Aviation Investigation Final Report

Location:	KING SALMON, Alaska	**Accident Number:**	ANC96TA163
Date & Time:	September 24, 1996, 10:15 Local	**Registration:**	N67207
Aircraft:	de Havilland U-6A	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 Serious, 2 Minor
Flight Conducted Under:	Part 91: General aviation		

Analysis

The pilot and three passengers were departing a remote lake in a float equipped airplane. The pilot positioned the hydraulic actuated flaps to 20 degrees. After takeoff, about 150 ft above the water, the pilot positioned the flap lever to the 'UP' position in preparation of pumping the flaps up, but said he did not move the pump handle. Turbulence was present during the takeoff, and during a left turn, the pilot encountered a severe gust at the time he positioned the flap lever. The airplane stalled in a left turn that steepened to almost a 90 degree bank. The airplane descended and the left wing contacted the surface of the lake. The left wing was torn off the fuselage, and the floats were crushed upward. Both flaps are activated by a common torque tube connected to a double-acting flap actuating cylinder. At the accident scene, the right wing flap and right aileron were observed to be extended to an intermediate position. The weather conditions included 20 kts of wind, turbulence, and rain. The pilot expressed a concern that the flaps may have retracted without being pumped to the up position. An examination of the flap system and the ratchet valve assembly was conducted after the airplane was recovered and the wings were removed. Leakage of hydraulic fluid and air was observed through the ratchet valve. Additional testing of the ratchet valve at an overhaul facility did not reveal any leakage.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: failure of the pilot to maintain sufficient airspeed during the initial climb after takeoff, which resulted in an inadvertent stall and collision with the terrain (water). Turbulence was a related factor.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (F) WEATHER CONDITION - TURBULENCE
2. (C) AIRSPEED(VS) - NOT MAINTAINED - PILOT IN COMMAND
3. (C) STALL - INADVERTENT - PILOT IN COMMAND

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

Findings
4. TERRAIN CONDITION - WATER,ROUGH

Factual Information

On September 24, 1996, about 1015 Alaska daylight time, a float equipped de Havilland U-6A, N67207, crashed during takeoff from Brooks Lake, located about 28 miles east of King Salmon, Alaska. The airplane was being operated as a visual flight rules (VFR) cross-country government flight under Title 14 CFR Part 91 when the accident occurred. The airplane, registered to Branch River Air Service, King Salmon, Alaska, and operated by the U.S. Department of Interior, sustained substantial damage. The certificated commercial pilot and one passenger received serious injuries. Two passengers received minor injuries. Visual meteorological conditions prevailed. VFR company flight following procedures were in effect.

The operator reported that the flight was for the purpose of transporting three National Park Service employees to King Salmon. The passengers reported the pilot elected to land on Brooks Lake which was more sheltered from the wind. After loading the airplane, the pilot taxied away from the shoreline and began the takeoff run. After the airplane became airborne, it began a left turn. The airplane then was hit by a gust of wind. The turn steepened to almost a 90 degree bank. The airplane descended and the left wing contacted the surface of the lake. The airplane came to rest in about 4 feet of water. The left wing of the airplane was torn off the fuselage. The floats were crushed upward.

The pilot reported he started the takeoff and held the airplane on the surface of the water longer than normal due to gusty wind conditions and turbulence. The flaps were positioned to about 20 degrees. The airplane lifted off the water and climbed to about 150 feet. The pilot positioned the flap lever to the "UP" position in preparation of pumping the hydraulic flaps up, but said he did not move the pump handle. The pilot indicated that turbulence was present during the takeoff, but he encountered a severe gust at the time he positioned the flap lever. The pilot stated the airplane began to "mush", and the left wing dropped as the airplane stalled. He applied full power and attempted to arrest the beginning of a spin. The airplane contacted the water and came to rest upright. The pilot indicated the weather conditions at the time were: 2,500 feet overcast skies; visibility, 10 miles; temperature, 40 degrees F; wind, easterly at 20 knots; light turbulence and light rain. The water conditions were reported as choppy water with swells of 2 to 3 feet.

The pilot expressed a concern that the flaps may have retracted without being pumped to the up position. Examination of photos taken at the accident scene revealed the right flap was extended to an intermediate position and the right aileron was drooped slightly.

The wing flaps are hydraulically extended and retracted by means of a hydraulic hand pump containing an integral selector valve for flaps "UP" and "DOWN", and a hydraulic reservoir. When activated, hydraulic fluid is delivered to a double-acting flap actuating cylinder through a ratchet and thermal relief valve. The actuating cylinder is connected to a flap torque tube that

is attached to each flap assembly. Movement of the flap torque tube transmits movement to both flaps and ailerons. The flaps are retained in any intermediate position by ceasing to operate the hand pump. This action closes the ratchet valve and traps fluid in the system lines to create a hydraulic lock of the actuating cylinder.

The ratchet valve contains a sliding piston that when the pump is activated, pushes on two spring loaded balls to open their respective orifices. Upon ceasing hand pump operation, springs return the piston to a neutral position allowing the spring loaded balls to seat. The thermal relief valve allows relief of excess pressure caused by expansion of fluid during operation in hot climates.

An airworthiness inspector from the Federal Aviation Administration (FAA's) Anchorage, Alaska, Flight Standards District Office (FSDO) examined the airplane after it was retrieved from the water and transported to the operator's base. The left wing separated during impact. The right wing had been removed from the airplane. The flap torque tube and the aileron/flap interconnecting push/pull tubes were intact and functional.

The inspector supervised an inspection of the flap system and the ratchet valve assembly. The inspector reported the hydraulic system appeared to be intact. The hand pump was activated and the actuating cylinder was extended to a flap down position. The flap selector was then positioned to the flap up position and hand pressure was applied to the actuating cylinder. The cylinder compressed toward a flap up position without any movement of the hand pump. Hydraulic fluid and air was displaced into and out of the top of the hand pump reservoir. The actuating cylinder's, flaps up return line, was opened and hydraulic fluid and air leaked past the ratchet valve Slight seepage of fluid was noted at the actuating cylinder rod end.

The ratchet valve was removed and connected to a hydraulic pressure source. The valve was then subjected to an internal leak test in accordance with the deHavilland maintenance manual. The valve failed the test which includes leakage past the internal ball seats and the piston "O" ring.

At the request of the NTSB investigator-in-charge (IIC), the ratchet valve was sent to the Transportation Safety Board of Canada's office in Richmond, British Columbia. The valve was examined at the overhaul facility of Viking Air Limited, Sidney, B.C., who is the authorized manufacturer and overhaul company for de Havilland Canada products. The testing of the ratchet valve was overseen by an inspector with the Canadian Safety Board on November 18, 1996. The valve subsequently passed the functional test, including internal leakage. The internal parts were within limits. Disassembly of the ratchet valve revealed dirty hydraulic fluid and small bits of rubber in the piston/shuttle valve area. Corrosion was noted on one end of the shuttle valve.

Pilot Information

Certificate:	Commercial	**Age:**	42,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:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	April 1, 1996
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5000 hours (Total, all aircraft), 1000 hours (Total, this make and model), 3000 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	de Havilland	**Registration:**	N67207
Model/Series:	U-6A U-6A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	305
Landing Gear Type:	Float	**Seats:**	8
Date/Type of Last Inspection:	September 5, 1996 100 hour	**Certified Max Gross Wt.:**	5100 lbs
Time Since Last Inspection:	75 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	10869 Hrs	**Engine Manufacturer:**	P&W
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	R-985
Registered Owner:	HARTLEY INC.	**Rated Power:**	450 Horsepower
Operator:	U.S. GOVT. DEPT OF INTERIOR	**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Unknown	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 2500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	20 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	70°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	4°C
Precipitation and Obscuration:	Light - None - Rain		
Departure Point:	BROOKS CAMP , AK	**Type of Flight Plan Filed:**	Company VFR
Destination:	(AKN)	**Type of Clearance:**	None
Departure Time:	10:15 Local	**Type of Airspace:**	Class G

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious, 2 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious, 2 Minor	**Latitude, Longitude:**	58.750846,-156.539077(est)

Administrative Information

Investigator In Charge (IIC):	Erickson, Scott
Additional Participating Persons:	MIKE BRICE; ANCHORAGE , AK DAVE BROADNAX; BOISE , ID GEORGE HARTLEY; KING SALMON , AK
Original Publish Date:	March 31, 1998
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=2924