



Aviation Investigation Final Report

Location:	Ketchikan, Alaska	Accident Number:	ANC10FA064
Date & Time:	July 23, 2010, 07:27 Local	Registration:	N9290Z
Aircraft:	DEHAVILLAND BEAVER DHC-2 MK.1	Aircraft Damage:	Substantial
Defining Event:	Turbulence encounter	Injuries:	1 Fatal
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The pilot had been advised by the Federal Aviation Administration flight service station (FSS) specialist to remain clear of the destination airport until the specialist could issue a special visual flight rules clearance. Instrument meteorological conditions prevailed at the airport, with a strong southeasterly wind. About 8 minutes after initial contact, the FSS specialist attempted to contact the pilot to issue the clearance but received no response. A witness about 0.5 mile southeast of the accident site said he saw the accident airplane flying very low over the treetops. He said the weather conditions consisted of low clouds, rain, and gusty southeasterly wind estimated at 30 to 40 knots. He said that, as the airplane passed overhead, it turned sharply to the left. As he watched the airplane, the wings rocked violently from side to side, and the nose pitched up and down. As the airplane passed low over hilly, tree-covered terrain, it rolled to the right, the right wing struck a large tree and separated, and the airplane descended behind a stand of trees. Pilots flying in the accident area reported strong wind with significant downdrafts and turbulence. A postaccident examination of the airplane did not disclose any preimpact mechanical malfunctions. Given the lack of mechanical deficiencies and the reports of turbulence and downdrafts, as well as the witness' account of the airplane's physical movements, it is likely that the pilot encountered significant terrain-induced turbulence and downdrafts while flying at low altitude. The area surrounding the accident site and portions of the pilot's earlier flight path were bordered by large areas of open and protected water, several of which were suitable for landing the float-equipped airplane.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's decision to continue the flight toward his destination in significant turbulence and

downdrafts, and his subsequent failure to maintain control of the airplane while flying low over rising terrain.

Findings

Environmental issues	Gusts - Contributed to outcome
Aircraft	Lateral/bank control - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Personnel issues	Decision making/judgment - Pilot

Factual Information

History of Flight

Maneuvering-low-alt flying	Turbulence encounter (Defining event)
Maneuvering-low-alt flying	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On July 23, 2010, about 0727 Alaska daylight time, a float-equipped de Havilland DHC-2 (Beaver) airplane, N9290Z, sustained substantial damage during a collision with tree-covered terrain about 5 miles north-northwest of Ketchikan, Alaska. The airplane was being operated as a visual flight rules (VFR) on-demand air taxi flight under 14 CFR Part 135, when the accident occurred. The airplane was owned by Radial Power Enterprises LLC, and operated by Pacific Airways, Inc., Ketchikan. The certificated commercial pilot, the sole occupant, sustained fatal injuries. Instrument meteorological conditions were reported in the area at the time of the accident, and company flight following procedures were in effect. At the time of the accident the flight was returning to the operator's base of operation at the Ketchikan Harbor Seaplane Base, Ketchikan.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on July 23, about 0830, the operator's dispatcher reported that the flight departed Ketchikan at 0630 for a round trip flight to Throne Bay, Alaska, which is about 35 miles northwest of Ketchikan. He said that the purpose of the flight was to transport baggage and boxes of frozen fish to Ketchikan. The dispatcher said that about 0710, as the flight was returning to Ketchikan, the pilot announced his inbound position near Ship Island, en route to the operator's airport dock, with 640 pounds of cargo. The dispatcher said he verified the airplane's inbound position using the company's Comprehensive Analysis of Real-time Broadcasting Systems (CRABS), which provides dispatch personnel with a real-time, moving map display of the airplane's progress. About 0725, the dispatcher noted that the airplane entered a holding pattern about 5 miles north of Ketchikan, in an area known as Ward Cove. Shortly thereafter, the airplane disappeared from the CRABS display, and the dispatcher was unable reestablish contact with the pilot.

According to personnel at the Ketchikan Flight Service Station (FSS), the pilot radioed the FSS at 0721, and advised that he was inbound for landing at the operator's airport dock facility. The FSS specialist on duty advised the pilot that current weather conditions at the airport were below basic VFR conditions, and then he asked the pilot of his intentions. In response, the pilot requested a Special VFR clearance to enter the Ketchikan Class E airspace. The FSS specialist instructed the pilot to remain clear of the airport surface area due to departing traffic, and told him to hold in the area of Ward Cove and wait for a clearance. At 0725, the FSS specialist

again contacted the pilot to verify that he was holding over Ward Cove, and to confirm that he was flying a left-hand holding pattern over the bay. The pilot confirmed that he was still over Ward Cove, flying a left-hand pattern. At 0729, the FSS specialist attempted to contact the pilot to issue him a special VFR clearance, but was unable to establish contact. No further communications were received from the accident airplane.

During an on-scene interview with the NTSB IIC on July 25, a witness that was about one-half of a mile southeast of the accident site reported while standing on a dock in Ward Cove, he heard what sounded like a low flying airplane headed towards him. As the airplane engine sound got louder, he saw the accident airplane flying very low over the treetops as it passed over the dock. He said that as the airplane passed overhead, it turned sharply to the left, and then it flew northwest, towards the mouth of Ward Cove. The witness stated that weather conditions at the time consisted of low clouds, rain, with very strong southeasterly gusty winds estimated at 30 to 40 knots. He said that as the airplane continued northwest and away from the dock, the wings of the airplane rocked violently from side-to-side, and the airplane pitched up and down. The witness said that as the airplane continued towards the mouth of the bay, and as it passed low over an area of hilly, tree-covered terrain, it rolled to the right, and the right wing struck the top of a large tree. He said that immediately after the impact the right wing separated and the airplane rolled inverted, then it descended behind a stand of trees. He said that as he lost sight of the airplane behind the trees, the engine speed increased significantly, followed by the sound of the airplane impacting terrain. The witness reported that immediately after hearing the impact, he reported the accident to the 911 fire emergency operator using his cellular phone.

According to the Alaska State Trooper dispatch personnel, the first emergency 911 call was received at 0727.

A search was initiated by the U.S. Coast Guard, Alaska State Troopers, and the Ketchikan Fire Department. Rescue personnel discovered the inverted airplane wreckage in an area of grass-covered terrain, which was surrounded by trees.

PERSONNEL INFORMATION

Pilot Information

The 38 year old pilot held a commercial pilot certificate with airplane single-engine land, multiengine land, single-engine sea, and instrument airplane ratings. The most recent second-class medical certificate was issued to the pilot on December 23, 2009, which contained no limitations.

In the Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1) submitted by the operator, the pilot's total aeronautical experience was listed as 5,300 hours, with 4,500 hours in the accident airplane make and model. The report noted that in the preceding 90 and 30 days prior to the accident, the pilot flew a total of 97 hours and 25 hours.

The pilot's normally scheduled duty day was from 0545 to 1945. In the three days prior to the accident, the pilot was off duty on July 20. On July 21, his duty day started at 0600, and he flew 3.7 hours, and on July 22, his duty day started at 0730, and he flew 2.6 hours. On the accident date of July 23, his duty day started at 0600. The accident flight was the pilot's first flight that day.

AIRCRAFT INFORMATION

According to the Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1) submitted by the operator, the airplane had a total time in service of 21,065.0 flight hours. The last recorded inspection of the engine and airframe was a 100-hour inspection, on July 21, 2010, about 4 flight hours before the accident. The airplane was equipped with Edo 4930 floats.

METEOROLOGICAL INFORMATION

The closest weather reporting facility was the Ketchikan International Airport, 5 miles south-southeast of the accident site. About 16 minutes after the accident, at 0743, a weather observation from the Ketchikan Airport was reporting, in part: Wind, 140 degrees (true) at 17 knots, gusting to 26 knots; visibility, 2 statute miles with light rain and mist; clouds and sky condition, few at 800 feet, 1,300 feet broken, 2,300 feet overcast; temperature, 54 degrees F; dew point, 52 degrees F; altimeter, 29.97 inches Hg. Remarks; peak wind 130 degrees at 26 knots occurred at 0741.

Pilots flying in the area at the time of the accident reported a strong southeasterly wind, between 30 and 40 knots, with significant downdraft and turbulence activity.

The next closest official weather observation station was Metlakatla, 20 miles south-southeast of the accident site. On July 23, at 0736, an Aviation Routine Weather Report (METAR) was reporting, in part: Wind, 160 degrees at 11 knots, gusting to 22 knots; visibility, 4 statute miles; clouds and sky condition, 800 feet broken, 1,600 feet overcast; temperature, 54 degrees F; dew point, 48 degrees F; altimeter, 29.99 inHg.

WRECKAGE AND IMPACT INFORMATION

The NTSB IIC, along with two Federal Aviation Administration aviation safety inspectors from the Juneau Flight Standards District Office (FSDO), Juneau, Alaska, examined the wreckage at the accident site on July 24 and 25.

All of the airplane's major components were found at the main wreckage site. The accident site was in a grass-covered meadow, which was surrounded by trees. The average heights of the trees around the accident site were in excess of 75 feet. The main wreckage site was about 125 feet above msl.

An area believed to be the initial impact point(s) was marked by broken treetops, atop two, slightly taller, 100 foot tall trees at the southern end of the meadow. A broken green navigation light lens was found at the base of the trees, along with various small wreckage fragments. The distance between the initial impact point and the main wreckage site was about 410 feet.

The airplane's severed right wing was discovered within the wreckage path, about 180 feet from the initial impact point. It had extensive spanwise leading edge aft crushing, with tree bark embedded within two elliptical impact areas. The wing's flight control surfaces remained connected to their respective attach points.

The main wreckage site was uphill and about 230 feet north of the right wing.

The left wing remained attached to the airplane fuselage, but it was displaced forward of the normal position. It had extensive spanwise leading edge aft crushing about midspan. The left wing's flight control surfaces remained connected to their respective attach points.

The fuselage and cabin area was crushed inward, and the empennage was bent up, and slightly to the left.

The left and right horizontal stabilizer and elevators remained attached to the fuselage mounting attach points, but sustained impact damage.

The vertical stabilizer remained attached to the empennage, but the rudder was torn from its upper hinge. The lower hinge remained attached.

The propeller and hub remained attached to the engine crankshaft. Two of the three propeller blades were loose in the propeller hub, but remained attached to the propeller hub assembly. The third propeller blade was found adjacent to the main wreckage site. All three of the propeller blades had multiple leading edge gouges, substantial torsional "S" twisting, and chordwise scratching.

The engine assembly remained attached to the engine firewall, which was found within the wreckage. The engine sustained impact damage to the front and underside. The exhaust tubes were crushed upward. The crushed and folded edges of the exhaust tubes were not cracked.

Due to impact damage, the flight controls could not be moved by their respective control mechanisms, but continuity of the flight control cables and push-pull tubes were established to the cabin/cockpit area.

There were no preaccident mechanical problems discovered during the NTSB IIC's on-scene wreckage examination.

MEDICAL AND PATHOLOGICAL INFORMATION

A postmortem examination was conducted under the authority of the Alaska State Medical Examiner, Anchorage, Alaska, on July 26, 2010. The cause of death for the pilot was attributed to blunt force, traumatic injuries.

The FAA's Civil Aeromedical Institute performed toxicological examinations for the pilot on August 25, 2010, which was negative for alcohol and drugs.

ADDITIONAL INFORMATION

ADS-B / Capstone Technology

The FAA implemented national automatic dependent surveillance-broadcast (ADS-B) technology in Alaska, and the accident airplane was equipped with an avionics package as part of that program. Formerly known as Capstone, the joint industry/FAA program (which includes ground-based stations, satellites, and aircraft avionics) currently provides pilots with situational awareness by displaying the airplane's position over terrain, while using GPS technology, coupled with an instrument panel mounted, moving map display. Additionally, the Capstone equipment installed in the accident airplane provided the pilot with color shading on the moving map, which depicts terrain elevation changes. Terrain displayed on the pilot's moving map that is within 300 feet of the airplane will be displayed in red, alerting the pilot of close proximity to terrain. The ADS-B equipment installed in the accident airplane included two Chelton Multi-function display (MFD) units. One MFD provides the pilot with moving map with terrain awareness information, and the other provides primary flight display information.

The two impact damaged MFD units were found in the wreckage, and both were removed and shipped, in a sealed shipping container, to the FAA's FSDO, Fort Worth, Texas.

On October 6, 2010, a postaccident data recovery examination was done at the S-Tec Corporation's facility in Mineral Wells, Texas, at the direction and under the direct supervision of a senior FAA avionics safety inspector. The recorded data, which was stored within the two MFD units was recovered, and forwarded to the NTSB vehicle recorder laboratory in Washington, DC.

An NTSB senior electronics engineer analyzed the recovered data which included, in part, the accident airplane's altitude, pitch, roll, heading, indicated airspeed, true airspeed, crosswind component, ground speed, and flight track data, all of which confirmed the witness's account of the accident. Additionally, he provided a flight track map overlay, along with aircraft performance plots, which are included in the public docket for this accident.

Pilot Information

Certificate:	Commercial	Age:	38, Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 Without waivers/limitations	Last FAA Medical Exam:	December 23, 2009
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	April 27, 2010
Flight Time:	5300 hours (Total, all aircraft), 4500 hours (Total, this make and model), 5250 hours (Pilot In Command, all aircraft), 97 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	DEHAVILLAND	Registration:	N9290Z
Model/Series:	BEAVER DHC-2 MK.1	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	1387
Landing Gear Type:	Float	Seats:	8
Date/Type of Last Inspection:	July 21, 2010 100 hour	Certified Max Gross Wt.:	
Time Since Last Inspection:	4 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	21065 Hrs as of last inspection	Engine Manufacturer:	P&W
ELT:	C91 installed, activated, did not aid in locating accident	Engine Model/Series:	R-985 SERIES
Registered Owner:	RADIAL POWER ENTERPRISES LLC	Rated Power:	450 Horsepower
Operator:	Pacific Airways, Inc.	Operating Certificate(s) Held:	Commuter air carrier (135), On-demand air taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	PAKT,89 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	07:43 Local	Direction from Accident Site:	330°
Lowest Cloud Condition:	Few / 800 ft AGL	Visibility	2 miles
Lowest Ceiling:	Broken / 1300 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	17 knots / 26 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	140°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.96 inches Hg	Temperature/Dew Point:	12°C / 11°C
Precipitation and Obscuration:	N/A - None - Mist		
Departure Point:	Thorne Bay, AK (KTB)	Type of Flight Plan Filed:	Company VFR
Destination:	Ketchikan, AK	Type of Clearance:	Special VFR
Departure Time:	07:00 Local	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	55.400554,-131.736389(est)

Administrative Information

Investigator In Charge (IIC):	Johnson, Clinton
Additional Participating Persons:	David U Frederick; Federal Aviation Administration (Airworthiness); Juneau, AK John Harvath; Federal Aviation Administration (Avionics); Juneau, AK Vance Robertus; Pacific Airways, Inc. - Chief Pilot; Ketchikan, AK
Original Publish Date:	January 17, 2012
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=76733

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).