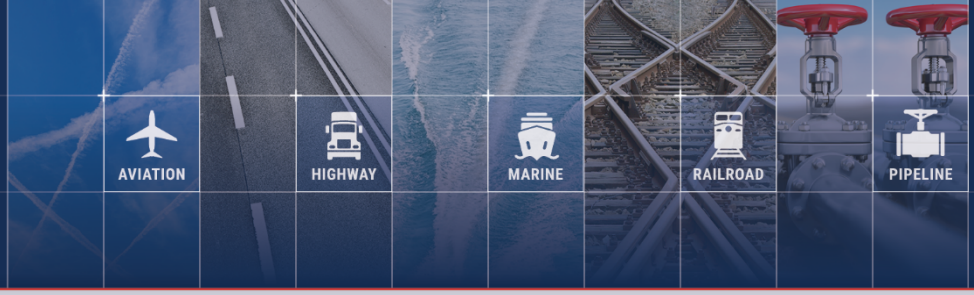

Aviation Investigation Final Report

Location:	BLANDING, Utah	**Accident Number:**	DEN00FA084
Date & Time:	May 4, 2000, 15:55 Local	**Registration:**	CGPTT
Aircraft:	Aerospatiale AS-350B	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	3 Fatal, 3 Serious
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

The pilot was assigned to fly for a geophysical seismic team in rugged high desert conditions (elevation 5,366 feet). On his second day of flying, he was requested, by one of the team members, to "fly a little easier; less aggressively." On his third day of flying, he was assigned to pick up five team members and their equipment. Once airborne (density altitude was 8,908 feet), he had been briefed that he would receive GPS team distribution coordinates; instead, he was instructed to land and hold for a period of time. A witness observed the helicopter fly eastbound, and then make a 45 to 60 degree bank turn [180 degrees] back to the west. The witness then saw the helicopter turn southbound, lower its nose down almost vertically, and then reduce its nose low pitch to approximately 45 degrees as it disappeared from sight. Postaccident examination of the engine revealed that the manual throttle pointer on the fuel control was in the emergency position. The first and second stage turbine wheels were found with their blades 50 to 70 percent melted, indicating an engine that functioned for a time at a temperature level well above its limits.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot's loss of aircraft control due to abrupt flight maneuvering. Contributing factors were the high density altitude weather condition, the total loss of engine power due to the pilot manually introducing excessive fuel into the engine and over temping the turbine section, and the lack of suitable terrain for the ensuing autorotation.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings
1. (C) AIRCRAFT HANDLING - ABRUPT - PILOT IN COMMAND
2. (F) WEATHER CONDITION - HIGH DENSITY ALTITUDE

Occurrence #2: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. (F) EMERGENCY PROCEDURE - ATTEMPTED - PILOT IN COMMAND
4. (F) TURBINE ASSEMBLY - OVERTEMPERATURE

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
5. AUTOROTATION - ATTEMPTED - PILOT IN COMMAND
6. TERRAIN CONDITION - ROUGH/UNEVEN
7. (F) TERRAIN CONDITION - NONE SUITABLE

Factual Information

HISTORY OF FLIGHT

On May 4, 2000, approximately 1555 mountain daylight time, an Aerospatiale AS-350B helicopter, Canadian registration CGPTT, was destroyed during impact with terrain while maneuvering near Blanding, Utah. The commercial pilot and two passengers were fatally injured, and the other three passengers were seriously injured. The helicopter was being operated by Peace Helicopters Ltd., Edmonton, Alberta, under Title 14 CFR Part 91. Visual meteorological conditions prevailed for the local flight that originated from landing zone 1 (LZ1) 10 minutes earlier. No flight plan had been filed.

The pilot arrived in Blanding, Utah, on May 1, 2000, to relieve the project pilot working for a geophysical seismic team. On May 2, 2000, he flew a familiarization flight with the previous project pilot, and was briefed on operational procedures and environmental concerns. The previous project pilot stated that "when you live with, and fly for a geophysical seismic crew for 3 or 4 weeks, they get used to you; a new guy has to prove himself." The operator stated that this was the first time that the pilot had been on assignment in the United States.

On May 3, 2000, the pilot flew his first day as the project pilot. In the afternoon, the Safety Officer of the geophysical project said that the pilot told him that this was "his first time to fly in the desert, and the [desert's unpredictable] winds." He also said that the pilot seemed "very brash."

On May 4, 2000, the helicopter mechanic said that the helicopter was fueled at the LZ1 staging area (landing zone 1; N37 degrees 22.77', W109 degrees 28.40'; elevation 4,702 feet) to its project maximum 40 percent of the 143 gallon tank, or 57 gallons. A geophysical team member, who operated the Kodiak system [a computerized ground based resource management system that displays and records the real-time helicopter location utilizing GPS technology] at the staging area, said that he briefed the pilot for the flight. He said that the briefing included a request that the pilot "fly a little easier; less aggressive." The Kodiak operator told the pilot that two other team members had spoken to him and requested that he talk to him about his "rough handling of the helicopter."

The helicopter departed at 1545 and flew 5.35 nautical miles (nm) direct to LZ4 (N37 degrees 20.56', W109 degrees 23.01'; elevation 4,586 feet) to pick up five geophysical team members. The helicopter's flight data stopped recording on the Kodiak, at 1547, due to the terrain masking characteristic of the line-of-sight system.

The passenger sitting in the left front seat said that when he boarded the helicopter at LZ4, the pilot was wearing a flight helmet and shoulder harness. Because of the anticipated short ride,

the passenger secured himself with only the seat belt; he also put on a headset. At 1552, the Kodiak system once again started recording; the helicopter was recorded flying westbound. The estimated weight of the helicopter, with five passengers and equipment, was 4,076 pounds.

At this point, the Kodiak operator said that he was scheduled to transmit the team's multiple drop off points to the pilot. But instead, he transmitted a radio request for the pilot to land the helicopter so that a seismic shot could be fired [the helicopter's noise/vibration is picked up by the geophones, and recorded if the helicopter is airborne at the time of the shot]. According to the Kodiak operator, the pilot radioed back that he would set down "on top, up here" [on top of the mesa]. The helicopter was last recorded (2.6 nm of flight from LZ4) on the Kodiak as flying 065 degrees at 68 knots, at an altitude of 1,696 meters, or 5,565 feet. This would have placed him 199 feet above the mesa (elevation 5,366 feet).

The Safety Officer, located .74 nm east of the crash site, observed the helicopter flying eastbound towards him (this portion of the flight was not recorded on the Kodiak due to terrain blocking). He said that as it approached the eastern edge of the mesa, it made a "very hard left hand turn [180 degrees] back to the west." He later estimated that the helicopter's bank was 45 to 60 degrees. He then saw the helicopter turn southbound, lower its nose almost vertically down, and then reduce its nose low pitch to approximately 45 degrees as it disappeared from sight. Immediately he observed a cloud of dirt and dust. He got on the radio and reported that the helicopter was down; approximately 1 minute from the helicopter's disappearance, he observed smoke rising from the mesa top.

One of the surviving back seat passengers [who was on his first flight with the pilot] said that he remembered a hard left turn, followed by a loud pop, then a screaming whir," followed by a red light on the pilot's instrument panel. Another surviving passenger said that he heard a loud noise (sounded like something breaking), and then a loud Beep, Beep, Beep.... The third surviving back seat passenger said that he saw the pilot move his left hand quickly towards something near his left knee. He said that the pilot looked "upset," and then he heard a loud high pitch screaming sound. The passenger further reported that moments later the pilot pulled up (on the collective) with both hands, but nothing happened.

PERSONAL INFORMATION

The pilot was a Canadian citizen. According to the operator's records, the pilot had a commercial pilot certificate (helicopter) and private pilot certificate (single engine airplane). He was not instrument rated. The records further indicated that at the time of the accident, the pilot had approximately 2,900 hours total time in helicopters, with approximately 1,500 hours in this make and model. The records also indicated that the pilot had flown in a variety of environmental conditions, including desert conditions in Canada.

AIRCRAFT INFORMATION

The helicopter was a single engine, six seat aircraft, which was manufactured by Aerospatiale (now Eurocopter) in 1980. It was powered by an Turbomeca Arriel-1B turbo shaft engine rated at 641 horsepower at sea level. The engine (S/N 303) was installed in the aircraft on March 14, 2000, with a total time on it of 9,274 hours.

On March 21, 2000, the engine air-intake particle separator was removed, which reduced the helicopter's weight by 14.6 pounds. The last weight and balance measurement was performed on March 29, 2000; the helicopter's empty weight was determined to be 2,624.01 pounds. The aircraft's certificated maximum gross weight was 4,300 pounds, its in-ground-effect (IGE) maximum gross weight for the weather conditions at the accident site was 4,025 pounds, and its out-ground-effect (OGE) maximum gross weight for the weather conditions at the accident site was 3,725 pounds. Transitional lift speed was 15 knots.

The previous pilot assigned to the helicopter, departed Edmonton, Alberta, on March 31, 2000, in the helicopter and flew it to the project site. He arrived in Blanding on April 1, 2000; the total trip flight time was approximately 10 hours. He flew for the geophysical project until being relieved by the accident pilot on May 3, 2000. The previous pilot stated that he "felt very good about the aircraft," and he had very few problems with it. Maintenance performed on the aircraft during his tour of duty was confined to a tail-rotor change and an engine bleed value change. He said that he thought it was one of the operator's "better aircraft."

The maintenance person assigned to the helicopter said that he performed an annual inspection on April 22, 2000. The aircraft records indicated that the last daily inspection was performed on May 3, 2000; the maintenance person said an inspection was performed on May 4, but was never recorded in the aircraft logbooks. At the time of the accident, the helicopter had 11,221 hours of flight time and the engine had 9,427 hours since new.

The helicopter's fuel tank held 143 gallons, and was calibrated in percent of capacity. The operator said that the Utah operation was using a 40 percent of tank capacity rule, or 57 gallons maximum fuel (6.7 pounds per gallon). A representative of the engine manufacturer said that the aircraft burned an average 37 gallons per hour. A manual fuel flow control lever (FCL) was located by the pilot's left knee. This was used for starting the engine, and would permit the pilot to manually control fuel flow if the engine's fuel controller malfunctioned. To manually operate the FCL, the pilot would have to disengage the lever and slowly manipulate it in the emergency side of the quadrant. According to the manufacturer's representative, the "manual FCL has a small range for movement, and is very sensitive to operate."

The helicopter's normal main rotor speed in flight was 386 RPM. The helicopter was equipped with a low rotor horn, which would have sounded steadily if the main rotor speed decreased below 360 rpm. The horn would also sound anytime the hydraulic system pressure fell below 30 BAR (1 BAR is equal to 14.5 pounds per square inch [psi]). The helicopter was also equipped with a master caution panel that included six red warning lights. They would illuminate for the following reasons: 1. low hydraulic pressure (when main rotor blade rpm decreased below 250); 2. low engine oil pressure (when the power turbine speed decreased

below 70%); 3. low main rotor gearbox oil pressure (when main rotor blade rpm decreased below 200); 4. high main rotor gearbox oil temperature; 5. engine fire warning light; and 6. high battery temperature warning light.

The helicopter's landing skids had black hard rubber "Bear Paws" attached to the aft end of the skids, which facilitated landing in snow or on soft terrain surfaces. They measured approximately 18 inches by 12 inches.

The aircraft was equipped with an NS500 Kodiak navigation system that provided real-time information about the helicopter's location (using GPS), and was used to transmit project instructions to the pilot. The equipment was designed and built by Eagle Navigation Systems, Inc., of Calgary, Alberta. The system stored, at 10 second intervals, the flight data of the helicopter's operations. Its data-link was limited to line-of-sight operation; a Kodiak repeater, located at the southern end of the project area, expanded the system's operational capabilities in the rugged terrain. When the helicopter's location was blocked by terrain from both Kodiak receivers, the aircraft's location could not be recorded, nor could it receive instructions.

METEOROLOGICAL INFORMATION

At 1553, the weather conditions at the Cortez Municipal Airport (elevation 5,914 feet), 110 degrees 36 nm from the accident site, were as follows: wind 230 degrees at 8 knots gusting to 16 knots; visibility 10 statute miles; cloud condition clear; temperature 82 degrees Fahrenheit; dew point 52 degrees Fahrenheit; altimeter setting 30.02 inches of mercury. Witnesses at the accident site reported that the temperature was between 90 and 95 degrees Fahrenheit. The density altitude was calculated to be 8,908 feet.

WRECKAGE AND IMPACT INFORMATION

The helicopter came to rest on an irregularly surfaced rocky desert mesa (N37 degrees 21.71', W109 degrees 24.51'; elevation 5,366 feet; McCracken Mesa) with scattered pockets of soil. The impact site was sparsely vegetated with cedars and scrub brush ranging up to 15 feet in height. The visible ground scars and aircraft debris trail were longitudinally aligned at 150 degrees and extended for approximately 100 feet. The fuselage and cabin area was found resting on its right side (240 degree alignment), and the empennage was found upright. The three fatally injured occupants, the pilot in the front seat and the two passengers in the back seat, were all on the right side of the cabin area. The injured passengers were all seated on the left side of the helicopter; two were seated in the back seat and one in the left front seat.

In the first 25 feet of visible debris, there were several brush and cedar branches separated from bushes; at 25 feet, there was a ground scar that was consistent with a tailskid strike. At 34 feet, there was a 3 foot high rock ledge (perpendicular to the ground scars); on the top of the ledge there were scrape marks with green and black paint transfers. Approximately 2 feet in front of the ledge and on the left hand side of the ledge scars, was a rock with additional ground scars. At 42 to 50 feet, there was an 8 to 10 inch deep ground scar with the right

landing skid in it; approximately 10 feet further was Plexiglas, and rubber window and door seals. Parallel to this debris, approximately 4 feet to the left, was another 8 foot ground scar (4 to 6 inches deep) leading towards the main fuselage. At the 40 foot point, a 16 to 18 foot slap mark was found (approximately 12 inches wide) extending to the right side of the debris field.

Flight control continuity could not be determined due to extensive thermal damage. All three main rotor blades were found with the fuselage; one blade was found under a section of burned and melted tail boom. All three main rotor blades were fractured chordwise near station 1,000 (approximately 4 feet outboard from the blade pins). The tail rotor blades remained attached; both blades exhibited no appreciable leading edge damage. One tail rotor blade strike tab had no damage; the other was bent approximately 45 degrees aft. Both blades exhibited mechanical abrasion on the leading edge on the outboard 3 to 4 inches of blade. One tail rotor blade cuff was broken; this same blade exhibited impact damage.

The lower fin on the vertical stabilizer, with tailskid, was found crushed back and up into the vertical stabilizer. The right horizontal stabilizer's outer 40 percent was bent up approximately 45 degrees.

The fuselage/cabin areas were found destroyed by fire. The rotor brake, engine fuel flow and emergency fuel shutoff were found disconnected from their respective control tubes. The rotor brake lever was found in the aft, or full main rotor blades brake position. The engine FCL was found in the aft/full off position, placing it in the position for engine shutdown. The emergency fuel flow shutoff lever was found in the forward position, placing it in the normal position for operation.

Examination of the engine to main gearbox and engine to tail rotor gearbox drive couplings showed no signatures of torque deformation. The number one tail rotor drive shaft remained attached to part of the long shaft by its forward spline. These two shafts separated from the tail rotor drive train, and were found approximately 15 feet forward of the main wreckage debris.

The Fuel Control Unit FCU) throttle pointer was found in the emergency position. During disassembly of the engine, the first and second stage turbine wheels were found with their blades 50 to 70 percent melted. The engine manufacturer reported that "the general evidence indicates an engine that functioned during a certain time at a temperature level well above the limits: something like +200 to +300 Celsius more than the temperatures measured by the manufacturer during the certification tests." The compressor section of the engine was undamaged and there was no evidence of impact marks. The engine manufacturer said the condition of the compressor section indicates that "the engine has [had] not ingested any foreign object."

No preimpact engine or airframe anomalies, which might have affected the helicopter's performance, were identified.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot by the State of Utah's Department of Health, Office of the Medical Examiner, Salt Lake City, on May 10, 2000.

Toxicology tests were performed on the pilot by the FAA's Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma. According to CAMI's report (#200000101001), the pilot's carbon monoxide, cyanide, and drug tests were negative. CAMI's report indicated that the volatiles found in the blood and muscle samples "may potentially be from postmortem ethanol formation, and not from the ingestion of ethanol."

ADDITIONAL DATA

The helicopter, including all components and logbooks, was released to the aircraft owner on December 28, 2000.

Pilot Information

Certificate:	Commercial; Foreign; Private	**Age:**	37,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	December 29, 1999
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	3000 hours (Total, all aircraft), 1485 hours (Total, this make and model), 2800 hours (Pilot In Command, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Aerospatiale	**Registration:**	CGPTT
Model/Series:	AS-350B AS-350B	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1317
Landing Gear Type:	Skid	**Seats:**	6
Date/Type of Last Inspection:	April 22, 2000 AAIP	**Certified Max Gross Wt.:**	4300 lbs
Time Since Last Inspection:	100 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	11221 Hrs	**Engine Manufacturer:**	Turbomeca
ELT:	Installed, not activated	**Engine Model/Series:**	ARRIEL-1B
Registered Owner:	NORTHERN MOUNTAIN HELICOPTERS	**Rated Power:**	641 Horsepower
Operator:	PEACE HELICOPTERS LTD.	**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	CEZ ,5914 ft msl	**Distance from Accident Site:**	36 Nautical Miles
Observation Time:	14:53 Local	**Direction from Accident Site:**	110°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / 16 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	95°C / 52°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	(NONE)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	15:45 Local	**Type of Airspace:**	Class G

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	Dry;Rough
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal, 3 Serious	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal, 3 Serious	**Latitude, Longitude:**	37.550178,-109.479652(est)

Administrative Information

Investigator In Charge (IIC):	Struhsaker, James
Additional Participating Persons:	ROBERT D LESITSKY; SALT LAKE CITY , UT ROBERT REULAND; GRAND PRAIRIE , TX ARCHIE WHITTEN; GRAND PRAIRIE , TX IVON WHITTICASE; PRINCE GEORGE
Original Publish Date:	November 1, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	
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