Aviation Investigation Final Report

Location:	Skokomish, Washington	**Accident Number:**	WPR10FA223
Date & Time:	October 10, 2009, 17:00 Local	**Registration:**	N44362
Aircraft:	Taylorcraft BC12-D1	**Aircraft Damage:**	Substantial
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

After refueling his airplane in the early afternoon, the pilot departed to a destination unknown to anyone else. When he did not return, he was reported missing and a search ensued for the airplane. About seven months later, the airplane's wreckage was discovered in thick underbrush on a ridge of densely forested hilly terrain. The airplane's left wing had impacted two conifer trees near their tops, resulting in the outboard four feet of the wing separating at that location. The airplane had traveled another 115 feet through the forest, with its wings impacting several other trees, before coming to rest inverted in the underbrush. Examination of the propeller blades and observation of cleanly cut tree sections along the wreckage path revealed evidence of engine rotation at the point of initial impact. A full engine teardown inspection did not reveal any evidence of anomalies that would have existed at the time of the accident and that would have kept the engine from developing full rated horsepower.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain clearance from trees while flying over hilly, forested terrain.

Findings

Environmental issues	Mountainous/hilly terrain - Contributed to outcome
Environmental issues	Tree(s) - Contributed to outcome
Aircraft	Altitude - Not attained/maintained
Personnel issues	(general) - Pilot

Factual Information

History of Flight

Enroute-cruise	Controlled flight into terr/obj (CFIT) (Defining event)

HISTORY OF FLIGHT

On October 10, 2009, about 1300 Pacific daylight time, a Taylorcraft BC12-D1, N44362, departed Harvey Field, Snohomish, Washington, for an undetermined location. When the Sport Pilot failed to return that evening to participate in a planned family activity that was supposed to take place about 1830, he was reported overdue/missing. The Washington State Department of Transportation Search and Rescue Unit then organized a search effort that lasted about 10 days. As of the termination of that search, neither the airplane nor the pilot had been found. Almost seven months later, on April 30, 2010, two individuals picking Salal on the densely forested lands of the Skokomish Tribal Reservation came across the substantially damaged wreckage of the airplane and the remains of the pilot. The crash site was located about 1.3 miles northwest of Skokomish, Washington. The airplane was registered to the pilot, and was being operated under Title 14 Code of Federal Regulations Part 91. On the day of the flight, visual meteorological conditions prevailed throughout the region. No flight plan had been filed, and the pilot did not tell anyone what his planned destination was. The airplane did not have an emergency locator transmitter (ELT) on board.

Initially the search for the airplane was focused in the area around Snohomish, Arlington, and Darrington, Washington, because individuals who knew the pilot well believed he had been limiting his flying to that general area while accumulating hours on a used engine that had recently been installed in his airplane. About four days after the beginning of the search effort, there was a report from an individual in Westport, Washington, stating that he believed he had talked with the pilot of N44362 at Westport Airport (14S) on the afternoon of October 10, 2009. That individual said that he watched a Taylorcraft land at Westport, and then after the pilot taxied to parking, he and that pilot chatted for about 30 minutes (mostly about home-built airplanes). Reportedly, the pilot had introduced himself by name, and during the conversation mentioned that he was going to walk into town (about one mile) to meet up with the pilot of another airplane that was already parked on the Westport Airport ramp. Although this witness did not talk with the pilot of N44362 again, he did notice the Taylorcraft take off between 1600 and 1700 and head northwest toward Hoquiam, Washington.

Based on that information, Search and Rescue personnel sought recorded radar coverage information for the area between Harvey Field and Westport, Washington, and switched their search to the area along the route between those two locations. The search effort was eventually terminated when no sign of the airplane or pilot was found. Later, after the airplane was located by the Salal pickers, it was determined that the crash site was about 1.5 miles

southeast of a direct line between Westport, Washington (where the witness believed he talked with the subject pilot) and Snohomish, Washington (the airplane's home airfield).

PERSONNEL INFORMATION

The 51 year old Sport Pilot, who was rated for single engine land airplanes, did not possess a Federal Aviation Administration (FAA) airman's medical, nor was he required to do so to exercise the privileges of his Sport Pilot certificate. After a review of his pilot log, which had no entries after August 23, 2009, and a discussion with individuals who were familiar with the pilot's flight activities after the engine installation, the NTSB Investigator-In-charge (IIC) estimated that the pilot had accumulated about 180 hours of total flight time, with about 140 hours of that time being in the same make and model as the accident airplane.

AIRCRAFT INFORMATION

The airplane was a fixed-wing single engine 1946 Taylorcraft BC12-D1 (serial number 10162). Its last annual inspection was signed off on October 4, 2009. It was being operated as a Light Sport Aircraft (LSA), and did not have an electrical system, a transponder, or an ELT. Neither the electrical system nor the transponder were required, but Federal Aviation Regulation (FAR) 91.207 requires a two seat LSA to have onboard an emergency locater transmitter (ELT) that meets Technical Standard Order (TSO) C-91/C-91a.

The airplane's engine was a Continental Motors model A65-8 rated at 65 brake horsepower. It had been removed from another airplane on December 7, 2008 (for an engine upgrade to 75 horsepower), and was installed on N44362 on October 4, 2009. The engine replacement was performed in lieu of overhauling the airplane's old engine because the owner had been informed that the overhaul would probably cost substantially more. Its standard fuel system included a 12 gallon fuselage tank and a 6 gallon auxiliary tank in the right wing (17 usable gallons). Refueling records show that about 1255 on the day of the accident, the pilot put 12.05 gallons of 100LL aviation fuel into the aircraft's fuel system from a self-serve fuel pump. The total amount of fuel onboard after the refueling was not able to be determined.

METEOROLOGICAL INFORMATION

The 1653 recorded surface aviation weather report (METAR) for Hoquiam, Washington, which is located about 43 miles southwest of the accident site, indicated winds at 030 degrees at 8 knots; 10 statute miles visibility; few clouds at 7,000 feet; a temperature of 15 degrees Celsius; a dew point of 02 degrees Celsius, and an altimeter setting of 30.03 inches of mercury.

The 1653 METAR for Shelton, Washington, which is located about 7 miles southeast of the accident site, indicated winds from 060 degrees at 03 knots; 10 statute miles visibility; an overcast ceiling at 7,500 feet; a temperature of 13 degrees Celsius; a dew point of minus 02 degrees Celsius; and an altimeter setting of 30.04 inches of Mercury.

The 1655 METAR for Bremerton, Washington, which is located about 22 miles northeast of the accident site, indicated winds from 030 degrees at 04 knots, 10 statute miles visibility; scattered clouds at 6,500 feet; an overcast ceiling at 8,000 feet, a temperature of 12 degrees Celsius; a dew point of minus 02 degrees Celsius; and an altimeter setting of 30.09 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The wreckage site was located in a dense coniferous forest, near the top of a nearly flat north/south running ridge, about one and one-half miles west of Skokomish, Washington. The altitude of the accident site was 560 feet above sea level, and the terrain along most of the top of the ridge was between 560 feet and 580 feet above sea level.

The airplane's entire structure, except for the outboard four feet of the left wing, was located at 47 degrees, 20.405 minutes North; 123 degrees, 11.057 minutes West. The left wing outboard section was about 115 feet south of the primary wreckage, and about 30 feet north of two trees, both about 80 feet tall, which had been broken off near their tops. There were about eight other trees of smaller diameter that had been snapped off at various heights along the path from the remains of the left wing tip to the main wreckage. During the wreckage recovery operation, two cleanly severed tree trunks, both about eight inches in diameter, were found along the impact path. Both trunks had smooth straight clean cuts at the location where they had been severed, and the face of the cuts contained evidence of silver-gray discoloration/staining (see photo # 13). One was located about half way between the point where the airplane first came in contact with the trees and the location of the primary wreckage. The other was found about 10 feet down-track from the primary wreckage.

The fuselage came to rest inverted in the dense underbrush below the forest canopy, with both wings and their associated lift struts folded almost straight back along the sides of the fuselage. The damage to both wings was consistent with their structure impacting numerous trees, as each was severely torn, crushed, and twisted, and the wood wing spars had been fractured in multiple locations. The severed outboard portion of the left wing was found in three distinct separate pieces. The first was the outboard one-half of the aileron, which had been crushed slightly, but retained its basic form. The second was the wingtip, which had been crushed aft about 10 inches, but still retained its basic form. The third was the wing structure itself, which had been crushed, torn, and splintered to a point where it maintained none of its basic form.

Except for significant oxidation and rusting of the ferrous parts due to exposure to the elements, the majority of the fuselage structure was only slightly damaged. The only significant damage to the fuselage was some bending of the tubing across the top of cabin area and a bend of about 20 degrees in the fuselage longerons just forward of the empennage. The empennage itself was undamaged. Rudder, elevator, and elevator trim control continuity and correct movement direction was established from the cockpit to the empennage flight controls. Aileron cable continuity was able to be established between the cockpit and the

ailerons, but no movement test could be performed due to the extensive damage to the structure of both wings. The auxiliary fuel tank, which no longer contained fuel, had been torn from the wing and was ruptured. The auxiliary fuel valve was found in the off position, and the main fuel selector was found in the on position. The throttle was about an inch and a half aft of maximum power, and the throttle knob shaft was bent upward at the location of the knob locking nut. The primer was fully in and locked, and the ignition key, which was bent sharply over to the right about 45 degrees, was in the left magneto position.

The engine was still attached to its mounts, with the crankcase intact, and all four cylinders still attached. The number three (right front) cylinder head suffered impact damage, to include separation of the intake manifold and the rocker cover. The carburetor was still attached to the bottom of the crankcase, and was undamaged. Both magnetos had broken away from the accessory section, but they were still connected to all of the spark plug harness leads. Both blades of the metal propeller, which was still attached to the crankshaft, were lying horizontally on top of the soft terrain. Neither blade of the propeller had cut or sliced into the terrain, and there were no leading edge indentations or scratching that would have been consistent with the propeller rotating at the time it came in contact with the terrain. The outboard eight inches of the tips of both the propeller blades had been significantly deformed. One of the blade tips, which showed burnishing of its paint to a point between one-quarter to one-half inch aft of its leading edge, was compressed slightly inward and bent back sharply at an angle of about 40 degrees. The inboard portion of the other blade tip was folded back about 45 degrees, and then slightly further outboard was curved tightly forward about 180 degrees, with the most outboard two inches being bent sharply aft about 45 degrees (see photo # 8). This blade tip showed significant burnishing through its black paint and chromate primer, exposing the bare aluminum surface of the propeller face to a point just over two inches aft of the leading edge.

After the on-site inspection, the airplane was recovered to the facilities of AvTech Aviation Services, in Maple Valley, Washington, for further examination. Once at that location, the IIC performed a full inspection teardown of the engine and its accessories. The inspection included a drive train continuity check, removal and inspection of all eight spark plugs, removal of all four cylinders and their respective pistons, removal of the accessory section, separation of the crankcase halves, and removal and inspection of the crankshaft, cam shaft, and connecting rods. In addition, the oil filter screen was removed and inspected, the carburetor was disassembled and inspected, and the magnetos were rotated by hand to check for the production of spark at each spark plug lead attach point. The teardown inspection revealed no evidence of oil contamination or lack of lubrication, and there was no unusual wear or particulate buildup on the spark plug electrodes. Except for the failure of the left magneto to produce spark, no evidence of any anomalies or malfunctions that would have kept the engine from producing full rated horsepower was observed.

Because of the failure of the left magneto to produce spark, after the engine teardown inspection, the IIC took the left magneto to the facilities of Aircraft Magneto Service, in Bainbridge Island, Washington. There the magneto was disassembled and inspected. The only

anomaly identified was an abnormal amount of oxidation on the magneto points, which the technician identified as most likely being created by the exposure of the impact-separated magnetos to the rain and ambient elements present at the accident site during the seven months the wreckage remained undetected. After lightly cleaning the excess oxidation off the points, the technician reassembled the magneto and connected it to the test bench. During the ensuing test, the magneto produced strong bright spark on all test leads through the full range of its normal operating speed.

MEDICAL AND PATHLOGICAL INFORMATION

A forensic pathologist performed an autopsy under the direction of the Mason County Coroner, and the cause of death was determined to be, "Multiple blunt force injuries to the torso and right lower extremity." The manner of death was classified as accidental.

Due to the elapsed time between the crash and the discovery of the wreckage, no reliable specimens were available for the forensic toxicology examination normally conducted by the Federal Aviation Administration's Civil Aero-medical Institute (CAMI).

ADDITIONAL DATA AND INFORMATION

As part of the investigation, the IIC overlaid a straight line direct route between Westport, Washington, and Snohomish, Washington, on a satellite image of the area between Puget Sound and the Pacific Ocean (see Satellite view of direct route between Westport and Snohomish). That overlay determined that the direct line distance between those two locations was 117 statute miles, and that the accident site was just short of the halfway point on a Westport to Snohomish flight.

In addition, based upon information provided by the Boeing Museum of Flight website, it was determined that a 1946 Taylorcraft BC12-D1, equipped with an approved metal propeller and a Continental A65-8 engine, would normally cruise between 90 and 95 miles per hour and burn between four and one-half and five gallons of fuel per hour. Based on those figures, a direct line flight between Snohomish and Westport would take between 1.2 and 1.3 hours, and consumed between 5.4 and 6.5 gallons of fuel. Assuming the higher of the two fuel consumption rates and the slower of the two speeds, a flight from Snohomish to Westport, and then halfway back to Snohomish would consume about 9.8 gallons.

As part of the investigation, the IIC used the data provided by the United States Naval Oceanography Portal to determine that the official sunset for the day of the accident was 1830, which was 1.5 to 2.5 hours after the witness saw the Taylorcraft depart the airport at Westport.

Pilot Information

Certificate:	Sport Pilot	**Age:**	51,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Sport pilot None	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 180 hours (Total, all aircraft), 140 hours (Total, this make and model), 20 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Taylorcraft	**Registration:**	N44362
Model/Series:	BC12-D1	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	10162
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	October 4, 2009 Annual	**Certified Max Gross Wt.:**	1200 lbs
Time Since Last Inspection:	15 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4515 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	Not installed	**Engine Model/Series:**	A&C65 SERIES
Registered Owner:	Gordon R. Last	**Rated Power:**	65 Horsepower
Operator:	Gordon R. Last	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSHN	**Distance from Accident Site:**	
Observation Time:	16:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 8000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	13°C / -2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Westport, WA (14S)	**Type of Flight Plan Filed:**	None
Destination:	Snohomish, WA (S43)	**Type of Clearance:**	None
Departure Time:	16:30 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:**	47.34,-123.184448

Administrative Information

Investigator In Charge (IIC):	Anderson, Orrin
Additional Participating Persons:	Ronnie Faulkner; Federal Aviation Administration; Renton, WA
Original Publish Date:	May 5, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=74933