Aviation Investigation Final Report

Location:	Kirkland, Washington	**Accident Number:**	SEA01LA031
Date & Time:	December 22, 2000, 10:45 Local	**Registration:**	N2502
Aircraft:	de Havilland DHC-2 Mk. I	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Ferry		

Analysis

The pilot reported that while in cruise flight at 1,800 feet, operating on the approximately 1/3 full center tank (note: the front tank was full and the rear tank was nearly empty), the aircraft's engine shut down. The pilot switched to the front tank and after about 10 to 15 seconds, the engine restarted. The engine ran smoothly for 15 to 20 seconds, then shut down again, with the fuel pressure reading zero. The pilot attempted to use the hand-operated wobble pump to restore fuel pressure, but was not successful. The pilot then performed a forced landing on what appeared to him to be the only suitable landing area, a high school football/baseball field. The pilot stated that he skidded across the wet field and hit a 10- to 12-foot-high chain link fence straight on at about 30 to 35 MPH. An FAA inspector reported that in a post-accident examination, anomalies with the fuel selector valve's operation were noted, namely, that "The selector valve was found to be able to aspirate to an empty tank in two different ways." The first condition was that "Using the wobble pump to create a suction in the supply-side line, slight inward pressure on the center of the valve would unseat the valve and the prime would be instantly lost. It would be impossible to recover unless the valve was allowed to resume its' [sic] original position." Second, the inspector reported that "With this particular valve it was possible to create enough suction in the selected off position, or in between position, to unseat the valve and cause aspiration to occur." The inspector stated that the condition was repeatable (to a lesser degree) with a newly overhauled valve.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A malfunction of the aircraft's fuel selector valve and subsequent fuel starvation. Factors included a short emergency landing area, a wet landing surface, and a fence.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: CRUISE

Findings
1. (C) FUEL SYSTEM,SELECTOR/VALVE - MALFUNCTION
2. (C) FLUID,FUEL - STARVATION

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Occurrence #3: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: EMERGENCY LANDING

Findings
3. (F) TERRAIN CONDITION - SHORT RUNWAY/LANDING AREA
4. (F) TERRAIN CONDITION - WET
5. (F) OBJECT - FENCE

Factual Information

On December 22, 2000, approximately 1045 Pacific standard time, a de Havilland DHC-2 Mk. I airplane, N2502, registered to the Dylan Bay Charter Company of Seattle, Washington, and being operated by a commercial pilot-in-command, experienced a loss of engine power at about 1,800 feet while on a 14 CFR 91 ferry flight from Everett, Washington, to Renton, Washington. The pilot subsequently made a forced landing onto a high school football field in Kirkland, Washington. During the forced landing, the aircraft impacted a chain-link fence. Neither the pilot nor a passenger aboard the aircraft were injured in the accident, but the aircraft sustained substantial damage. Visual meteorological conditions were reported by the pilot, and no flight plan was filed for the flight.

The accident flight was a return flight to the aircraft's home airport after being painted. The pilot, who reported his total time as 16,217 hours including 11,000 in make and model, reported that he drained the sumps on all three fuel tanks during preflight, and that the fuel gauges indicated full fuel in the front tank, 18 to 20 gallons in the center tank, and an empty rear tank (note: according to the FAA type certificate data sheet for the aircraft, the front and center fuel tanks have a capacity of 35 U.S. gallons each). The pilot stated that he took off with the fuel selector on the center tank, and that he was using carburetor heat to keep the carburetor air temperature gauge indicating above 0 degrees C. The pilot reported that a couple of minutes after passing abeam the Kenmore Air Harbor seaplane base, the aircraft's Pratt & Whitney R-985 engine shut down "smoothly and completely", stating that "It did not hesitate, stutter, backfire or miss in any way. It just shut down." The pilot reported that he switched to the front tank at this point, and that after about 10 to 15 seconds, "the motor re-started just as smooth as it shut down." The pilot stated that the engine ran smoothly for 15 to 20 seconds when it shut down again, "exactly like it had shortly before", with the fuel pressure gauge reading zero. The pilot stated that he attempted to use the hand-operated wobble pump to restore fuel pressure, but was not successful. The pilot then performed a forced landing on what appeared to him to be the only suitable landing area, the football/baseball field at Juanita High School. The pilot stated that he skidded across the wet field and hit a 10- to 12-foot-high chain link fence straight on at about 30 to 35 MPH.

On-site and follow-up examinations of the aircraft and its systems were conducted by inspectors from the FAA Seattle, Washington, Flight Standards District Office (FSDO). No findings were made during the on-scene examination to account for the loss of power. Follow-up examinations were subsequently conducted on January 2, 2001, January 24, 2001, and March 28, 2001. During the January follow-up examinations, the front fuel tank was found full, the center tank had approximately 12 gallons, and the aft tank had approximately 1/2 gallon. According to the inspector's report, the engine was successfully run during these examinations, including with the fuel remaining in the aft tank. The inspector reported that in an attempt to restart the engine after exhausting the fuel in the rear tank, the engine "gave

plenty of warning that it was about to run out of fuel", but when the selector was moved to the center tank and the wobble pump operated after the aft tank was empty, the restart attempt was unsuccessful. It was subsequently found that with the aircraft blocked up in the normal flight attitude and the engine not running, 21 strokes of the wobble pump were required before pressure would build up in the main fuel system. This was true for each tank position. The inspector reported that this was considered an excessive number of strokes required to prime the main fuel system.

An FAA inspector reported that in the March 28, 2001 follow-up session, anomalies with the fuel selector valve's operation were noted during examination of a mockup setup of the fuel selector valve (Thompson Products part number TC-17400). Specifically, the FAA inspector reported that "The selector valve was found to be able to aspirate to an empty tank in two different ways." He described the first anomalous condition as follows: "Using the wobble pump to create a suction in the supply-side line, slight inward pressure on the center of the valve would unseat the valve and the prime would be instantly lost. It would be impossible to recover unless the valve was allowed to resume its' [sic] original position." The inspector believed that the inward pressure came from the cable drive capstan, and the selector cables acting against two small aluminum cable guides, "like a jackscrew moving, slightly, but enough, to move the selector valve center shaft." Second, the inspector reported that "With this particular valve it was possible to create enough suction in the selected off position, or in between position, to unseat the valve and cause aspiration to occur." The inspector stated that the condition was repeatable (to a lesser degree) with a newly overhauled valve that was set up in the mockup.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	41,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	May 17, 2000
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	January 25, 2000
Flight Time:	16217 hours (Total, all aircraft), 11000 hours (Total, this make and model), 16000 hours (Pilot In Command, all aircraft), 110 hours (Last 90 days, all aircraft), 38 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	de Havilland	**Registration:**	N2502
Model/Series:	DHC-2 Mk. I	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	522
Landing Gear Type:	Tailwheel	**Seats:**	8
Date/Type of Last Inspection:	December 4, 2000 Annual	**Certified Max Gross Wt.:**	5090 lbs
Time Since Last Inspection:	2 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	10166 Hrs at time of accident	**Engine Manufacturer:**	P&W
ELT:	Installed, not activated	**Engine Model/Series:**	R-985
Registered Owner:	On file	**Rated Power:**	450 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

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:		**Visibility**	15 miles
Lowest Ceiling:	Overcast / 3000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	135°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	7°C
Precipitation and Obscuration:			
Departure Point:	Everett, WA (PAE)	**Type of Flight Plan Filed:**	None
Destination:	Renton, WA (RNT)	**Type of Clearance:**	None
Departure Time:	10:30 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	47.718334,-122.198333

Administrative Information

Investigator In Charge (IIC):	Nesemeier, Gregg
Additional Participating Persons:	James M Erwin; FAA - SEA FSDO; Renton, WA
Original Publish Date:	September 6, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=50826