



National Transportation Safety Board Aviation Accident Final Report

Location:	Stehekin, WA	Accident Number:	LAX08FA144
Date & Time:	05/17/2008, 1645 PDT	Registration:	N9558Q
Aircraft:	de Havilland DHC-2 MK I	Aircraft Damage:	Substantial
Defining Event:	Landing gear not configured	Injuries:	2 Fatal, 3 Minor
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

The amphibious-float-equipped airplane departed from a paved runway for the 40-nautical-mile flight to its destination, where a water landing on a lake was to be made. The pilot did not raise the landing gear after takeoff. During the flight, the air was bumpy and turbulent, and this resulted in the gear advisory system activating numerous times. The purpose of the system is to alert the pilot of the landing gear position--up for a water landing or down for a runway landing--when the airspeed decreased below a set threshold value. The pilot disabled the system by pulling its circuit breaker because the alerts were becoming a nuisance; he intended to reset the breaker during descent, but did not do so. Upon reaching the destination, the pilot set up a 150- to 200-foot-per-minute rate of descent for a glassy water landing on the lake. With the landing gear in the down position, the airplane contacted the water and abruptly nosed over. The airplane came to rest floating inverted, suspended by the floats. The pilot reported that the day of the accident was his nineteenth consecutive duty day, including office duty and flight duty. He stated that he feels the lack of days off during the previous 19 days was a contributing factor to this accident. When asked what would have prevented the accident, the pilot suggested consistency in using the checklist. On two flights earlier in the day he had used a written checklist; on the accident flight he did not.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to retract the landing gear wheels prior to performing a water landing. Contributing to the accident were the pilot's disabling of the landing gear warning/advisory system and possible fatigue due to his work schedule.

Findings

Aircraft	Gear position and warning - Not used/operated (Factor) Gear extension and retract sys - Not used/operated (Cause)
Personnel issues	Forgotten action/omission - Pilot (Cause) Fatigue due to work schedule - Pilot (Factor)

Factual Information

HISTORY OF FLIGHT

On May 17, 2008, about 1645 Pacific daylight time, a de Havilland DHC-2 MK I amphibious airplane, N9558Q, nosed over following a wheels down landing on the waters of Lake Chelan, near Stehekin, Washington. The airplane sustained substantial damage. The airline transport pilot and two passengers received minor injuries, and the other two passengers were killed. The airplane was registered to, and being operated by, Lake Chelan Air Service, Inc., doing business as Chelan Airways. Visual meteorological conditions prevailed for the on demand air taxi flight conducted under 14 Code of Federal Regulations Part 135. A company flight plan was filed for the flight that departed Lake Chelan Airport about 1615, with an intended destination of Stehekin.

The pilot reported that he performed a quick preflight and loaded the passenger's bags into the baggage compartment. He gave the passengers a safety briefing before boarding. The passengers had flown numerous times in the airplane with him, so he gave a "briefer briefing" than normal.

He taxied out to runway 20. He performed an engine run-up, set flaps and trim for takeoff, and announced on the Common Traffic Advisory Frequency (CTAF) that he was departing on runway 20. After a normal takeoff, he reduced throttle to 30 inches of manifold pressure (MAP), reduced the propeller to 2,000 rpm and raised the flaps. He does not remember raising the landing gear.

He continued down river before turning west instead of going through a cut in the hills that he routinely uses as he was concerned the air would be bumpy in the cut. Because the air was bumpy during this portion of the flight, the gear advisory aural and visual warning went off. He canceled it before the aural warning was complete. He turned over the city, leveled off at 2,000 feet, and set cruise power while confirming the flaps were up. The pilot recalled that as he progressed north up the lake, it was warm and bumpy, and at 2,000 feet, the outside air temperature (OAT) was 90 degrees. He commented to the passengers that it was a warm day.

The pilot further reported that the airplane never accelerated beyond 95 mph (82.5 knots). This did not seem unusual to him due to the warm day and the load. He conversed with the passengers about the snow melt and the fact that the lake was filling rapidly. During the portion of the flight through what is called the Straights of Lake Chelan, the air was bumpy and turbulent causing the gear advisory to be activated numerous times. Each time he canceled the warning before it completed the aural warning portion. At this time he pulled the Gear Advisory circuit breaker to prevent reoccurrence of the warning as it was becoming a nuisance because of the bumpy/turbulent air, which caused the airspeed to fluctuate. He mentally noted that during the descent he would reset the breaker. He does not recall resetting the breaker.

About halfway up the lake, he switched frequencies to 122.9, which is the designated frequency for that area. Around Lucerne, he noticed that the wind had died and the water was glassy. As he approached Stehekin, he announced his intentions. On his previous flight that morning, he had noted a lot of debris floating in the lake. The debris had now floated down the lake away from the village.

The pilot planned to land to the north-northeast heading toward Stehekin Resort. There was flat glassy water in the landing area. He slowed the airplane, brought the mixture and propeller

up, and lowered the flaps halfway between cruise and takeoff in preparation for a glassy water landing. He set up a 150 to 200 feet per minute rate of descent. He continued to slow the airplane and descend, and then there was water in the cockpit.

Several witnesses adjacent to the accident location observed the airplane conduct what appeared to them to be a normal approach to landing on Lake Chelan. As the airplane contacted the water, it abruptly nosed over. The airplane came to rest floating inverted suspended by the floats. The witnesses reported that they could see the landing gear wheels protruding from the floats.

Chelan County Sheriff's Department personnel reported that bystanders who witnessed the accident were able to access the airplane by boat within approximately 5 minutes. The pilot and two passengers had escaped from the cabin and were hanging onto the floats when the first boat reached the airplane. The bodies of the other two passengers were removed from the airplane about 15 to 20 minutes after the accident. Later in the day, local personnel recovered the airplane to a barge.

PERSONNEL INFORMATION

The pilot, age 62, held an airline transport pilot certificate with an airplane multiengine land rating, commercial privileges in single engine land and sea airplanes, and a type rating in the CE-500. He also held a flight engineer certificate and a flight instructor certificate with single and multiengine airplane and instrument airplane ratings. The pilot's most recent second-class medical certificate was issued on October 30, 2007, with the limitation: must have available glasses for near vision.

The pilot reported that he had accumulated 5,747 total flight hours, of which 2,136 and 3,611 hours were in single and multiengine airplanes, respectively. He had accumulated 637 hours flight time in the accident make and model of airplane. In the past 90 and 30 days, he had flown 69 and 30 hours, respectively, all in the accident airplane.

On March 17, 2008, the pilot successfully passed an Airman Competency/Proficiency Check (FAR 135.293 and 135.299), which was administered by a Federal Aviation Administration (FAA) operation's inspector and completed in the accident airplane.

According to the pilot's flight and duty time records, the accident date, May 17, 2008, was the pilot's second consecutive duty day. The pilot's duty day began at 0900 and the accident flight was the pilot's third flight of the day. He had worked each day from May 1 to 14 with a daily duty time of 10 hours, with the exception of May 12, when he had a duty time of 11 hours. During these 14 days, he had flight times ranging from 1.0 to 4.0 hours per day. The pilot had a day off on May 15 and then worked a 10-hour duty day on May 16 that included 2.0 hours flight time.

The pilot reported that the day of the accident was his nineteenth consecutive duty day, including office duty and flight duty. He stated that he feels the lack of days off during the previous 19 days was a contributing factor to this accident.

When asked what would have prevented the accident, the pilot stated consistency in using the checklist. On the two flights earlier in the day, he used a written checklist. On the accident flight he did not use a written checklist.

AIRCRAFT INFORMATION

The single engine, high-wing, amphibious float equipped airplane was manufactured in 1957. It was powered by a Pratt and Whitney R-985 radial engine and equipped with a three bladed Hartzell constant-speed propeller. Review of the maintenance records revealed that the most recent annual inspection was completed on March 14, 2008, at a tachometer time of 411.8 hours and an airframe total time of 12,069.9 hours. At the time of the annual inspection, the engine had accumulated 411.8 hours since major overhaul.

The time on the tachometer at the accident site was 479.36 hours.

The airplane was equipped with Wipline 6100 amphibious floats. A main landing gear and a nose landing gear were installed in each float. The gear system was hydraulically actuated and driven by two electric hydraulic pumps. The selection of gear up or gear down was accomplished with a cockpit mounted selector handle. Gear position indicator lights were located on a panel beside the selector handle. There were four blue indicator lights, one for each gear, which illuminated when the landing gear was retracted for a water landing. There were four green indicator lights, one for each gear, which illuminated when the landing gear was extended for a runway landing. Also, there were two red lights, one for each hydraulic pump, which are illuminated when the pumps were running, indicating the landing gear was in transit.

Additionally, the airplane was equipped with a Lake and Air Amphibian Landing Gear Position Advisory System. The system consisted of an air data computer and an annunciator light/pushbutton mounted on the instrument panel. It sensed landing gear position and airspeed and provided advisories to the pilot visually through the amber "GEAR ADVISORY" annunciator light and aurally through the airplane audio system. The system turned on automatically upon receiving normal electrical power. It could be disabled by pulling the circuit breaker labeled "Gear Adv."

The gear advisory system functioned as follows. During takeoff and climb, as the airspeed of the airplane increased through the threshold value, the system armed. As the airplane slowed for landing and the airspeed decreased through the threshold value, the annunciator light began blinking and one of the following messages was heard: GEAR IS UP FOR WATER LANDING, GEAR IS DOWN FOR RUNWAY LANDING, or CHECK GEAR. These advisories continued until the pilot canceled them by pressing the annunciator light.

METEOROLOGICAL INFORMATION

The pilot reported that the weather conditions were clear skies, visibility greater than 10 miles, and calm winds. He stated that it was a very warm day and noted that the airplane's OAT gauge read 92 degrees on the ground at Chelan Airport.

WRECKAGE AND IMPACT INFORMATION

Examination of the airplane by a National Transportation Safety Board investigator and an FAA inspector revealed that the airplane remained intact with the exception of the engine cowling, which was not recovered. The left wing remained attached to the airframe and was bent downwards about 30 degrees. The right wing remained attached to the airframe and was bent downwards about 20 degrees. The flaps were partially extended. The empennage remained attached and displayed no visible deformation. All control surfaces remained attached to their respective attachment points. The fuselage roof structure above the two forward seats was crushed and bent downwards. The left and right front windshields were fractured into multiple pieces and mostly separated.

The floats remained attached at all fittings with the exception of the aft right fitting. No punctures or damage was observed to the floats. The landing gear wheels were observed in the down and locked position, and the landing gear selector handle was found in the down position. The water rudders were found in the down (water) position, and the water rudder selector lever was found in the down position.

Flight control continuity was established from the control column and rudder pedals to the elevator, ailerons, and rudder. When the flap handle was actuated by hand, movement of the flaps was observed. The flap indicator showed the flaps positioned between the takeoff and cruise climb settings. Throttle, mixture and propeller pitch control continuity were established from the throttle quadrant to the engine. The circuit breakers labeled "Gear Adv" and "Yaw" were popped.

TESTS AND RESEARCH

On April 20, 2008, a gear retraction/extension test was performed under the supervision of the Safety Board investigator-in-charge. The airplane was placed on jacks, and the airplane's battery was replaced with a serviceable battery. The master switch was turned on, and the landing gear handle was placed in the UP position. All four landing gear wheels retracted. With the exception of the right nose wheel, the landing gear wheels locked in the up position and three of the blue position lights illuminated. It was noted that the right nose gear retraction mechanism had sustained impact damage, which prevented the up lock from functioning. The gear handle was placed in the DOWN position. All four landing gear wheels extended and locked in the down position; all four of the green position lights illuminated.

The air data computer from the gear position advisory system was sent to Shadin Avionics for a functional test. Shadin reported that the unit was received with a threshold switch setting of 5, which corresponds to a threshold speed of 75 knots. Testing showed that in all gear positions the unit gave the proper warnings (CHECK GEAR, GEAR IS UP FOR WATER LANDING, GEAR IS DOWN FOR RUNWAY LANDING) at approximately 73 knots.

SURVIVAL ASPECTS

The water temperature of the lake in the vicinity of the accident site was measured at 47 degrees F on July 18, 2008, about 1600.

The airplane was equipped with seven seats in three rows, two seats in the front row, three seats in the middle row, and two seats in the rear row. The pilot occupied the left front seat. A male passenger was seated in the right front seat. Two female passengers occupied the left and right seats in the middle row; the center seat in the middle row was empty. A female passenger occupied the left rear seat, and a box containing plants was placed on the right rear seat.

The pilot, the female passenger in the right middle seat, and the female passenger in the left rear seat survived the accident. The male passenger in the right front seat and the female passenger in the left middle seat were killed.

Each seat was equipped with a seat belt. Additionally, the two front seats were equipped with shoulder harnesses. The seat belts for the left and right seats were found unbuckled with their shoulder harnesses retracted into their respective inertia reels. In the middle row, the left seat belt was buckled and the webbing was cut, the middle seat belt was buckled, and the right seat belt was unbuckled. In the rear row, the left seat belt was unbuckled, and the right seat belt was buckled. Each seat was equipped with a personal flotation device (PFD) located in a pouch on

the front of the seat cushion. All seven PFDs were found secure within their storage pouches.

The airplane was equipped with four doors; two front doors providing access to the front seats and two main cabin doors providing access to the middle and rear rows of seats. Review of photos taken during recovery of the airplane from the lake showed the left front door closed and the left rear door approximately half open with its rear upper corner jammed against the bottom of the wing. The upper half of the right front door was bent outwards about 30 degrees and the door appeared to be jammed shut. The right rear door was slightly ajar.

The pilot reported that he initially thought he had landed too flat and the nose of the floats had dug into the water, so he pulled back on the yoke. The cockpit was full of water, and he was disoriented. He was floating in the cockpit, so he must have released his belt right away. He popped to the surface, probably going through the broken out windshield. He could see the left middle seat passenger still in the airplane. Her chin was above water and she said "seat belt, seat belt." He dove down to release her seat belt, but could not find the buckle. He later realized this was because she had twisted around and was facing backwards. The buckle was on her back side, not her front side.

He saw the left rear seat passenger come to the surface. He told her to help the trapped passenger, and that he needed to help the right front seat passenger. He went to the other side of the airplane. He found the knob to the right front door, but could not open it. The water was very cold. He never saw the right front seat passenger. He did see the right middle seat passenger pop to the surface. The fuselage settled further into the water. He switched sides again back to the trapped passenger. Boats began to arrive, and he yelled at them to "get a knife, get a knife." Eventually, the rescuers pulled him into one of the boats.

During interviews conducted by a Safety Board investigator and a law enforcement officer, the left rear seat passenger reported that the flight was uneventful until the landing on the lake. The airplane hit the water hard, and she saw the front of the cabin filling with water. She was able to unbuckle her seat belt, open one of the rear doors and exit the airplane. She surfaced and held onto one of the floats. Rescuers arrived within minutes and got her out of the water.

In a written statement, the right middle seat passenger reported that she felt a "strong, blunt jolt forward," and water immediately filled the airplane. She attempted to unbuckle her seat belt and open the right main cabin door, but was unable to do so. Then she felt her husband (the right front seat passenger) unbuckle her seat belt. She looked to her left, saw light, and went towards the light. She exited the left side of the airplane, surfaced and held onto one of the floats. She saw the left middle seat passenger still in the airplane with her face about 1 foot below the surface. Although she and the other surviving passenger attempted to free the trapped passenger, they were unable to find and release her seat belt buckle. Rescuers arrived in what "seemed like 10 minutes," and at that point, she realized her husband was not on the surface.

Approximately 15 to 20 minutes after the accident, a rescuer was able to free the trapped passenger by diving down to the left cabin door and cutting her seat belt. The rescuer then dove back into the water to free the right front seat passenger, who was floating inside the passenger compartment. Cardiopulmonary resuscitation was initiated immediately; however, these two passengers did not revive and were pronounced dead upon arrival at the hospital.

History of Flight

Initial climb	Landing gear not configured
Landing	Landing gear not configured (Defining event)
Landing-flare/touchdown	Nose over/nose down

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	Age:	62, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	No
Medical Certification:	Class 1 With Waivers/Limitations	Last FAA Medical Exam:	10/30/2007
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	03/17/2008
Flight Time:	5747 hours (Total, all aircraft), 637 hours (Total, this make and model), 4951 hours (Pilot In Command, all aircraft), 69 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	de Havilland	Registration:	N9558Q
Model/Series:	DHC-2 MK I	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	1151
Landing Gear Type:	Amphibian;	Seats:	7
Date/Type of Last Inspection:	03/14/2008, Annual	Certified Max Gross Wt.:	5370 lbs
Time Since Last Inspection:	68 Hours	Engines:	1 Reciprocating
Airframe Total Time:	12070 Hours as of last inspection	Engine Manufacturer:	Pratt & Whitney
ELT:	C126 installed, not activated	Engine Model/Series:	R-985
Registered Owner:	Lake Chelan Air Service, Inc.	Rated Power:	450 hp
Operator:	Lake Chelan Air Service, Inc.	Operating Certificate(s) Held:	On-demand Air Taxi (135)
Operator Does Business As:	Chelan Airways	Operator Designator Code:	LCCA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:		Distance from Accident Site:	
Observation Time:		Direction from Accident Site:	
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	33° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Chelan, WA (S10)	Type of Flight Plan Filed:	Company VFR
Destination:	Stehekin, WA	Type of Clearance:	None
Departure Time:	1615 PDT	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	1 Minor	Aircraft Damage:	Substantial
Passenger Injuries:	2 Fatal, 2 Minor	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal, 3 Minor	Latitude, Longitude:	48.305833, -120.660278

Administrative Information

Investigator In Charge (IIC):	Georgia R Struhsaker	Report Date:	05/06/2009
Additional Participating Persons:	John H Phillips; FAA FSDO; Spokane, WA		
Publish Date:	05/06/2009		
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](#).