National Transportation Safety Board
Aviation Accident Final Report

Location:	WASHOUGAL, WA	**Accident Number:**	SEA00FA023
Date & Time:	11/27/1999, 1455 PST	**Registration:**	N666XT
Aircraft:	de Havilland DHC-2 MK. I	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

Witnesses reported that following takeoff from a river, the aircraft climbed to approximately 100 to 400 feet above the water, then initiated a left turn of approximately 45 degrees bank. The majority of the witnesses reported that after the aircraft had turned about 180 degrees, its nose abruptly dropped and it impacted the water. Witnesses did not report observing any evidence of problems with the aircraft before impact, and did not report hearing any abnormal engine sounds or sudden changes in engine pitch. Upon water impact, the aircraft went inverted and its cabin submerged. Efforts by witnesses to gain entry to the aircraft cabin to render assistance were unsuccessful due to aircraft damage. Rescue divers found all occupants deceased in the aircraft upon arrival, but were able to remove the two rear-seat victims without removing any passenger restraints. Autopsies disclosed that all four aircraft occupants had drowned. Investigators did not find any evidence of pre-impact aircraft or engine malfunctions during post-accident examinations of the wreckage, but did find that a cabin entry door was jammed shut due to impact damage, and that the range of travel of both pilot doors was restricted by damaged aircraft components.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to ensure attainment of adequate airspeed prior to initiating a steep turn at low altitude, resulting in an accelerated stall. A factor contributing to the occurrence of the accident was the aircraft's low altitude. Factors contributing to the severity of the accident included a water impact, and jammed/restricted doors due to impact damage resulting in degraded aircraft evacuation capability.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings
1. (C) AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
2. STALL - ENCOUNTERED - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. (F) ALTITUDE - LOW - PILOT IN COMMAND
4. (F) TERRAIN CONDITION - WATER
5. (F) DOOR - JAMMED
6. EVACUATION - RESTRICTED

Factual Information

HISTORY OF FLIGHT

On November 27, 1999, approximately 1455 Pacific standard time, a deHavilland DHC-2 Mk. I amphibious floatplane, N666XT, was substantially damaged in a crash into the Columbia River following takeoff from the river approximately 9 nautical miles east of Washougal, Washington. The private pilot-in-command of the aircraft and three passengers (the pilot's sons, ages 14, 13, and 9) received fatal injuries in the accident. The FAA reported no record of a flight plan being filed for the 14 CFR 91 personal flight, and witnesses reported that visual meteorological conditions existed in the accident area at the time. The flight's destination was not determined.

A witness to the accident, who stated he observed the accident from a boat anchored north of the river shipping channel and adjacent to Multnomah Falls, reported that the aircraft initially performed "a seemingly normal takeoff, flying past my boat in an easterly direction as he did so." He stated that the aircraft departed upwind to the east, then reappeared "only a few seconds later." The witness reported:

> ...I looked over just in time to see the aircraft, which was now slightly to the North of it's [sic] departure path, and flying in a westerly direction at approximately 400 feet [above ground level]. Suddenly, the left wing of the aircraft dropped sharply, and the plane began a vertical descent with the left wing leading. Due [to] the sound of the engine, the aircraft appeared to be developing full power at the onset of the accident. The aircraft struck the water with a great deal of force, in about fifteen feet of water....

In a written statement to the FAA, the witness, who stated he is a professional pilot, provided sketches indicating that the aircraft impacted approximately 90 degrees left wing down and 50 degrees nose down. The witness reported that visual meteorological conditions prevailed at the time, with winds approximately from 100 degrees at 7 knots and visibility more than 10 miles. The witness reported he immediately proceeded to the site of the wreckage, but that all efforts to gain access to the cabin were hampered by debris.

Another individual who was in the boat with this witness reported that the plane took off on the river upstream into the wind, climbed 300 to 400 feet, and then "fell off to the left and nose dived into the river." This witness reported that "the engine never sputtered or choked out." The second witness in the boat reported that they arrived at the aircraft about 4 to 5 minutes after the accident, but that his partner, who entered the water in an attempt to provide assistance to the aircraft occupants, was unable to get the aircraft's doors open since the "wing braces were jammed tight against the cabin."

Three individuals in a hiking party on Angel's Rest (a mountain on the Oregon side of the river, directly across the river from the accident site) also witnessed the crash. These three individuals generally described the airplane taking off to the east, climbing approximately 100 to 200 feet into the air, and then initiating a left turn with a bank angle of approximately 45 degrees. These witnesses stated that the aircraft turned approximately 180 degrees (i.e. reversed course to the west) before it impacted the water, with one witness stating that the aircraft's wings were "perpendicular with [the] water" at the completion of this course reversal. Two of the individuals stated they observed the aircraft's nose drop abruptly just prior to the water impact, and one of these witnesses stated that a gradual altitude loss began before the

aircraft was halfway around the 180-degree turn. The witness who reported observing the gradual altitude loss indicated he did not observe any abrupt changes in the aircraft's flight path prior to water impact. None of these three witnesses reported hearing any abnormal engine noises or sudden changes in engine pitch, and two of them described the engine noise as "loud."

A caretaker at a family residence on the river near where the aircraft took off from (and approximately 1/2 mile west of the aircraft crash site), reported to local law enforcement authorities that the aircraft took off from 1,000 yards out in the Columbia River to the east "as it normally does." The caretaker stated he last observed the aircraft to be about 100 feet in the air, but had his back turned to the aircraft when he heard the sound of the crash.

The accident occurred during the hours of daylight at approximately 45 degrees 35.5 minutes North latitude and 122 degrees 8.3 minutes West longitude.

PERSONNEL INFORMATION

According to FAA records, the pilot held a private pilot certificate with airplane single engine land, airplane single engine sea, and instrument airplane ratings, and had 2,400 hours total civil pilot time. The pilot also held a current FAA third-class medical certificate. No other information was obtained regarding the pilot's flight history.

The aircraft was equipped with dual controls. During recovery of the aircraft occupants, rescue divers recovered the pilot from the left pilot's seat, and the pilot's 14-year-old son from the right pilot's seat.

AIRCRAFT INFORMATION

The aircraft logs indicated that the airplane, originally manufactured in 1955, had been converted from military L-20A specification to civil DHC-2 Mk. I specification in 1974. The airplane had undergone a major refurbishment at Kenmore Air Harbor, Kenmore, Washington, in 1991, approximately 575 flight hours prior to the accident. This major refurbishment included installation of an overhauled Pratt & Whitney R-985-AN39A engine and a new Hartzell 3-bladed propeller. Additionally, the airplane had been modified by installation of Wipaire model 6100 amphibious floats in accordance with a supplemental type certificate (STC) held by Wipaire, in August 1997. Other significant modifications to the basic aircraft included: installation of a Sealand cabin extension kit (per STC SA00094NM) and cabin access door (field-approved) in April 1998; pilot and copilot shoulder harnesses via FAA Form 337 in April 1991; STC SA4025NM to increase the aircraft gross weight to 5,370 pounds in April 1991; water rudder steering system per STC SA428NM in April 1991; and auxiliary vertical seaplane fins per STC SA456NW. During post-accident wreckage examinations, investigators observed that the center rows of seats had been removed from the aircraft, leaving the two pilot seats and a bench-type seat at the rear of the cabin as available seating.

At the time of the accident, the airplane had approximately 15,539 total airframe hours, and the engine had approximately 5,848 hours total time and 575 hours since overhaul. The airplane's last annual inspection was on June 28, 1999, approximately 66 flight hours prior to the accident. Investigators noted no discrepancies with the airplane's recent inspection or maintenance history.

According to the aircraft manufacturer, Bombardier Inc. of Downsview, Ontario, Canada, the aircraft's flap settings are referred to as follows: "cruise" (0 degrees), "climb" (15 plus or minus

1 degrees), "takeoff" (35 plus or minus 1 degrees), "landing" (50 plus or minus 2 degrees), and "full" (58 plus or minus 2 degrees.) According to excerpts of the DHC-2 operating manual furnished by the aircraft manufacturer, the seaplane variant's flaps-up stall speed at a gross weight of 5,090 pounds ranges from 60 MPH indicated airspeed (IAS) at 0 degrees of bank to 130 MPH IAS at 70 degrees of bank. With flaps at the "landing" setting, at 5,090 pounds gross weight and 0 degrees of bank, the seaplane variant's stall speed is 45 MPH IAS. The operating manual describes the aircraft's stall characteristics as follows:

The stall is gentle at all normal conditions of load and flap and may be anticipated by a slight vibration, which increases as flap is lowered. The aircraft will pitch if no yaw is present. If yaw is permitted, the aircraft has a tendency to roll. Prompt corrective action must be initiated to prevent the roll from developing.

The manual states that it is possible to retain full control of the aircraft at 75 MPH IAS with flaps at "cruise", and at 65 MPH IAS with flaps at "landing."

During the on-site examination, Skamania County, Washington, sheriff's officials exhibited the baggage and personal effects recovered from the accident aircraft to investigators. The baggage and personal effects consisted of approximately five to six shotguns, ammunition, a backpack, and clothing. The total weight of the baggage and personal effects was estimated at 100 pounds. An unrestrained golden retriever dog was also aboard the aircraft at the time of the accident. The dog was found dead in the aircraft by rescue divers.

METEOROLOGICAL INFORMATION

The 1453 automated METAR observation for Portland-Troutdale Airport, Troutdale, Oregon (11 nautical miles west of the accident site), reported conditions as follows: winds from 080 degrees true at 12 knots, gusting to 17 knots; visibility 10 statute miles; ceiling 5,000 feet overcast; temperature 8 degrees C; dew point 6 degrees C; and altimeter setting 30.06 inches Hg.

METAR observations at Cascade Locks, Oregon (12 nautical miles east-northeast of the accident site) at 1345 and 1545 reported calm winds, visibility 1/2 mile in light rain and fog, scattered clouds at 2,800 feet, and ceiling 6,500 feet overcast. Temperature at Cascade Locks dropped from 8 degrees C at 1345 to 7 degrees C at 1545, and dew point was reported as 6 degrees C in both observations. No observations were recorded at Cascade Locks between 1345 and 1545.

Witnesses to the crash reported good visibility, light easterly winds, and overcast skies at approximately 2,000 to 3,000 feet in the accident area at the time of the accident.

WRECKAGE

The aircraft came to rest inverted and adjacent to the Washington shoreline of the river, with its nose pointed approximately south and the cabin submerged in about 8 to 10 feet of water. While search and rescue/recovery activities were underway, the aircraft remained submerged at the accident site until the afternoon of November 28, 1999. The aircraft wreckage was recovered from the river prior to the arrival of investigators at the accident scene.

Investigators from the NTSB and FAA conducted a post-accident examination of the aircraft wreckage at the facilities of Mark Marine Service, Camas, Washington, and Aero Maintenance, Inc., Vancouver, Washington, from November 29, 1999, to December 1, 1999. The aircraft's landing wheels were noted to be up, and the aircraft's hydraulic flap actuator was found at an

extension corresponding to a flap position approximately midway between the "takeoff" and "climb" positions. Fuel was also found at various points in the aircraft's fuel system. The aircraft's left passenger door had been forced inward through the door frame, and the door could not be opened. The right passenger door operated and opened normally. Both pilot doors would open but their range of travel was restricted by damaged aircraft components. During the post-accident examination, investigators found no evidence of any pre-impact aircraft or engine malfunctions.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy on the pilot was conducted by the Clark County Medical Examiner's Office, Vancouver, Washington, on November 28, 1999. The autopsy determined that the cause of the pilot's death was drowning. The Clark County Medical Examiner's Office also reported to the NTSB that the cause of death for the other three occupants was also determined to be drowning.

Toxicology testing on the pilot was performed by the FAA Civil Aeromedical Institute (CAMI), Oklahoma City, Oklahoma. The CAMI toxicology tests screened for carbon monoxide, cyanide, ethanol, and legal and illegal drugs and did not detect any of these substances.

SURVIVAL ASPECTS

The aircraft went inverted in approximately 15 feet of water following water impact. One witness to the crash immediately telephoned for emergency assistance, and others proceeded immediately to the aircraft by boat to attempt to render assistance to the aircraft occupants. The witnesses arrived on scene within approximately 4 to 5 minutes of the crash. One of these witnesses entered the water and attempted cabin entry but was unable to open the cabin doors due to aircraft damage.

Rescue personnel found all aircraft occupants dead in the aircraft upon their arrival at the accident scene. According to the Skamania County Sheriff's incident report, the pilot was found in the left pilot's seat, and the 14-year-old boy was found in the right pilot's seat and was strapped in. The two youngest boys were recovered from the rear of the aircraft. The incident report indicated that divers did not have to remove any passenger restraints to remove the two occupants in the rear of the aircraft.

During post-accident examination of the aircraft (following its recovery from the river), the right rear seat belt buckle was found latched. The right end of the belt was connected to the seat belt anchor. The belt was not connected to the left belt anchor. However, both right rear seat belt anchors were observed to be deformed into an oval, "chain link" or "race track"-type shape. (NOTE: The nominal shape of these anchors approximates a teardrop, with the narrow end of the teardrop passing through the attach bolt that anchors the belt to the aircraft structure.) The left rear seat belt was observed to be unlatched. The left side of the belt was attached to its anchor, which was deformed into a "D" shape. The right side of the belt was not connected to its anchor. The left rear seat's right anchor was teardrop-shaped, with the round (wide) bottom of the teardrop passing through the anchor attach bolt in the cabin floor (i.e., reversed from the nominal drawing position.)

ADDITIONAL INFORMATION

All aircraft wreckage, with the exception of certain parts retained by the NTSB for possible further examination, was telephonically released to Mr. James V. Stiger of Pac Northwest,

Bellevue, Washington, on or about January 24, 2000. Mr. Stiger is an insurance adjuster representing the aircraft owner. Final release of all aircraft wreckage was given to Mr. Stiger on January 24, 2001.

Pilot Information

Certificate:	Private	**Age:**	48, Male
Airplane Rating(s):	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):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	07/13/1998
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	2400 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	de Havilland	**Registration:**	N666XT
Model/Series:	DHC-2 MK. I DHC-2 MK.	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	826
Landing Gear Type:	Amphibian; Float	**Seats:**	4
Date/Type of Last Inspection:	06/28/1999, Annual	**Certified Max Gross Wt.:**	5370 lbs
Time Since Last Inspection:	67 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	15540 Hours	**Engine Manufacturer:**	P&W
ELT:	Installed	**Engine Model/Series:**	R-985-AN39A
Registered Owner:	WILLIAM S. WARREN	**Rated Power:**	450 hp
Operator:	WILLIAM S. WARREN	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	TTD, 39 ft msl	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:	1453 PST	**Direction from Accident Site:**	242°
Lowest Cloud Condition:	Unknown / 0 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	Overcast / 5000 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	12 knots / 17 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	8°C / 6°C
Precipitation and Obscuration:			
Departure Point:		**Type of Flight Plan Filed:**	None
Destination:	UNKNOWN	**Type of Clearance:**	None
Departure Time:	0000	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	GREGG NESEMEIER	**Report Date:**	05/30/2001
Additional Participating Persons:	LARRY R WILLIAMS; PORTLAND, OR		
Publish Date:			
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/.		