Aviation Investigation Final Report

Location:	Goshen, Oregon	**Accident Number:**	SEA02LA073
Date & Time:	April 22, 2002, 11:30 Local	**Registration:**	N3004T
Aircraft:	Hiller UH-12E	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	3 None
Flight Conducted Under:	Part 91: General aviation - Aerial observation		

Analysis

While in cruise flight the engine experienced a total loss of power in the Hiller UH-12E rotorcraft. In an attempt to avoid a water landing he maneuvered over trees and then ran out of rotor RPM landing hard. Post crash examination revealed that the left hand exhaust stack tube inside the cylindrical stainless steel heat muffler was cracked and separated circumferentially in the vicinity of an old weld. The left side muffler was dedicated exclusively to providing engine heated air for carburetor heat application. The exhaust stack tube was observed to be thin and heat distorted and the circumferential split was noted to be in the vicinity of an old weld. The split in the tube allowed hot engine exhaust to duct directly to the carburetor via the carburetor heat plenum. Additionally, the carburetor heat valve within the plenum to the carburetor was found to be out of rig such that when carburetor heat was fully de-selected in the cockpit (FULL COLD), engine heated air was still partially flowing to the carburetor intake. A 100-hour inspection had been completed and signed off by company maintenance personnel 19.8 hours previous to the accident. Appendix D to Part 43 of the Federal Aviation Regulations requires each person performing an annual or 100-hours inspection to inspect (where applicable) components of the engine and nacelle group including exhaust stacks - for cracks, defects, and improper attachment.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of company maintenance personnel to identify and replace/repair the degraded exhaust stack. Contributing factors were the mis-rigged carburetor heat control and the pilot's failure to maintain appropriate rotor RPM. Additional contributing factors were trees and water.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CRUISE

Findings
1. (C) EXHAUST SYSTEM,STACK - CRACKED
2. (C) MAINTENANCE,100-HOUR INSPECTION - INADEQUATE - COMPANY MAINTENANCE PERSONNEL
3. EXHAUST SYSTEM,STACK - SEPARATION
4. (F) CARBURETOR HEAT CONTROL,LINKAGE - OTHER

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

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

Findings
5. (F) OBJECT - TREE(S)
6. (F) TERRAIN CONDITION - WATER
7. (F) ROTOR RPM - NOT MAINTAINED - PILOT IN COMMAND

Factual Information

HISTORY OF FLIGHT

On April 22, 2002, approximately 1130 Pacific daylight time, a Hiller UH-12E, N3004T, registered to and being flown by a commercial pilot, and being operated by Sundance Helicopters, Inc., sustained substantial damage during a hard autorotation landing following a total loss of power while in cruise near Goshen, Oregon. The pilot and two accompanying passengers were uninjured. Visual meteorological conditions prevailed and a company flight plan was in effect. The flight, which was engaged in a migratory waterfowl count, was operated under 14CFR91, and had originated from Eugene, Oregon, approximately 1030.

The pilot reported that while flying along the Middle Fork of the Willamette River at an elevation of 100 feet above ground the engine coughed once followed by a return of power and then a complete loss of power. The pilot reported that in order to avoid a water landing he had to maneuver over trees approximately 50 feet in height, and that he had insufficient rotor RPM to complete the autorotation. The helicopter landed hard breaking the skids and damaging the tail boom (refer to photograph 1).

PERSONNEL INFORMATION

The pilot held a commercial pilot license with a helicopter rating and all of his reported 4,000 hours of flight experience was acquired in rotorcraft equipment. He also reported 3,500 hours in the Hiller UH-12 helicopter.

AIRCRAFT INFORMATION

The Operator reported that the helicopter had undergone a 100-hour inspection on April 10, 2002, at a total time of 4095.0 hours (Hobbs time of 640.0 hours). The 100-hour engine inspection was documented within the rotorcraft's engine log (refer to Attachment JPG-I). The Hobbs reading at the accident site was 659.8 hours.

Appendix D to Part 43 of the Federal Aviation Regulations states in part:

(d) Each person performing an annual or 100-hours inspection shall inspect (where applicable) components of the engine and nacelle group as follows:
(8) Exhaust stacks - for cracks, defects, and improper attachment.
(refer to Attachment APP-D).

METEOROLOGICAL INFORMATION

The aviation surface weather observation for the Eugene airport, taken at 1127 on the morning of the accident reported variable winds of three knots, an overcast at 1,500 feet, temperature/dew point of 10 and 7 degrees Centigrade respectively and 10 miles visibility. The Eugene airport bears 280 degrees and is 10 nautical miles distant from the accident site.

TESTS AND RESEARCH

A test run of the helicopter's engine at the Operator's facilities following the accident with oversight by personnel from the Federal Aviation Administration's Boise Flight Standards District Office determined that the engine would run but could not sustain power.

Fuel samples from the helicopter's dual carburetor, fuel pump and fuel tank as well as two different samples taken from the Operator's fueling truck were hand delivered to the Department of the Air Force's Aerospace Fuels Laboratory, Mukilteo, Washington, for testing and examination. No detectable contaminant was found in any of the samples with the additional finding of a fine yellow particulate in the pump and carburetor samples, which was reported as most likely lead monoxide (refer to Attachment AFL-I through V).

The dual carburetor was taken to the facilities of Precision Air Motive, Everett, Washington, where it was examined and flow checked. Although running slightly rich, the tests revealed no malfunction and satisfactory operation with either carburetor unit (refer to Attachment PAM-I).

The dual carburetor unit was returned to the Operator and re-installed in the accident helicopter. A mechanic from Pendleton Aircraft Service was contracted to test the helicopter's engine and fuel system with oversight by personnel from the Federal Aviation Administration's Boise Flight Standards District Office and the participancy of Lycoming (refer to Attachments PAS-I and LYC-I). The test revealed that the left hand exhaust stack tube inside the cylindrical stainless steel heat muffler was cracked and separated circumferentially (refer to Attachments JPG-II, III, and IV). The left side muffler was dedicated exclusively to providing engine heated air for carburetor heat application (the right muffler exclusively providing cabin heat). When the scat tubing was disconnected from the muffler outflow (allowing engine intake air to bypass the carburetor heat source) the engine ran without problem.

The exhaust stack tube was observed to be thin and heat distorted and the circumferential split was noted to be in the vicinity of an old weld (refer to Attachment JPG-V). The exhaust tube was also noted to have shifted aft several inches at the rear face of the muffler.

Additionally, the carburetor heat valve within the plenum to the carburetor was found to be out of rig such that when carburetor heat was fully de-selected in the cockpit (FULL COLD), engine heated air was still partially flowing to the carburetor intake (refer to Attachment JPG-VI).

Pilot Information

Certificate:	Commercial	**Age:**	48,Male
Airplane Rating(s):	None	**Seat Occupied:**	Center
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 19, 2001
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 18, 2001
Flight Time:	4000 hours (Total, all aircraft), 3500 hours (Total, this make and model), 4000 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Hiller	**Registration:**	N3004T
Model/Series:	UH-12E	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	5012
Landing Gear Type:	Skid	**Seats:**	3
Date/Type of Last Inspection:	April 10, 2002 100 hour	**Certified Max Gross Wt.:**	3150 lbs
Time Since Last Inspection:	19.8 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4114.8 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	VO-540-C2A
Registered Owner:	Stevenson, Philip R.	**Rated Power:**	305 Horsepower
Operator:	Sundance Helicopters, Inc.	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	SD7A

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	EUG	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	11:27 Local	**Direction from Accident Site:**	280°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 1500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.27 inches Hg	**Temperature/Dew Point:**	10°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Eugene, OR (EUG)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Creswell, OR (77S)	**Type of Clearance:**	None
Departure Time:	10:00 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	44.016666,-123.021667

Administrative Information

Investigator In Charge (IIC):	McCreary, Steven
Additional Participating Persons:	Kieth Crimin; FAA FSDO; Hillsboro, OR Jeffrey Poschwatta; Lycoming; Kent, WA
Original Publish Date:	April 23, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=54588