



National Transportation Safety Board Aviation Accident Final Report

Location:	New Castle, DE	Accident Number:	NYC08FA051
Date & Time:	12/04/2007, 0722 EST	Registration:	N105PP
Aircraft:	BEECH 60	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

According to a witness, prior to arriving in the run-up area the pilot lowered the airplane's flaps. After the right flap fully extended, the flap key on the drive shaft inside the 90-degree drive assembly adapter fractured, in overload, in the direction of flap extension. Before takeoff, the pilot raised the flaps; however, with the fractured key, the right flap would have remained fully extended. The pilot could have identified this condition prior to takeoff, either visually or by means of the flap indicator, which received its input from the right flap actuator. The pilot subsequently took off, and the airplane turned left, but it is unknown at what point the pilot would have noted a control problem. The pilot climbed the airplane to 250 to 300 feet and allowed the airspeed to bleed off to where the airplane stalled and subsequently spun into the ground. Airplane manufacturer calculations revealed that the pilot should have been able to maintain control of the airplane at airspeeds over 70 knots. According to the pilot's operating handbook, the best two-engine angle of climb airspeed was 99 knots and the best two-engine rate of climb airspeed was 120 knots.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain adequate airspeed during a split flap takeoff, which resulted in an aerodynamic stall. Contributing to the accident were the failure of the right flap drive mechanism and the pilot's failure to verify that both flaps were retracted prior to takeoff.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: TAXI - TO TAKEOFF

Findings

1. (F) FLIGHT CONTROL,FLAP - FAILURE,PARTIAL
2. (F) PREFLIGHT PLANNING/PREPARATION - NOT FOLLOWED - PILOT IN COMMAND

Occurrence #2: LOSS OF CONTROL - IN FLIGHT

Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings

3. (C) AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
4. STALL/SPIN - INADVERTENT - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Findings

5. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On December 4, 2007, at 0722 eastern standard time, a Beech 60, N105PP, was destroyed when it impacted terrain while attempting to take off from New Castle Airport (ILG), New Castle, Delaware. The certificated private pilot was fatally injured. Visual meteorological conditions prevailed, and no flight plan had been filed for the flight to Lehigh Valley International Airport (ABE), Allentown, Pennsylvania. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91.

During a recorded weather briefing, the pilot indicated to the flight service specialist that he was going to first fly to Allentown to pick up a passenger, then proceed via an instrument flight rules flight plan to Athens, Georgia.

According to an airport employee, who was also a certificated flight instructor, he was in an airport vehicle near the approach end of runway 27 when he observed the accident airplane in the engine run-up area. The run-up appeared normal; however, the witness noted that the airplane's flaps were extended. After the run-up, the airplane taxied toward the runway with both flaps still extended. The witness did not see the airplane depart, as he had turned his vehicle away from the runway.

The tower controller reported that he cleared the airplane to depart from runway 27, and based on previous communications, expected the pilot to turn right, to the north after departure. After takeoff, the airplane's initial climbout was "normal" until it was 50 to 70 feet in the air. The airplane then entered a "slight" left bank, and the controller asked the pilot if he still intended turning to the north. The pilot responded, "five papa papa," and the transmission "cut off." The airplane then made a "steep climb" to 250 to 300 feet, and as it climbed, the angle of bank appeared to increase. As the airplane reached the top of its climb, the nose "came down and went straight into the ground." Upon impact, the airplane became engulfed in flames.

PILOT INFORMATION

The pilot, age 40, held a private pilot certificate with airplane single engine land, airplane multi-engine land, and instrument airplane ratings. The pilot's latest FAA third class medical certificate was issued on March 15, 2006.

In excerpts from the pilot's logbook, he indicated 1,080 hours of total flight time, with 425 hours in multiengine airplanes. The pilot completed Beech 60 recurrent training on October 16, 2007.

AIRPLANE INFORMATION

The airplane, which was manufactured in 1969, was powered by two Lycoming TIO-540 series engines.

According to the Duke 60 Series Maintenance Manual, "the flaps consist of a section on each wing driven by a single electric motor. A flexible drive shaft extends from the motor assembly to a jackscrew actuator for each section." In addition, limit switches are installed on the outboard side of the inboard left wing flap track to stop flap travel at 0 degrees (full up), 15 degrees (approach), and 30 degrees (full down), depending on the position of the flap control

switch. "To indicate the position of the flaps...an adjustable flap position transmitter is installed on the flap actuator in the right wing. An indicator on the right subpanel provides a visual indication of the flap position."

The airplane's logbooks were not located. A mechanic who had previously worked on the airplane recalled the pilot mentioning that the flap motor had been worked on in North Carolina; however, an FAA check of maintenance facilities in that state could not confirm that any work was done. In addition, the pilot's wife and his business associates could also not locate any receipts or work orders referring to flap system maintenance.

The mechanic also thought that the airplane's latest annual inspection occurred on October 15 or 16, 2007. Estimated operating time since then, based on the pilot's logbook, was about 19 hours.

METEOROLOGICAL INFORMATION

Weather, reported at the airport at 0751, included clear skies, winds from 270 degrees true, at 21, gusting to 26 knots, 10 statute miles visibility, temperature 0 degrees Celsius, dew point minus -3 degrees Celsius, and an altimeter setting of 29.73 inches of mercury.

WRECKAGE INFORMATION

The initial impact point was in a grassy area, left of runway 27, near taxiway F, at 39 degrees, 40.5 minutes north latitude, 75 degrees, 36.74 minutes west longitude. The initial impact point was delineated by ground scars that correlated to the leading edges of both wings, and craters that corresponded to the positions of both engines and the nose compartment. The wing scars were aligned 165/345 degrees magnetic, with green lens material near the most northerly point.

The airplane's propeller hubs were broken off from the engines, and buried in the craters. When recovered, both sets of propellers exhibited "S" bending, leading edge damage, and chordwise scratching.

The main wreckage was displaced about 20 feet, 240 degrees magnetic from the initial impact point. Although the wreckage, including the instrument panel, was mostly consumed by fire, all flight control surfaces were accounted for, and flight control continuity was confirmed from all flight control surface connections to the main cabin.

The control gust locks were not located; however, the gust lock holes in the yoke columns were not elongated.

The pilot seat locking mechanism revealed no evidence of malfunction.

The landing gear actuator correlated to the gear being up. Flap actuator measurements revealed that the right flap was fully extended, while the left flap was fully retracted. The flap actuating system was retained for further examination.

Both engines were examined, and neither engine exhibited evidence of any preimpact anomalies.

TESTS AND RESEARCH

The flap drive mechanism was further examined at Hawker-Beechcraft facilities, Wichita, Kansas, under FAA oversight. The examination confirmed that the left flap actuator was retracted and the right flap actuator was extended. Further examination revealed that the left

flap drive cable was separated from the flap motor, and the actuator attachment fixture socket was disconnected from the hex nut fitting that was still attached to the 90-degree drive assembly.

Both the left and right flap actuators were extended and retracted by hand, with no binding noted. Both also maintained "position in tension and compression."

According to the Hawker Beechcraft Metallurgical Engineering Laboratory Report, the left 90-degree drive assembly adaptor housing was fractured, as was the adjacent attachment lug on the flap actuator body. The output drive shaft was fractured just above the bevel gear at the pin hole, with the mating piece absent. Fractures appeared consistent with impact damage.

All right side actuator system components were intact except that the key on the drive shaft inside the right 90-degree drive assembly adapter was fractured and the drive shaft could be turned freely without engaging the actuator. The key was found inside the keyway. Key fracture surfaces were examined stereoscopically and found to be characteristic of shear overload, "indicating torsional shear with the output drive shaft turning a clockwise direction." The metallurgical report also noted that the direction of the overload corresponded to the "flap extension direction" and that "metallurgical forensic evidence was not conclusive as to when the fracture occurred."

Lubricants found on the internal screw shafts and pistons were covered in a dark, grease-like substance. A review of applicable engineering drawings indicated that the parts were supposed to be lubricated with lubricating oils, not grease.

The parts were subjected to a lubricant analysis, with samples appearing to be a blend of Mobil 75W90 oil used on the production line and bearing grease. An elemental analysis of the samples revealed elevated levels of iron, chromium, aluminum, copper, lead and silicon.

- Airplane Performance -

Hawker Beechcraft personnel studied the feasibility of flight for the accident airplane while taking off in a split flap configuration. The study required that certain assumptions be made due to the fact that "flap retracted" versus "flap deflected" data comparisons were not available for the Duke. However, since Duke, Baron and Bonanza airplanes all utilize the same wing planform and control surface geometry, and Baron and Bonanza data, including wind tunnel data, do exist, that data could be "renormalized" and applied to Duke performance calculations.

Additional assumptions included a 0.80 propeller efficiency, a 70-knot true airspeed, and the actual elevation and temperature at the time of the accident. In addition, the angle of attack was assumed to be low enough to have no effect on the spanwise lift distribution generated at zero angle of attack, and the lift increment due to flap deflection produced a pure roll.

Results of the study indicated that while at takeoff power, with one flap extended to 30 degrees and the other flap fully retracted, the ailerons would have had sufficient authority, "though marginally," to counter the resulting moment at a 70-knot true airspeed.

MEDICAL AND TOXICOLOGICAL INFORMATION

An autopsy was performed on the pilot by the State of Delaware, Office of the Chief Medical Examiner, Wilmington, Delaware. Cause of death was determined to be "multiple blunt force and thermal injuries." Toxicological testing was subsequently performed by the FAA Forensic

Toxicology Research Team, Oklahoma City, Oklahoma, with no abnormalities noted.

ADDITIONAL INFORMATION

There were no emergency procedures for a split flap condition in the Pilot's Operating Handbook (POH).

According to the POH, item 7 of the Before Take-Off Checklist, "Flaps - CHECK OPERATION AND SET" .

Under "Operational Speeds," the POH listed 99 knots for "two-engine best angle of climb," and 120 knots for "two-engine best rate of climb."

Pilot Information

Certificate:	Private	Age:	40, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3	Last FAA Medical Exam:	03/15/2006
Occupational Pilot:	No	Last Flight Review or Equivalent:	10/16/2007
Flight Time:	1080 hours (Total, all aircraft), 18 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	BEECH	Registration:	N105PP
Model/Series:	60	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	P-105
Landing Gear Type:		Seats:	6
Date/Type of Last Inspection:	10/15/2007, Annual	Certified Max Gross Wt.:	6775 lbs
Time Since Last Inspection:	19 Hours	Engines:	2 Reciprocating
Airframe Total Time:		Engine Manufacturer:	LYCOMING
ELT:	Installed	Engine Model/Series:	TIO-541 SER
Registered Owner:	AVWERKS LLC	Rated Power:	310 hp
Operator:	Daniel S. Hart	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	ILG, 75 ft msl	Distance from Accident Site:	
Observation Time:	0751 EST	Direction from Accident Site:	
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	21 knots / 26 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	270°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	0°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	New Castle, DE (ILG)	Type of Flight Plan Filed:	None
Destination:	Allentown, PA (ABE)	Type of Clearance:	VFR
Departure Time:	EST	Type of Airspace:	

Airport Information

Airport:	New Castle Airport (ILG)	Runway Surface Type:	Asphalt
Airport Elevation:	79 ft	Runway Surface Condition:	Dry
Runway Used:	27	IFR Approach:	None
Runway Length/Width:	7181 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	On-Ground
Total Injuries:	1 Fatal	Latitude, Longitude:	39.675556, -75.612222

Administrative Information

Investigator In Charge (IIC):	Paul R Cox	Report Date:	06/11/2009
Additional Participating Persons:	Robert Fus; FAA/FSDO; Philadelphia, PA Timothy Rainey; Hawker Beechcraft; Wichita, KS Mike Childers; Lycoming Engines; Williamsport, PA		
Publish Date:	09/10/2015		
Note:	The NTSB traveled to the scene of this accident.		
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 pubinquiry@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](#).