 <b>National Transportation Safety Board</b> <b>FACTUAL REPORT</b> <b>AVIATION</b>		NTSB ID: SEA00FA061		Aircraft Registration Number: N3377H	
		Occurrence Date: 04/02/2000		Most Critical Injury: Fatal	
		Occurrence Type: Accident		Investigated By: NTSB	
<b>Location/Time</b>					
Nearest City/Place STANWOOD		State WA	Zip Code 98292	Local Time 1150	Time Zone PDT
Airport Proximity: Off Airport/Airstrip		Distance From Landing Facility:			
<b>Aircraft Information Summary</b>					
Aircraft Manufacturer Bell		Model/Series 47G-3B-1 /47G-3B-1		Type of Aircraft Helicopter	
Revenue Sightseeing Flight: Yes			Air Medical Transport Flight: No		
<b>Narrative</b>					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
<p>HISTORY OF FLIGHT</p> <p>On April 2, 2000, approximately 1150 Pacific daylight time, a Bell 47G-3B-1 helicopter, N3377H, registered to and being operated by a commercial pilot, was destroyed when it struck a fence and terrain following a rotor RPM loss while in cruise approximately three nautical miles southeast of Stanwood, Washington. The pilot, occupying the left seat, sustained minor injuries. The center passenger sustained serious injuries and her husband, occupying the right seat, sustained fatal injuries. A post-crash fire consumed a portion of the helicopter. Visual meteorological conditions prevailed and no flight plan had been filed. The trip was a sightseeing flight which was to have been conducted within 25 nautical miles of the departure airport, in accordance with 14 CFR 135.1(a)(5). The flight departed Arlington, Washington, approximately 1105 after picking up the two passengers.</p> <p>The pilot was telephonically interviewed on April 3, 2000, and reported that after departing Arlington and flying towards the coast and then north to the mouth of the Stillaguamish River he turned inland to follow the river (refer to CHART I provided by the pilot). He reported that he was flying about 60-70 mph. Shortly after crossing the bridge (refer to CHART II) he heard a little "clunk" sound and then the engine started to race (RPM increased above what he normally saw for this type of flight regime). There was no vibration, coughing, sputtering or other engine indications. As the engine RPM increased the (main) Rotor RPM began to decay. This all occurred in a very short time (2 seconds). He maneuvered the helicopter toward a field along the north side of the River and never saw the electric fence. He reported that he landed hard in a little right roll and the helicopter came to rest on its right side.</p>					
<p>PERSONNEL INFORMATION</p> <p>The pilot held a commercial certificate and reported a total of 5,777 hours of flight experience, of which 1,187 were in the Bell 47 rotorcraft.</p>					
<p>AIRCRAFT INFORMATION</p> <p>Airframe and engine logbooks, as well as a computer printout provided by the pilot/owner for N3377H's trip log, were reviewed. The rotorcraft was equipped with a Lycoming O-435-25A engine (the military equivalent of the TVO-435-B1A), a 270 horsepower engine. The engine was installed in N3377H on March 2, 2000, having been previously removed from another Bell 47 rotorcraft on March 10, 1993, at a total time since last major overhaul (TSMOH) of 507.8 hours, (refer to ATTACHMENT EL-I). There was no evidence within the logbook that the engine had been installed in any rotorcraft or operated during the time interval between March 10, 1993, and March 2, 2000.</p> <p>The overhaul had been signed off on December 17, 1984. The total engine time (TSMOH) on the day</p>					
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## Narrative (Continued)

before the accident was 540.0 hours (32.2 hours since installation). The last inspection conducted on N3377H was logged as an "annual" on April 2, 1999. The total airframe time at that time was recorded as 6,471.8 hours (refer to ATTACHMENT AF-I), however, the trip log showed 6,468.2 hours on the same date. The following (and final) airframe log entry was the previously described engine installation and no total airframe time was recorded. The trip log showed a total time of 6,568.2 hours on April 2, 2000.

The Lycoming aircraft engine assembly parts list manual contained a diagram of the crankshaft for the TVO-435-B1A engine showing the installation of an "Oil Jet" (refer to ATTACHMENT LYC-I). The jet, which was a 1/8-27 National Pipe Thread (NPT) standard fitting, was a threaded plug (hollow bolt) with a small orifice drilled thorough the bolt cap designed to allow oil to pass out of the end of the crankshaft and up into the transmission so as to provide lubrication to the lower mast bearing. The orifice was not greater than 0.025 inch in diameter. With the jet not screwed in place within its threaded insert, a greater amount of oil would have been allowed to flow into the transmission and clutch chamber from the 3/8 inch inside diameter threaded hole at the end of the crankshaft. The Overhaul Manual - AVCO Lycoming Vertical Helicopter Engines stated on page 9-14:

"9-85. Oil Jet or Pipe Plug. Install either the oil jet or pipe plug in the threaded opening in the front crankshaft oil plug and tighten to specified torque. See figure 9-18." (refer to ATTACHMENT OM-I).

The jet was to have been torqued to a minimum of 40 inch-pounds, as shown in the Lycoming Service Table of Limits (refer to ATTACHMENT LYC-II).

Refer to DIAGRAM A-A which is a copy of the airspeed versus altitude chart taken from the flight manual of the Bell 47G-3B-1 rotorcraft.

## WRECKAGE AND IMPACT INFORMATION

On-site examination was conducted by an inspector from the Federal Aviation Administration's (FAA) Renton Flight Standards District Office. The rotorcraft was observed to have come to rest in a flat, green, grassy field a short distance north of the east/west oriented Stillaguamish River (refer to CHART II). Two sets of electric fencing, separated by an approximate 10 foot wide tractor path, were observed to run east/west just north of the river. The southernmost fence consisted of metal stakes painted green with an approximate eight inch white section at the top of each stake. Two strands of un-insulated wire were attached to the fence and the top wire was observed to be broken. The northernmost fence consisted of rust colored stakes and the tops of this fence was approximately two feet higher than the former fence due to a general upslope in the terrain toward the north. Two strands of un-insulated wire were attached to the fence and both wires were observed to be broken. One of the wires was observed entangled in one of the helicopter's skids at its final resting place.

The rotorcraft was observed approximately 65 feet north-northeast of the initial ground impact marks located at the northern edge of the northernmost electric fence (refer to photograph 1). The aircraft was observed at rest on its right side and all major components were located at the final resting place or within a short distance thereof (refer to photograph 2). A post-crash fire had destroyed the cockpit/cabin area, including the cockpit instrumentation.

## FIRE

The pilot reported that he observed a small fuel-fed post-crash fire under the right saddle tank about 15 seconds after the aircraft came to rest. The occupants were all removed from the aircraft before they sustained any fire injury.

## TESTS AND RESEARCH

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## Narrative (Continued)


Post-crash examination and disassembly of the transmission revealed that the oil jet (hollow bolt) which screws into the forward end of the engine crankshaft was not within its threaded hole. The threaded oil jet was observed lying loose within the cavity forward of the crankshaft (refer to photograph 3). Examination of the oil jet revealed random mechanical damage to the bolt's threads characteristic of the bolt having vibrated/bounced around within the cavity. The overall appearance of the threads was clean and unworn. The clutch assembly was examined and dimensionally checked with no discrepancies noted. The clutch pads were checked for thickness and found to be within acceptable tolerances and without excessive wear (refer to photograph 4). The pads displayed their diagonal grooving and a slight satin-like sheen (refer to photograph 5). Additionally, the pads as well as the interior of the clutch housing had a moderate coating of oil on their surfaces (refer to photograph 6).

Post-crash examination revealed no other anomalies within the transmission assembly. The engine was examined with continuity of the crankshaft, camshaft and accessory drive gears being verified. The engine oil filter was clear of particulates and debris, and compression on all six cylinders was established during manual rotation of the crankshaft.

## ADDITIONAL INFORMATION

On-site examination of the wreckage was conducted on April 2, 2000, after which the wreckage was moved to the Arlington airport and secured. Post-crash examination of the wreckage was conducted April 11, 2000, and the wreckage was then released to Mr. Jim Stiger, representative of the insurance company (refer to NTSB form 6120.15 enclosed).

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<b>Landing Facility/Approach Information</b>					
Airport Name	Airport ID:	Airport Elevation Ft. MSL	Runway Used 0	Runway Length	Runway Width
Runway Surface Type:					
Runway Surface Condition:					
Approach/Arrival Flown: NONE					
VFR Approach/Landing: Forced Landing					
<b>Aircraft Information</b>					
Aircraft Manufacturer Bell	Model/Series 47G-3B-1 /47G-3B-1		Serial Number 3391		
Airworthiness Certificate(s): Normal					
Landing Gear Type: Skid					
Amateur Built Acft? No	Number of Seats: 3	Certified Max Gross Wt. 2950 LBS	Number of Engines: 1		
Engine Type: Reciprocating	Engine Manufacturer: Lycoming	Model/Series: O-435-25A	Rated Power: 270 HP		
- Aircraft Inspection Information					
Type of Last Inspection Annual	Date of Last Inspection 04/1999	Time Since Last Inspection 100 Hours	Airframe Total Time 6569 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed?/Type Yes /	ELT Operated? Yes	ELT Aided in Locating Accident Site? No			
<b>Owner/Operator Information</b>					
Registered Aircraft Owner GABLE, STEPHEN, L.		Street Address PO BOX 541			
		City EVERETT	State WA	Zip Code 98206	
Operator of Aircraft GABLE, STEPHEN, L.		Street Address 10511 52ND STREET NE			
		City SNOHOMISH	State WA	Zip Code 98290	
Operator Does Business As: CASCADE WEST HELICOPTERS			Operator Designator Code:		
- Type of U.S. Certificate(s) Held: None					
Air Carrier Operating Certificate(s):					
Operating Certificate:			Operator Certificate:		
Regulation Flight Conducted Under: Part 91: General Aviation					
Type of Flight Operation Conducted: Unknown					

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**First Pilot Information**

Name On File	City On File	State On File	Date of Birth On File	Age 54
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Sex: M	Seat Occupied: Left	Occupational Pilot? Civilian Pilot	Certificate Number: On File
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Certificate(s): Flight Instructor; Commercial

Airplane Rating(s): Single-engine Land; Single-engine Sea

Rotorcraft/Glider/LTA: Helicopter

Instrument Rating(s): Airplane

Instructor Rating(s): Helicopter

Current Biennial Flight Review?

Medical Cert.: Class 2	Medical Cert. Status: Valid Medical--w/ waivers/lim.	Date of Last Medical Exam: 06/1999
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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	5777	1187			273	80	11	1187		
Pilot In Command(PIC)	5577	1180			263					
Instructor										
Instruction Received										
Last 90 Days	13	13								
Last 30 Days	13	13								
Last 24 Hours										

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

Type of Flight Plan Filed: None

Departure Point ARLINGTON	State WA	Airport Identifier AWO	Departure Time 1105	Time Zone PDT
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Destination Local Flight	State	Airport Identifier	
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Type of Clearance: None

Type of Airspace: Class G

**Weather Information**

Source of Wx Information:

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<b>Weather Information</b>					
WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
AWO	1155	PDT	137 Ft. MSL	5 NM	96 Deg. Mag.
Sky/Lowest Cloud Condition: Clear			0 Ft. AGL	Condition of Light: Day	
Lowest Ceiling: None		0 Ft. AGL		Visibility: 10 SM	Altimeter: 30.00 "Hg
Temperature: 13 °C	Dew Point: 8 °C	Weather Conditions at Accident Site: Visual Conditions			
Wind Direction: 330		Wind Speed: 5		Wind Gusts:	
Visibility (RVR): 0 Ft.		Visibility (RVV) 0 SM			
Precip and/or Obscuration:					

<b>Accident Information</b>		
Aircraft Damage: Destroyed	Aircraft Fire: Ground	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	1	1			2
- TOTAL ABOARD -	1	1	1		3
Other Ground	0	0	0		0
- GRAND TOTAL -	1	1	1		3

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**FACTUAL REPORT**

**AVIATION**



NTSB ID: SEA00FA061

Occurrence Date: 04/02/2000

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

STEVEN A. MCCREARY

Additional Persons Participating in This Accident/Incident Investigation:

OVE S LARSEN  
RENTON, WA

KEVIN MCKEE  
RENTON, WA

BILL SHINN  
RENTON, WA

JEFF POSCHWATTA  
KENT, WA