# National Transportation Safety Board
# Aviation Accident Final Report

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| **Location:** | WEST POINT, VA | **Accident Number:** | NYC95MA220 |
| **Date & Time:** | 09/10/1995, 1840 EDT | **Registration:** | N945PA |
| **Aircraft:** | BEECH 65 | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | | **Injuries:** | 12 Fatal |
| **Flight Conducted Under:** | Part 91: General Aviation - Skydiving | | |

## Analysis

The airplane was loaded with 10 sport parachutists and one pilot. Later, investigators calculated that the maximum gross weight was exceeded by 149.6 pounds, and the center of gravity was 2.87 inches aft of the aft limit. The cabin door had been removed for parachuting operations; however, an altered Flight Manual Supplement had been used as authority for the door removal. The airplane was not on the FAA-approved eligible list for such removal. The airplane needed to be refueled before flight, but the quantity of fuel in the airport's underground storage tank was below the electric cutoff level. Fuel was pumped manually from the storage tank into plastic jugs, which were used to refuel the airplane. Before takeoff, samples of fuel were reported to have been drained from the airplane's fuel tanks (sumps). According to witnesses, they heard an engine misfiring during takeoff. They observed the airplane level off during the initial climb and start a shallow right turn. The bank angle gradually increased from shallow to steep as the nose dropped and the airplane descended. Other witnesses observed the airplane in a steep dive just before it crashed in the rear of a residence. One person in the residence was killed. A postaccident fire destroyed the accessory sections of both engines. Examination of the airplane disclosed evidence that the right engine had been shut down and the right propeller had been feathered; however, no preimpact mechanical failure was found. A sample of excess fuel was obtained from the tank that was used to refuel the airplane, but no observable quantity of water or contamination was found.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate preflight/preparation, his failure to ensure proper weight and balance of the airplane, and his failure to obtain/maintain minimum control speed, which resulted in a loss of aircraft control after loss of power in one engine. A factor relating to the accident was: loss of power in the right engine for undetermined reason(s).

## Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. 1 ENGINE
2. (F) REASON FOR OCCURRENCE UNDETERMINED
3. REFUELING - PERFORMED
4. AIRPORT FACILITIES,FUEL STORAGE - INADEQUATE
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Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
5. (C) PREFLIGHT PLANNING/PREPARATION - INADEQUATE - PILOT IN COMMAND
6. MAINTENANCE,MODIFICATION - IMPROPER
7. (C) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND
8. (C) AIRSPEED(VMC) - NOT OBTAINED/MAINTAINED - PILOT IN COMMAND
9. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
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Occurrence #3: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - UNCONTROLLED

Findings
10. OBJECT - RESIDENCE

## Factual Information

HISTORY OF FLIGHT

On September 10, 1995, at 1840 eastern daylight time, a Beech 65, N945PA, operated by the Peninsula Sky Diving Club, was destroyed by impact with a residence and postcrash fire, 2.5 miles east of the West Point Municipal Airport, West Point, Virginia. The airline transport rated pilot, 10 sports parachutists, and 1 resident of the house were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight conducted under 14 CFR Part 91.

The airplane had flown seven parachute jumping operations on this day, prior to the accident flight. After the seventh flight, the airplane was refueled using plastic jugs/cans, because the quantity of fuel in the underground storage tank was below the electric cutoff level. The fuel was pumped manually into these jugs. A pilot witness stated:

While refueling the aircraft for the last two jump runs for the day, the airport [fuel] pumps ran dry. It was suggested that we could by using a hand pump, get some more fuel from the airport tank. This we accomplished with several jumpers assisting. I put approximately five to seven gallons in the left tank that brought it to overflow full. I continued ...to ferry fuel containers from the pump to Nick [the pilot] to complete the refueling. The containers we used were clear plastic 2 gallon cans and one red four or five gallon container. After refueling I observed Nick emerge from under the right wing having sampled the fuel. I had already drained some from the left.

Another witness described how two jugs were used at first, and another one was found in the hanger. A small amount of liquid was in this jug. It smelled like fuel and was dumped prior to this jug being used for the refueling operation.

After refueling, the airplane was loaded with the sport parachutists, including two students. The pilot-witness stated:

After what seemed usual starting (the right engine taking three or four attempts before starting) the airplane taxied out and I heard a normal run up, with the props going out of phase enough times to suggest mag and prop checks.

The airplane taxied to runway 09 and initiated the takeoff. Several witnesses, with aviation backgrounds, observed the airplane take off from the uncontrolled airport and commence its climb. They reported that, after becoming airborne, they heard unusual engine noises, indicative of a rough running engine. One witness (a pilot familiar with the airplane) stated:

...the aircraft had reached the tree line at the east end of the field, the right engine began making rhythmic throbbing noises which lasted for approximately 3-5 seconds. During the period of engine roughness, the aircraft appeared to level off. When the unusual engine noises ceased, the aircraft resumed its climb. (At the time the noises first began the approximate altitude of the aircraft was 200-250 feet)....Following the start of the second period of engine noise...only one engine could be heard....The aircraft...began a flat turn to the south [right turn]....the aircraft rolled abruptly right to a bank angle of between 70 and 80 degrees and maintained that attitude and angle of descent until it disappeared below the tree line...

A pilot, who had received training on flights in this airplane prior to the accident flight, also

witnessed the takeoff. He said that he heard the engine noise stop for about 4 seconds and then resume. He observed a black/mist smoke trailing the airplane. He thought that the airplane entered a shallow right turn that gradually increased to seventy to eighty degrees; then, suddenly rolled into a forty degree left bank and forty five degree nose down attitude.

The accident occurred during the hours of daylight, about 37 degrees, 31 minutes north, 76 degrees, 42 minutes west.

PILOT INFORMATION

The pilot held an Airline Transport Pilot Certificate, issued on March 18, 1992. He also held an FAA First Class Airman Medical Certificate, dated June 26, 1995, with no limitations.

The pilot's logbook indicated total flight time of 2980 hours, with 462 hours in the BE-65 model airplane. He had logged 95 hours in the 90 day period prior to the accident.

The pilot had flown 10 parachute jumping flights in this airplane the day prior to the accident. The accident flight was his eighth flight that day in the same airplane. One more flight was planned to be flown that day.

AIRCRAFT INFORMATION

MAINTENANCE RECORDS

The NTSB Maintenance Records Group Chairman's Factual Report stated the following:

Safety Board records indicate that on November 16, 1975,...the airplane [N945PA] crashed...[in] Minnesota. ...The airplane was described by the [NTSB] report as destroyed....According to FAA records, on June 30, 1976, the airplane was sold for salvage...for $1.00.... On November 9, 1976, [name] registered the airplane with the FAA....on May 9, 1995, the airplane was sold to [current owners] for $49,500.

The airplane's registration was changed from N19CR to N945PA on September 5, 1995, at the request of the current owners.

Aircraft maintenance records did not indicate when the cabin seats were removed, but an FAA Form 337 showed floor-mounted seatbelts installed on October 16, 1990. The form stated that the aircraft weight and balance had been recalculated and logbook records updated. No such weight and balance figures were found in the logbooks.

Additional modifications were made in May and June 1995 and Forms 337 submitted. An outside handrail and steps were added to the aircraft for sport parachuting operations. The Form 337s stated that weight and balance had been recalculated and records updated; however, no entries were made in the airframe logbook.

AIRPLANE CONFIGURATION

The airplane was configured for sport parachute operations, which included the removal of the passenger seats and the aft boarding door, located on the left side of the fuselage.

The investigation revealed that this model airplane was not on the eligibility list for flight with the cabin door removed. The Type Certificate Data Sheet for certain Beech 65 series airplanes listed several models as eligible for such door removal, but the Beech Model 65 was not one of those airplanes.

A Flight Manual Supplement that appeared to authorize such door removal was provided to

investigators by the operator. Examination of this document revealed that it had been altered by an unknown person. There were no records of this model having been flight tested and authorized for such door removal.

FUEL SAMPLE

A sample of fuel, from the tank used to refuel the accident airplane, was obtained by FAA Inspectors from airport personnel. The sample was in a plastic jug and was excess fuel obtained during the refueling of accident airplane. Investigators examined this sample visually and concluded that there was no observable quantity of water or contaminants.

WEIGHT & BALANCE

Investigators determined the weight of the jumpers from individual registration forms completed by the occupants. The same type of equipment worn by each jumper was weighed by FAA investigators, using scales. The weight & balance figures for the airplane were the best available from a review of maintenance records provided by the operator during the investigation.

The occupant positions at the time of departure were provided by the Peninsula Sky Diving Club members to the Virginia State Police and confirmed by the Safety Board Investigators. An FAA Form 337 was filed on May 25, 1995, which described the seat belt installations on this airplane. The positions of the occupants as provided to the investigators indicated that one occupant was seated opposite the open cabin door, which does not show a seat belt at that location. This seating resulted in three jumpers on the left side of the airplane and five on the right side. One jumper was in the co-pilot's seat, and the other jumper was in the middle of the front passenger row.

The positions of the occupants after the impact was determined by the medical examiner. Pre-impact occupant positions could not be confirmed by this method.

Based on these positions and the weights as provided, the following weight & balance calculations were determined:

Maximum Allowable Takeoff Gross Weight.....7700.0 lbs

Calculated Gross Weight at time of accident.....7869.6 lbs

Center of Gravity (CG) Range.....149.90" to 158.40"

Calculated CG of N945PA at time of accident.....161.27"

WRECKAGE

The wreckage was examined at the accident site on September 11 and 12, 1995. It was then moved to a hanger at the West Point Municipal Airport and examined on September 12, 1995. The airplane wreckage was confined to the rear of a residence and the immediate yard area.

The Safety Board Airworthiness Group Chairman's Factual Report stated:

The...airplane came to rest, in the upright position, at the rear of the residence...The residence was destroyed by postimpact fire....A large oak tree in the front of the yard of the residence exhibited burned and dead leaves 50 feet above the ground and an automobile parked behind the residence was destroyed by postcrash fire. The fuselage, cockpit, left wing, and right horizontal stabilizer were consumed by postimpact fire. The airplane

wreckage was oriented with the nose of the airplane on a magnetic heading of 080 degrees....The examination of the airplane wreckage revealed no evidence of structural fatigue or in-flight fire.

The report also stated:

The right firewall shutoff valve was found in the open position....NTSB laboratories revealed the [right fuel] valve in the open position....The examination of the cockpit and forward fuselage revealed that the flight instruments and gages, including all those considered relevant to the accident, were consumed by postimpact fire.....The magneto switches were burned and sooted; however, the right engine magneto switch was in the "off" position, and the left engine magneto switch was in the "both" position. The magneto switches were further examined at the Safety Board's laboratories. The switches internal phenolic spacers exhibited compression damage consistent with the positions that the switches were found at the accident site.

All major components of the airplane were accounted for at the site. The landing gears and wing flaps were in the UP position. Flight control continuity was established to both ailerons. Fire damage prevented confirmation of such continuity to the elevators or rudder; however, rudder trim tab actuator position indicated left rudder trim tab displacement of 8 degrees.

Both engines were severely damaged by postcrash fire. Only external visual examinations of the engines and propellers were conducted at the accident site. The engines and propellers were shipped to the Textron Lycoming Engine Company, in Williamsport, Pennsylvania, for disassembly.

MEDICAL and PATHOLOGICAL INFORMATION

An autopsy was conducted on the pilot by Dr. Elizabeth Kinnison, of the Commonwealth of Virginia, on September 16, 1995, at the Offices of the Commonwealth Medical Examiner, Richmond, Virginia.

Toxicological testing was performed on the pilot by Dr. Dennis V. Canfield, Manager of the FAA Toxicology and Accident Research Laboratory. Results of this testing were negative for carbon monoxide, alcohol, or drugs.

SURVIVAL ASPECTS

The Safety Board's Survival Factors Group Chairman's Factual Report stated:

The cockpit was configured in the standard pilot and co- pilot arrangement. The cabin had no seats because the airplane was used specifically for parachuting operations. The parachutists sat on the floor facing aft in single file on each side of the cabin except for an occupant who sat in the cockpit doorway. Seatbelts were attached to the floor mounted seat tracks to restrain the parachutists while they were seated.

The factual report also stated:

The following seat location was derived from on-scene documentation via...stakes, and the subsequent Medical Examiner's identification of each victim by...number. (See attached diagram for seat location.)

TESTS AND RESEARCH

ENGINES & PROPELLERS

The engines and propellers were disassembled and examined under the supervision of the Safety Board Investigator-In-Charge, on September 20 & 21, 1995, at the Textron Lycoming Engine Company, Williamsport, Pennsylvania.

Right Engine

The engine would not rotate due to postcrash fire and impact damage. The accessory section was also destroyed by postcrash fire. The oil pump housing, including the oil filter and oil pump, was severely burned. Postcrash fire also destroyed the supercharger, fuel control systems, and fuel pump.

The crankcase was severely damaged by postcrash fire and impact.

The bottom spark plug electrode for the number 2 cylinder was grounded. The other spark plugs tested within acceptable standards.

Internal components of the engine, including the crankshaft, camshaft, valves, pistons, connecting rods, and bearings were intact. Heat and impact damage was evident on some components. Four of the cylinders and pistons showed evidence of foreign object damage (FOD).

No discrepancies were revealed during this examination, which would have prevented engine operation.

Left Engine

The engine would not rotate due to severe fire and impact damage. The accessory section was extensively damaged or destroyed by postcrash fire. This included the magnetos, electrical wiring, alternators, engine fuel pump, and fuel controls. The reduction housing, oil sump, fuel injectors and the bottom of the crankcase were also destroyed by postcrash fire.

The supercharger drive gear assemblies had numerous damaged gear teeth. This unit was sent to the NTSB Materials Laboratory for additional examination. In a factual report, the NTSB Senior Metallurgist stated that "the fractures strongly suggests that overstress breaks initiated on the nonpressure faces of the teeth."

The engine internal timing remained intact.

Except for fire and heat damage, the internal components of the engine were intact. This included the crankshaft. There was no evidence of pre-impact damage to the valves, camshaft, pistons, connecting rods or bearings.

No discrepancies were found during this examination, which would have prevented engine operation.

PROPELLERS

The right propeller blades were rotated to a position consistent with the feathering mode. Two of the three blades were bent approximately 90 degrees. The third blade was bent only slightly. The two bent blades had gouges on the leading edges. There was no indication of blade rotation in the clamp assemblies.

The right propeller governor would not rotate. The governor was shipped to the manufacturer, Woodward Governor, Inc., Rockton, Illinois, for disassembly. Under the supervision of the Safety Board Investigator-In-Charge, the governor was disassembled on

October 10, 1995. A foreign substance was found in the governor housing. This substance was removed and the unit rotated normally. It was bench-tested and met all testing parameters.

No other discrepancies were noted.

The substance was shipped to the NTSB Materials Laboratory for testing. In a factual report, Safety Board's Senior Metallurgist stated:

...the [material] all appeared to be made up of the same material having a texture representative of a previously molten plastic....none of the clusters appeared to have been mechanically deformed or damaged after they solidified.

The left propeller blades and assemblies were severely damaged by postcrash fire. The blades were in a high angle position, close to feather. Major portions of the pitch change mechanism were melted away. Butt end impressions were noted on two of the blades.

Position of the left engine propeller blades prior to impact could not be determined.

No discrepancies were noted in the disassembly of either propeller assembly.

VIDEO

An 8mm video was located in the front yard of the accident site. It was obtained from a helmet worn by one of the jumpers and was used to provide the occupants with a record of their jump. The video contained several previous jumps and also the first part of the accident flight, including the takeoff roll and initial climb of the airplane. It did not show the positions of the occupants during the taxi or takeoff.

A spectrum analysis of this video was conducted by a National Transportation Safety Board Engineering Services Specialist in an attempt to distinguish the sounds of the two engines. The sound of the left engine exhaust was heard on this analysis, but not the right engine. The specialist determined that the absence of the cabin door, and the position of the video audio pickup resulted in only the left engine being detected.

No useful information was obtained from this video.

ADDITIONAL INFORMATION

FAA Advisory Circular, AC 61-21A, Flight Training Handbook, dated 1980, contained the following information:

Multi-engine Flight Characteristics

Many pilots erroneously believe that because a light-twin engine has two engines, it will continue to perform at least half as well with only one of those engines operating....When one engine fails on a light-twin, performance is not really halved, but is actually reduced by 80 percent or more.

Vmc (minimum control speed) is greater when the center of gravity is at the rearmost allowable position. Many pilots...only consider the rear CG of their light-twin as a factor for pitch stability, not realizing that it could affect the controllability with one engine out.

Generally speaking, an airplane becomes less controllable, especially at slow flight speeds, as the center of gravity (CG) is moved aft. An airplane which cleanly recovers from a prolonged spin with the center of gravity at one position may fail

completely to respond to normal recovery attempts when the center of gravity is moved aft by 1 or 2 inches.

The recovery from a stall in any airplane becomes progressively more difficult as its center of gravity moves aft.

The airplane becomes less and less stable as the CG is moved aft....Any CG movement further aft will result in an unstable airplane.

The release of the airplane wreckage was completed on and signed by Paul E. Geddes, the insurance company representative, on February 14, 1996.

## Pilot Information

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| **Certificate:** | Airline Transport | **Age:** | 30, Male |
| **Airplane Rating(s):** | Multi-engine Land; Single-engine Land; Single-engine Sea | **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 Single-engine | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 1 Valid Medical--no waivers/lim. | **Last FAA Medical Exam:** | 06/26/1995 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 2980 hours (Total, all aircraft), 462 hours (Total, this make and model), 209 hours (Last 90 days, all aircraft), 81 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | BEECH | **Registration:** | N945PA |
| **Model/Series:** | 65 65 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | | **Amateur Built:** | No |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | LC-217 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 0 |
| **Date/Type of Last Inspection:** | 05/14/1995, Annual | **Certified Max Gross Wt.:** | 7700 lbs |
| **Time Since Last Inspection:** | 95 Hours | **Engines:** | 2 Reciprocating |
| **Airframe Total Time:** | 1530 Hours | **Engine Manufacturer:** | LYCOMING |
| **ELT:** | Installed, not activated | **Engine Model/Series:** | IGSO-480-A1E6 |
| **Registered Owner:** | PENINSULA SKY DIVERS | **Rated Power:** | 340 hp |
| **Operator:** | PENINSULA SKY DIVERS | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual Conditions | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | , 0 ft msl | **Distance from Accident Site:** | 0 Nautical Miles |
| **Observation Time:** | 0000 | **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:** | 5 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 340° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 29 inches Hg | **Temperature/Dew Point:** | 26°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | (W97) | **Type of Flight Plan Filed:** | None |
| **Destination:** | | **Type of Clearance:** | None |
| **Departure Time:** | 0000 | **Type of Airspace:** | Class G |

## Airport Information

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| **Airport:** | WEST POINT MUNICIPAL (W97) | **Runway Surface Type:** | Asphalt |
| **Airport Elevation:** | 24 ft | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 9 | **IFR Approach:** | |
| **Runway Length/Width:** | 3750 ft / 75 ft | **VFR Approach/Landing:** | |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | 10 Fatal | **Aircraft Fire:** | On-Ground |
| **Ground Injuries:** | 1 Fatal | **Aircraft Explosion:** | None |
| **Total Injuries:** | 12 Fatal | **Latitude, Longitude:** | |

## Administrative Information

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| **Investigator In Charge (IIC):** | CHARLES F LEONARD | **Report Date:** | 03/25/1997 |
| **Additional Participating Persons:** | JOSEPH F MANNO; WASHINGTON, DC<br>GERALD R JAMES; WILLIAMSPORT, PA<br>EDDIE E WEBBER; WICHITA, KS<br>ROGER W STALLKAMP; PIQUA, OH | | |
| **Publish Date:** | 10/17/2016 | | |
| **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/. | | |