07-03) was issued. The AD, which applied to all BT-13 series airplanes required the addition of a placard that read: "CAUTION: Unless Right Tank is full, use Reserve or Left Tank for Takeoff and Landing."

The AD was issued due to several accidents that occurred from engine stoppage on takeoff and landing when operating on the right tank standpipe outlet, with fuel in the tank, at the level of the standpipe. According to the text of the AD, such engine stoppages occurred because pilots who were not fully familiar with the fuel system, had misinterpreted the right tank fuel gauge as indicating the total available fuel quantity when the selector valve was in the " Right Hand Main" (standpipe) position, and were unaware that the change to "Reserve or Left Hand Main" position must have been made "before the fuel level in the right tank had dropped to 17 gallons."

Examination of the airplane's maintenance records revealed that the AD was originally complied with on June 2, 1952 at 2,202 hours of operation with installation of a placard "to preclude the possibility of pilot error."

ADDITIONAL INFORMATION

On November 17, 2005, during a reexamination of the wreckage, an approximately 3 inch long by 3 inch wide melted and crushed piece of aluminum was discovered. After cleaning and removal of debris, it was revealed to be the remains of the fuel selector from the aft cockpit.

During an Examination of an exemplar airplane which had the fuel selector placard in both cockpits clearly marked with the 4 selector positions (L.H. MAIN, RES, R.H. MAIN, and OFF), it was revealed that when the accident airplanes fuel selector was oriented to match the exemplar airplane's fuel selector, the handle's pointer corresponded to a position in the R.H. MAIN quadrant area of the fuel selector placard.

After treatment to remove ash and dirt from the remains of the aluminum placard, portions of the words L.H. MAIN and RES were also visible and a horizontal gouge was evident on the left side of the placard that corresponded to the width of the fuel selector handle's inner edge.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	46,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	April 1, 2005
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 1, 2005
Flight Time:	13584 hours (Total, all aircraft), 77 hours (Total, this make and model), 3916 hours (Pilot In Command, all aircraft), 17 hours (Last 90 days, all aircraft), 6 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Convair	**Registration:**	N49646
Model/Series:	BT-13A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	6685
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	May 1, 2005 Annual	**Certified Max Gross Wt.:**	4350 lbs
Time Since Last Inspection:	2.5 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3205.9 Hrs as of last inspection	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	R-985-AN-14B
Registered Owner:	On file	**Rated Power:**	450 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LEB,603 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	13:53 Local	**Direction from Accident Site:**	180°
Lowest Cloud Condition:	Few / 4300 ft AGL	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	31°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Lyme, NH (NONE)	**Type of Flight Plan Filed:**	None
Destination:	Canaan, CT (CT24)	**Type of Clearance:**	None
Departure Time:	14:02 Local	**Type of Airspace:**	

Airport Information

Airport:	Private Airstrip NONE	**Runway Surface Type:**	Grass/turf
Airport Elevation:	430 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	35	**IFR Approach:**	None
Runway Length/Width:	1870 ft / 85 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	43.871387,-72.174446

Administrative Information

Investigator In Charge (IIC):	Gunther, Todd
Additional Participating Persons:	Sandra Taylor; FAA FSDO-05; Portland, ME
Original Publish Date:	October 3, 2006
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=62121