		NTSB ID: SEA00LA170		Aircraft Registration Number: N570CA	
		Occurrence Date: 08/25/2000		Most Critical Injury: None	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place COOLIN		State ID	Zip Code 83821	Local Time 1430	Time Zone PDT
Airport Proximity: On Airport/Airstrip		Distance From Landing Facility:			
Aircraft Information Summary					
Aircraft Manufacturer Hughes		Model/Series 369E /369E		Type of Aircraft Helicopter	
Revenue Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
<p>Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:</p> <p>*** Note: NTSB investigators may have traveled in support of this investigation and used data provided by various sources to prepare this aircraft accident report. ***</p> <p>On August 25, 2000, at 1430 Pacific daylight time, a McDonnell Douglas Helicopter (Hughes) 369E, N570CA, registered to and operated by Silverhawk Aviation as a 14 CFR Part 135 contract flight for the Idaho Department of Lands in support of fire suppression and administrative flights, experienced a loss of engine power shortly after takeoff from Cavanaugh Bay airstrip, Coolin, Idaho. The pilot initiated an emergency running landing which resulted in the main rotor blades contacting and subsequently separating the tail boom during the landing phase. Visual meteorological conditions prevailed and a company visual flight rules flight plan was in effect. The helicopter was substantially damaged and the commercial pilot and his two passengers were not injured. The flight was departing for Nordman, Idaho, for the purpose of transporting personnel.</p> <p>In a written statement, the pilot reported that the start, warm-up and lift off were uneventful with all gauges and warning lights operating in the normal range. The helicopter lifted off to a three to five foot hover for positioning to the runway centerline and a southbound departure. The helicopter gained speed and passed through translational lift at 15 to 20 mph and 10 feet above ground level (AGL). The pilot stated that at 30 to 35 mph and 15 to 20 feet AGL, he felt the helicopter stop climbing, followed by the engine out audible warning and the flashing engine out light illuminated. The rotor rpm and the N2 indicated 96% and the pilot lowered the collective and applied slight aft cyclic to lower the power requirements. The rotor rpm and N2 decreased to 92% and the helicopter began to lose altitude. The pilot reported that he then initiated a running landing. The collective was held where it was to hold power and he adjusted the cyclic to slow the helicopter down in order to touch down on the landing skids in a level attitude. When the helicopter touched down, it slid on the skids for about 80 to 90 feet. During the last 30 feet, the collective was lowered to slow the ground speed. At this time the main rotor blades made contact with the tail boom, which was severed. The helicopter yawed slightly before coming rest upright. The pilot secured the cockpit and the passengers deplaned without further incident.</p> <p>The wreckage was moved to Pendleton, Oregon, for inspection. During the inspection the airframe/fuselage, tail rotor assembly, main rotor system, drive system, flight control systems, fuel system, engine, and turbine outlet temperature (TOT) indicating systems were examined.</p> <p>Maintenance logbook information indicated that the engine automatic re-light/re-ignition system had been inoperative since logbook entry 5,068 flight hours. Approximately 132 hours had been accumulated since this write-up to the time of the accident. The pilot also reported that the helicopter had a history of excessive droop "during huge power changes and would droop to approximately 94% N1." There was no aircraft or engine maintenance entry indicated in the logbooks regarding this issue.</p> <p>Several anomalies were noted during the inspection (see attached Boeing Report).</p>					
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FACTUAL REPORT

AVIATION

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Narrative (Continued)

While inspecting the fuel system, it was noted that the fuel pressure differential switch (delta P switch) electrical line/lead evidenced a complete fracture and the switch was not capable of normal operation. The switch was removed and sent to the manufacturer for examination (see attached Spectra Lux Fuel Pressure Switch Test). A pressurization test revealed that the diaphragm was in good working condition. The unit did not leak and operated as expected. Further inspection noted that the reed switch did not function. The pressure switch was x-rayed and found that one of the leads of the reed switch was damaged and "had obviously been mechanically agitated in two directions." The engineer performing the test reported that it would take a great deal of force for the leads to end up in their current position and this could not have happened during normal operating conditions. The Boeing participant reported that, "Malfunction of the fuel pressure differential switch rendered the impending fuel filter bypass warning system inoperative."

A vacuum check of the engine fuel system, and a bleed valve functional check were normal, with no deficiencies noted, however, a pneumatic system pressure check identified an air leak at the "T" fitting on the #1 pneumatic line from the power turbine governor (PTG) to the fuel control unit (FCU). A correlation check between the cockpit control and the engine control indicated the systems were capable of normal operation.

The spark ignitor was not properly secured at the combustion outer case and could be turned with finger pressure. The ignitor lead was frayed where it passes through the exhaust collector firewall shield, and excessive wear of the ground electrode (outer electrode) portion of the ignitor was noted.

Excessive coking with one hole completely plugged and three additional holes partially plugged were noted to the fuel nozzle assembly.


The compressor section would not rotate. Minor foreign object debris (FOD) was noted on several #1 compressor wheel rotors. The 4th stage N2 power turbine wheel rotated but would not freewheel. A light coating of silver metallic granules lined the engine exhaust forward of the 4th stage power turbine was noted.

The TOT indicating system was inspected to verify calibration. The manufacturers calibration inspection requires the "TOT Indicating System Calibration" to be performed during all 300-hours inspections for those systems that are not self-calibrating. The last 300-hour inspection was performed on March 18, 2000. The test revealed (see attached TOT Gage Test) that the turbine outlet temperature indicated on the cockpit gage was below actual engine outlet temperatures. The Boeing participant reported that, "The specified resistance for the calibration inspection must be 8.0 +/- 0.05 ohms through the specified resistor and engine thermocouple harness. The results of the calibration test showed the resistance to be at 8.64 ohms." The Boeing participant further stated that, "Lower than actual turbine outlet temperature readings provided to the pilot via the cockpit TOT gage may have resulted in numerous operations being conducted in higher temperature ranges than that authorized by the Pilot's Flight Manual and/or the engine manufacturers temperature limitations," and that "Unreliable TOT readings were the result of an improper ohm resistance on the engine thermocouple harness (and associated resistors) and an inaccurate cockpit TOT gage."

The engine was removed from the airframe and shipped to Rolls-Royce Allison, Indianapolis, IN, for further examination. The engine was torn down and inspected. Metallurgical examinations and testing of components were performed at Rolls-Royce Allison. (See attached report)


The findings of the teardown inspection revealed:


- The 1st stage Turbine Wheel failed by stress rupture at mid-length on all blades resulting from high temperature engine operation above 2000F.
- Microstructure evaluation of the Second Stage Turbine Wheel blades indicated operation above 2000F.

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Narrative (Continued)

- Both the First and Second Stage Turbine Nozzles exhibited evidence of high temperature operation above the normal operating range.
- The Combustion Liner Assembly exhibited a biased combustion flow pattern on the inner surface in line with the drain plug, which lead to the hot spots on the 1st and 2nd Stage Turbine Nozzles.
- The material chemistries conformed to the requirements of the engineering drawings.

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		Occurrence Type: Accident			
Landing Facility/Approach Information					
Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
CAVANAUGH BAY	66S	2484 Ft. MSL	15	3100	120
Runway Surface Type: Grass/turf					
Runway Surface Condition: Dry					
Approach/Arrival Flown:					
VFR Approach/Landing:					
Aircraft Information					
Aircraft Manufacturer		Model/Series		Serial Number	
Hughes		369E /369E		182E	
Airworthiness Certificate(s): Normal					
Landing Gear Type: Skid					
Amateur Built Acft? No	Number of Seats: 4	Certified Max Gross Wt.	3000 LBS	Number of Engines: 1	
Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:		
Turbo Shaft	Allison	250-C20B	450 HP		
- Aircraft Inspection Information					
Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time		
100 Hour	08/2000	90 Hours	5200 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed?/Type Yes /	ELT Operated? No	ELT Aided in Locating Accident Site?			
Owner/Operator Information					
Registered Aircraft Owner		Street Address			
SILVERHAWK AVIATION		4301 AVIATION WAY			
		City	State	Zip Code	
		CALDWELL	ID	83605	
Operator of Aircraft		Street Address			
SILVERHAWK AVIATION		4301 AVIATION WAY			
		City	State	Zip Code	
		CALDWELL	ID	83605	
Operator Does Business As:			Operator Designator Code:		
- Type of U.S. Certificate(s) Held:					
Air Carrier Operating Certificate(s): On-demand Air Taxi					
Operating Certificate:			Operator Certificate: Aircraft External Load		
Regulation Flight Conducted Under: Part 135: Air Taxi & Commuter					
Type of Flight Operation Conducted: Unknown;Non-scheduled; Domestic; Passenger Only					

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>	NTSB ID: SEA00LA170
	Occurrence Date: 08/25/2000
	Occurrence Type: Accident

First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 32
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Sex: M	Seat Occupied: Left	Occupational Pilot? Civilian Pilot	Certificate Number: On File
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Certificate(s): Commercial

Airplane Rating(s): None

Rotorcraft/Glider/LTA: Helicopter

Instrument Rating(s): None

Instructor Rating(s): None

Current Biennial Flight Review?

Medical Cert.: Class 2	Medical Cert. Status: Valid Medical--no waivers/lim.	Date of Last Medical Exam: 03/2000
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- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	2320	1823			28			2320		
Pilot In Command(PIC)	2001	1823			28			2001		
Instructor										
Instruction Received										
Last 90 Days	140	140						140		
Last 30 Days	117	117						117		
Last 24 Hours										

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? No	Second Pilot? No
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Flight Plan/Itinerary

Type of Flight Plan Filed: Company VFR

Departure Point Same as Accident/Incident Location	State	Airport Identifier 66S	Departure Time 1430	Time Zone PDT
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Destination NORDMAN	State ID	Airport Identifier 67S	
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Type of Clearance: None

Type of Airspace: Class E

Weather Information

UAT/CA Source of Wx Information:
Company

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>	NTSB ID: SEA00LA170
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Weather Information					
WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
	0000		0 Ft. MSL	0 NM	0 Deg. Mag.
Sky/Lowest Cloud Condition: Clear			0 Ft. AGL	Condition of Light: Day	
Lowest Ceiling: None		0 Ft. AGL	Visibility: 15 SM	Altimeter: 29.00 "Hg	
Temperature: 28 °C	Dew Point: °C	Weather Conditions at Accident Site: Visual Conditions			
Wind Direction: 180	Wind Speed: 4	Wind Gusts:			
Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM				
Precip and/or Obscuration:					

Accident Information		
Aircraft Damage: Substantial	Aircraft Fire: None	Aircraft Explosion: None

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants					
Other Crew					
Passengers				2	2
- TOTAL ABOARD -				3	3
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	3	3

National Transportation Safety Board

FACTUAL REPORT

AVIATION



NTSB ID: SEA00LA170

Occurrence Date: 08/25/2000

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

DEBRA J. ECKROTE

Additional Persons Participating in This Accident/Incident Investigation:

DONNY WARE
SPOKANE, WA

MIKE WEBER
INDIANAPOLIS, IN

JOHN KURTZ
MESA, AZ