Aviation Investigation Final Report

Location:	Taholah, Washington	**Accident Number:**	SEA03LA058
Date & Time:	April 7, 2003, 09:05 Local	**Registration:**	N5225C
Aircraft:	Hughes 369D	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Minor
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The pilot of the Hughes 369D helicopter had been engaged in logging operations for about an hour when the engine flamed out, and he executed a hard landing to a nearby road. Post-crash examination found no fuel within the fuel tank, and the fuel quantity sending float entangled in the unsecured start pump wiring preventing the float from registering anything less than about 120 pounds of fuel (about 60 pounds above the Low Fuel Warning light activation setting). The helicopter had undergone a 100-hour inspection just before the accident flight during which the fuel quantity sending unit had been replaced. The maintenance manual contained procedures including a caution to secure the start pump wiring to prevent entanglement with the float, but this caution was addressed only in the start pump replacement procedure of the manual and not included in the fuel quantity sending unit replacement procedures.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The entanglement of the fuel quantity sender float in the start pump wiring within the fuel tank as a result of the wiring not being properly secured. This rendered the fuel gauge inaccurate and the low fuel warning light inoperative which led to fuel exhaustion. The improper securing of the wiring was a result of unspecified maintenance personnel not identifying the unsecured condition. Contributing factors were the lack of adequate guidance in the maintenance manuals on inspection of the wiring and the low rotor RPM during the autorotation resulting in a hard landing.

Findings

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

Findings
1. (C) FUEL SYSTEM,FUEL QUANTITY FLOAT/SENSOR - ENTANGLED
2. (C) ELECTRICAL SYSTEM,ELECTRIC WIRING - NOT SECURED
3. (C) MAINTENANCE,INSPECTION - INADEQUATE - COMPANY MAINTENANCE PERSONNEL
4. (F) FACILITY,INADEQUATE MANUALS/DIRECTIVES - MANUFACTURER
5. (C) ENGINE INSTRUMENTS,FUEL QUANTITY GAGE - UNRELIABLE
6. (C) FUEL SYSTEM,LOW FUEL WARNING LIGHT - NOT OPERATING
7. (C) FLUID,FUEL - EXHAUSTION

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

Occurrence #3: HARD LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
8. (F) ROTOR RPM - INADEQUATE

Factual Information

On April 7, 2003, approximately 0905 Pacific daylight time, a Hughes 369D helicopter, N5225C, registered to/operated by Olympic Air, Inc., and being flown by a commercial pilot, sustained substantial damage during a hard landing following a total loss of power while engaged in log-slinging operations approximately six nautical miles north of Tahola, Washington. The pilot was uninjured. Variable meteorological conditions existed at the accident site and a company VFR flight plan was in effect. The flight was operated under 14 CFR 133, and had originated from Central Park, Washington, approximately one hour previous to the accident.

The helicopter had just undergone a 100-hour inspection on April 4, 2003, at an aircraft total time of 11,325.3 hours. It was then flown on a check flight and subsequently ferried from Aberdeen, Washington, to the vicinity of the accident site. At the site, it was flown through 10 log slinging cycles. The pilot reported that at the conclusion of the 10th cycle the engine flamed out and then immediately restarted. He then aborted the mission and initiated a return to the staging site, which he missed "...in the rain and excitement...." The engine then quit again and the pilot executed an autorotation landing to a dirt road. The landing was hard and the left skid collapsed during the touchdown (refer to photograph 1). The pilot also reported approximately 120 pounds of fuel aboard at the time according to the helicopter's fuel gauge.

Post-crash examination revealed no fuel within the fuel cell. Additionally, the fuel quantity indicator sending unit (float and arm) within the fuel tank was observed entangled in the electrical power supply lines to the fuel start pump (refer to graphic image I). The fuel quantity indicator sending unit was found to be restricted such that the float and arm provided an erroneous fuel quantity reading, which bottomed out around 100-120 pounds and no lower. The low fuel warning annunciator light was triggered by the unit's reaching approximately 60 pounds of fuel remaining.

The maintenance manual for the Hughes 369D helicopter contained procedures for securing the electrical power supply lines to the fuel line to prevent interference with the fuel quantity indicator sending unit (refer to ATTACHMENT MM-I). The procedure also contained a caution as follows:

CAUTION

"Ensure start pump wire lead is wrapped around or tie-wrapped to fuel supply hose so that there is no possibility of its interfering with fuel quantity transmitter float mechanism." (Refer to ATTACHMENT MM-I).

This caution was specifically related to the "Start Pump Installation" procedure found in the "Fuel System" section of the Boeing Company MD-369D maintenance manual. There was no corresponding caution or reference in the "Fuel Quantity Transmitter Replacement" section of

the procedure in the "Fuel System" section of the Boeing Company MD-369D maintenance manual.

A review of the helicopter's airframe records dating back to 1996, revealed no documentation of maintenance, repair or replacement of the fuel system start pump.

According to the airframe log the "fuel sender" (i.e., fuel quantity transmitter) was removed and replaced due to erratic fuel readings. This was accomplished at the 100-hour inspection completed immediately prior to the loss of power (refer to ATTACHMENT AL-I).

The maintenance manual for the Hughes 369D helicopter also specified procedures for the inspection of the fuel system (refer to ATTACHMENT MM-II). The only reference related to the start pump electrical lines was noted on the first page under "Fuel System General Inspection." Specifically, item (5) read:

> "If start pump wire is ty-rapped [sic] to start pump line,
> inspect security and condition of ty-raps [sic]."
> (Refer to ATTACHMENT MM-II).

Section (5) provided no guidance in the event that the start pump wires were found unsecured.

Additionally, the only reference relating to the fuel system found within the "Continued Airworthiness Inspection" section of the Boeing Company Maintenance Manual for the Hughes 369D helicopter was noted in the "Yearly (Annual) Inspection Checklist." The last annual inspection conducted on N5225C was documented in the airframe log as occurring on February 24, 2003, at an aircraft total time of 11,227.6 hours.

Pilot Information

Certificate:	Commercial	**Age:**	57,Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	December 23, 2002
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 4, 2003
Flight Time:	11500 hours (Total, all aircraft), 11500 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Hughes	**Registration:**	N5225C
Model/Series:	369D	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	590497D
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	April 4, 2003 Annual	**Certified Max Gross Wt.:**	3550 lbs
Time Since Last Inspection:	1 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	11325 Hrs at time of accident	**Engine Manufacturer:**	Allison
ELT:	Installed, not activated	**Engine Model/Series:**	250-C20B
Registered Owner:	Olympic Air, Inc.	**Rated Power:**	420 Horsepower
Operator:		**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	GILL

Meteorological Information and Flight Plan

Conditions at Accident Site:		**Condition of Light:**	Day
Observation Facility, Elevation:	HQM,14 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	08:53 Local	**Direction from Accident Site:**	344°
Lowest Cloud Condition:		**Visibility**	3 miles
Lowest Ceiling:	Overcast / 1700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	11 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	8°C / 7°C
Precipitation and Obscuration:	N/A - None - Fog		
Departure Point:	Central Park, WA	**Type of Flight Plan Filed:**	Company VFR
Destination:	Taholah, WA	**Type of Clearance:**	None
Departure Time:	08:00 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	47.452777,-124.27639

Administrative Information

Investigator In Charge (IIC):	McCreary, Steven
Additional Participating Persons:	Kevin McKee; FAA FSDO; Renton, WA
Original Publish Date:	March 2, 2004
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=56768