Aviation Investigation Final Report

Location:	JUNEAU, Alaska	**Accident Number:**	ANC99FA073
Date & Time:	June 9, 1999, 10:50 Local	**Registration:**	N6099S
Aircraft:	Eurocopter AS-350BA	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	7 Fatal
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Sightseeing		

Analysis

The air tour helicopter, with the pilot and six passengers, departed Juneau, Alaska, for a 50 minute flight over mountainous glaciers. About ten minutes after making a normal radio transmission, the helicopter was located by the pilot of a second company helicopter who was also conducting a tour. The accident helicopter impacted a nearly level, snow-covered glacier, and all occupants received fatal injuries. The leading edge of the impact crater was angled between 30 and 45 degrees below the horizon, and the face of the airspeed indicator gauge had a needle slap mark at 130 knots. The pilots of the only two helicopters near the accident site at the time of the accident, said the "flat light" made the featureless, snow-covered terrain difficult to discern from the indefinite, overcast ceiling. Photographs taken within one hour of the accident showed that the mountain pass the pilot was attempting to fly through was difficult to distinguish from the clouds, the glacier surface, and the surrounding snow-covered terrain. A postaccident inspection discovered no evidence of any preaccident mechanical anomalies. At the time of the accident, the pilot had accrued 7.9 hours in AS-350 helicopters, and a total of 37.5 hours in turbine helicopters, all with the accident company. This was the second day the pilot operated the AS-350 by himself. The pilot did not hold any instrument certificates, nor was he required to by the FAA. FAA Order 8400.10 requires Principal Operations Inspectors (POIs), and approved company check airmen, to have pilots demonstrate their ability to control a helicopter solely by reference to flight instruments during 14 CFR 135.293 competency checks for VFR-only helicopter operations. This requirement is not specified in 14 CFR Part 135. The FAA approved the company's training manual without this requirement being incorporated. The FAA did not ensure that the company check airman was aware of the checking requirements listed in FAA Order 8400.10. The pilot received no emergency instrument training from the company, nor did the company require him to demonstrate the ability to control the helicopter solely by reference to the installed flight instruments. The helicopter was required to, and did have, a gyroscopic pitch and bank indicator installed. The FAA's training minimums for new hire pilots is 16 hours of Indoctrination Training, and 16 hours of aircraft ground training. The FAA's national norm for

these training programs are 24 hours each. POIs can approve the minimum hours based on the type and sophistication of the training methods. The approved training for the accident company was the minimum. The pilot's previous helicopter piloting experience (as a student, and as a flight instructor) was in Arizona and California. The pilot stated on his company resume that he had accrued 891 hours of helicopter flight experience at the time of his employment. The NTSB IIC, and the FAA, estimated the pilot actually had 612 helicopter flight hours when hired. The company had not received background checks for the pilot before the accident occurred, and was allowed by the Pilot Records Improvement Act to use a pilot for 90 days prior to receipt of background information. The pilot had expressed to a previous employer, and a previous instructor, that he was uncomfortable with company pressure to fly tours in bad weather.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's continued VFR flight into adverse weather, spatial disorientation, and failure to maintain aircraft control. Factors associated with the accident were pressure by the company to continue flights in marginal weather, and the "flat" lighting leading to whiteout conditions. Additional factors were the pilot's lack of instrument experience, lack of total experience, inadequate certification and approval of the operator by the FAA, and the FAA's inadequate surveillance of the emergency instrument procedures in use by the company.

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: MANEUVERING

Findings
1. (F) LIGHT CONDITION - OTHER
2. (F) WEATHER CONDITION - WHITEOUT
3. (C) FLIGHT INTO ADVERSE WEATHER - CONTINUED - PILOT IN COMMAND
4. (F) PRESSURE - COMPANY/OPERATOR MANAGEMENT

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings
5. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
6. (F) LACK OF TOTAL INSTRUMENT TIME - PILOT IN COMMAND
7. (C) SPATIAL DISORIENTATION - PILOT IN COMMAND
8. (F) LACK OF TOTAL EXPERIENCE - PILOT IN COMMAND
9. (F) INADEQ CERTIFICATION/APPROVAL,OPERATION/OPERATOR - FAA(ORGANIZATION)
10. (F) INADEQUATE SURVEILLANCE,INADEQUATE PROCEDURE - FAA(ORGANIZATION)

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: MANEUVERING

Factual Information

HISTORY OF FLIGHT

On June 9, 1999, at 1050 Alaska daylight time, a skid/ski equipped Eurocopter AS-350BA helicopter, N6099S, was destroyed when it impacted the Herbert Glacier, about 3,400 feet above sea level (msl), approximately 20 miles north of Juneau, Alaska, at 58 degrees 34.958 minutes north latitude, 134 degrees 33.602 minutes west longtitude. The commercial certificated pilot and the six passengers on board were fatally injured. The helicopter was owned and operated by Coastal Helicopters, Inc., of Juneau, Alaska, under 14 CFR Part 135 as an on-demand air tour flight. The flight departed Juneau at 1008 for the Herbert Glacier. Visual meteorological conditions prevailed in Juneau at the time of the accident, and a company VFR flight plan was in effect.

The accident helicopter landed about the 1,000 feet msl level of the Herbert Glacier about 1025, as a routine part of the tour. The helicopter was near a second company helicopter which had also landed on the glacier. The accident flight took off again about 1035 to continue the tour. The pilot of the second company helicopter indicated he was about 5 minutes behind the accident helicopter, and did not have the accident flight in sight during the second half of the tour.

The pilot of the second company helicopter, and the pilot of a third helicopter (operated by a different company) who was on the Mendenhall Glacier side of the pass between the Herbert and Mendenhall glaciers, told the NTSB investigator-in-charge (IIC) that about 1045 they heard the accident pilot transmit "Coastal 99S is upper Herbert for the Mendenhall, right side." Both pilots said the radio transmission sounded normal. The pilot of the second helicopter, flying up the Herbert Glacier behind the accident helicopter, found the wreckage about 1055. Both pilots said the snow-covered glacier was featureless, the overcast ceiling was difficult to discern from the snow, and described the lighting as "flat." Both pilots said the overcast layer was a few hundred feet above the elevation of the 4,100 feet msl pass between the two glaciers, but neither could discern the exact ceiling.

INJURIES TO PERSONS

All seven persons on board the helicopter were fatally injured. The State of Alaska Medical Examiner's report noted decelerative injuries to all occupants.

DAMAGE TO AIRCRAFT

The helicopter was destroyed by impact forces.

PERSONNEL INFORMATION

The pilot was a New Zealand citizen, legally working in the United States. He held no New Zealand airplane or helicopter certificates.

The pilot held a U.S. commercial helicopter pilot certificate issued on June 29, 1998. The pilot did not hold any U.S. ratings for airplanes. His helicopter flight instructor certificate was issued on September 19, 1998. He did not hold an instrument rating. All pilot rating examinations were administered by FAA Designated Pilot Examiners (DPE). There were no records indicating the pilot had received instrument training in the United States, or in New Zealand. His most recent U.S. second class medical certificate was issued on March 15, 1999, with no restrictions.

The New Zealand Civil Aviation Authority (CAA), and the New Zealand Transportation Accident Investigation Commission (TAIC), reviewed the pilot's New Zealand aviation, education, and medical records. This review found the following:

The pilot had been a part owner of two microlight aircraft in New Zealand. The other owner/partner estimated the pilot had accrued about 500 hours in microlights. During April 1996, the pilot completed a microlight check with a flight instructor. He was issued an Advanced Microlight pilot certification by the Recreational Aircraft Association of New Zealand (RAANZ), on October 27, 1997, for three-axis control (group B) aircraft. There is no CAA license required for microlight flying, but there is a legal requirement for pilots to hold a microlight certificate to fly microlight aircraft in New Zealand. The progression of certificates issued by the RAANZ is novice, intermediate, and advanced.

Interviews conducted by the FAA indicated the pilot had difficulty reading and writing English. Quantum Helicopters, Inc., in Chandler, Arizona, provided commercial helicopter flight training to the pilot. Quantum's chief pilot stated that the accident pilot began training for his helicopter flight instructor certificate, but the company terminated his training, citing a failure to meet the standards set forth in FAR 61.183: "To be eligible for a flight instructor certificate a person must - (b) Read, write, and converse fluently in English." The pilot then completed training for his flight instructor certificate with Group-3 Aviation, Inc., of Van Nuys, California, on September 18, 1998. He passed an examination for the certificate on September 19, 1998.

Interviews conducted by the FAA and NTSB IIC with other employers and flight schools did not indicate obvious language difficulties. The other persons interviewed consistently commented that upon review, none remembered the pilot performing detailed written work in person. Comments indicated that when given written work assignments, they were normally returned the following day, in good order. Group-3 Aviation commented that when the pilot arrived for training, he already had extensively prepared lesson plans with him, and generating new ones was not required.

The pilot was hired as a flight instructor by Aero Helicopters, Inc., in Scottsdale, Arizona, the

same company which had provided his initial training for the private pilot certificate. He worked for Aero Helicopters, Inc., from September 20 to November 30, 1998. Between December 1, 1998 and May 8, 1999, the pilot worked as a flight instructor for Guidance Helicopters, Inc., in Prescott, Arizona.

The pilot was hired by Coastal Helicopters, Inc., on May 8, 1999. He was based and lived in Juneau. He completed initial ground training on May 11, 1999. On May 11, 1999, the pilot was administered a pilot-in-command, 14 CFR 135.293 and 135.299 proficiency and line check in a BHT-206 by the company president, who is also the director of operations, and FAA authorized company check airman. On June 7, the pilot successfully completed pilot-in-command checks in the AS-350.

The pilot had no turbine engine powered aircraft experience as a pilot prior to his employment at Coastal Helicopters, Inc. His previous helicopter piloting experience was in Robinson R-22, and Schweizer-300C helicopters. During his employment at Coastal Helicopters, Inc., he accrued a total of 37.5 hours of flight experience. He received a total of 5.7 hours of dual flight instruction in the BHT-206, and 5.7 hours of dual flight instruction in the AS-350. His total experience (including dual flight instruction) in the AS-350 at the time of the accident was 7.9 hours.

Flight and Duty Time

On the day of the accident, the pilot's estimated total helicopter experience was 650 hours. According to prior employer and flight school records compiled by the FAA, the pilot had accumulated 487 hours of verifiable flight experience in helicopters. An additional 125 hours of helicopter experience was estimated to have been accrued while employed by Aero Helicopters, Inc., from September 19 to November 30, 1999 (flight records are missing for this time period). The pilot's total estimated helicopter experience at the time of employment by Coastal Helicopters Inc., on May 5, 1999, was 612 hours.

In the 24 hours prior to the accident, the pilot had flown 2.2 hours. He completed his flights about 1700 on June 8, the day prior to the accident, and was off duty for 14 hours prior to reporting to work the morning of the accident.

The pilot flew each of the nine days prior to the accident. He had flown 13.8 hours in the previous 7 days, and 36.4 hours in the previous 30 days.

Helicopter Experience Claimed By The Pilot

According to New Zealand CAA records, FAA medical records, and employment applications submitted by the pilot, the following progression of flight time was presented by the pilot:

Date(s)	Flight Experience	Source

August 22, 1995 82 hours(microlight),10(other) New Zealand CAA records April 24, 1998 47 hours(helo) to date private pilot application June 25, 1998 157 hours(helo) to date commercial pilot application September 18, 1998 203 hours(helo) to date flight instructor application March 11, 1999 804 hours(helo) resume submitted to Coastal Helicopters March 15, 1999 800 hours(helo) second class medical application May 11, 1999 891 hours(helo) Crew Information Sheet-Coastal Helicopters

Helicopter Experience Verified By FAA

The following flight hours were determined by the FAA to have been accrued by the pilot between September 1998 and May 5, 1999:

Sept 19-Nov 30, 98 125 hours estimate by Aero Helicopters, Inc. Dec 1, 98 - May 5, 99 283.6 hours(helo) Guidance Helicopters, Inc. pay records

According to the FAA inspector who verified the pilot's flight experience, when the pilot's employer at Aero Helicopters, Inc., was asked for a summary of his flight time, he was told the records were not available. The employer stated that he had not discarded the records, and he believed the pilot removed them when he terminated his employment. Aero Helicopters, Inc., estimated that as a flight instructor, the accident pilot would have averaged 50 hours per month of flight time. The estimated experience gained while employed at Aero Helicopters, Inc., was 125 hours.

Ultralight Vehicle Experience

In a letter he sent to Coastal Helicopters, Inc., on March 9, 1999, the pilot stated: "I started as a fixed wing pilot flying tailwheel aircraft... . I have 800 helicopter hours and am averaging 80-100 hours per month at present plus have 600 hours of tailwheel fixed wing." Research revealed that he had accumulated about 500 hours in microlight (ultralight) aircraft in New Zealand.

14 CFR Part 103, Ultralight Vehicles, contains the following regulatory statements:

"103.1 ...an ultralight vehicle is a vehicle that... (c) Does not have any U.S. or foreign airworthiness certificate..." "103.7...ultralight vehicles...are not required to meet the airworthiness certification standards specified for aircraft....(b) ...operators of ultralight vehicles are not required to meet any aeronautical knowledge, age, or experience requirements...or to have airman or medical certificates..."

FAA Order 8700.1 (General Aviation Inspector's Handbook), Volume 2, Chapter 1, page 1-46 and 1-47, paragraph 9B states, in its entirety:

"B. Logging Time. Unless the vehicle is type certificated as an aircraft in a category listed in

FAR 61.5(b)(1) or as an experimental aircraft, or otherwise holds an airworthiness certificate, flight time acquired in such a vehicle may not be used to meet requirements of FAR 61 for a certificate or rating or to meet the recency of experience requirements."

The NTSB IIC, the FAA, and the New Zealand CAA, requested the pilot's logbook from his family. The family responded that the pilot's logbook and all flight records were cremated with his remains.

AIRCRAFT INFORMATION

The helicopter was an American Eurocopter AS-350BA. It was equipped with a Turbomeca Arriel-1B turboshaft engine. The helicopter was configured to carry one pilot and six passengers.

The helicopter was maintained on the manufacturer's inspection program, under an Approved Aircraft Inspection Program (AAIP). This program contains inspections performed approximately every 100 hours. The helicopter and engine were manufactured in January 1995, and both had accumulated 1,827 hours in service at the time of the accident. 62 hours had elapsed since the most recent 100 hour inspection. A review of maintenance records revealed no evidence of preexisting anomalies at the time of the accident.

The allowable maximum weight of the helicopter was 4,630 pounds. The NTSB IIC estimated the weight at the time of the accident to be 4,366 pounds.

Required Equipment

All equipment required by 14 CFR Part 91.205, 207, 209, and 135.149, 159, and 161, was installed on all company helicopters.

The company was authorized to operate the helicopter in day and night VFR conditions. 14 CFR Part 135.159, Equipment Requirements: Carrying Passengers Under VFR At Night, states, in part: "No person may operate an aircraft carrying passengers under VFR at night...unless it is equipped with- (a) A gyroscopic rate-of-turn indicator... (b) A slip skid indicator (c) A gyroscopic bank-and-pitch indicator. (d) A gyroscopic direction indicator..."

METEOROLOGICAL INFORMATION

The nearest official weather reporting station to the accident site is located at the Juneau International Airport, 20 nautical miles south of the accident site. The airport elevation is 19 feet above sea level (msl).

Numerous pilots from different companies were interviewed by the NTSB IIC. All confirmed that weather conditions on the various glaciers flowing from the Juneau Ice Field often vary significantly from that reported at the Juneau airport. The weather conditions tend to be local

in nature due to mountainous terrain, wind, and temperature variations associated with the large mass of ice.

The pilot of the second company helicopter on the Herbert Glacier who found the wreckage stated "the light was flat and very difficult to distinguish terrain from the overcast....a milky blur."

Numerous photographs were taken by rescue personnel, and the Alaska State Troopers, about one hour after the accident. A review of these photographs by the NTSB IIC showed the pass between the Herbert Glacier and the Mendenhall Glacier obscured, with no discernible horizon, when looking at the pass from the accident site. The view looking down the Herbert Glacier from the accident site depicted an overcast ceiling which sloped up with the terrain, gradually lowering toward the upper elevations.

Weather observations for the Juneau International Airport, for the time periods of each flight the pilot took while employed by the company revealed the following:

The weather observation at the Juneau airport, at 0952 on the day of the accident, was 1,700 feet broken; 2,500 feet overcast; visibility 10 miles; temperature 52 degrees Fahrenheit; dew point 46 degrees Fahrenheit, winds 220 degrees at 6 knots.

The weather observation at the Juneau airport, at 1053 on the day of the accident, was 1,600 feet scattered; 2,100 feet overcast; visibility 10 miles; temperature 52 degrees Fahrenheit; dew point 46 degrees Fahrenheit, winds 210 degrees at 5 knots. This was the lowest weather reported at the Juneau airport during any time period in which the pilot flew since he was hired.

The reported weather at the airport during the pilot's training and check flights in the BHT-206 was 8,000 feet ceilings and 10 miles visibility. The lowest reported weather during AS-350 training was 2,500 feet scattered; 3,500 feet overcast; 10 miles visibility in light rain. The weather during the pilot's check flight in the AS-350 was clear, with unlimited visibility.

According to company records, the pilot had flown to and from the Herbert Glacier on 31 occasions prior to the accident flight. He had flown from the Herbert Glacier to the Mendenhall Glacier via the Upper Herbert Glacier Pass, on 11 flights, on 5 different days. According to the company president, the preferred tour route would be to fly up the Herbert Glacier, cross the upper pass to the Mendenhall Glacier, and then down the Mendenhall Glacier to the Juneau airport. The company president indicated the reason the pilot would fly up the Herbert Glacier, and return via the same route, would be due to low ceilings which closed the pass to the Mendenhall.

The Juneau International Airport weather on the five previous days the pilot had flown through the upper Herbert Glacier pass to the Mendenhall Glacier, was:

May 21 3,000 feet scattered, 4,200 feet overcast, 10 miles visibility June 4

2,500 feet scattered, 7,000 feet overcast, 10 miles visibility June 6 14,000 feet scattered, 10 miles visibility June 7 clear June 8 5,500 feet broken, 10 miles visibility

COMMUNICATIONS

At 1008 the pilot of the accident helicopter requested, and was cleared by the Juneau Air Traffic Control Tower for, a west Spaulding Meadows departure.

About 1045, two tour pilots overheard the accident pilot transmit "upper Herbert for the Mendenhall, right side."

The company radio log has the following entries: 1010: "99S -->Herbert" 1014: "07S -->Herbert" 1023: "686 -->Herbert" 1056: "07S 99S down HBT Upper HBT"

At 1058, the company operations log has the entry "07S...99 down." At 1056, the Glacier Fire Department log has the entry "Herbert Glacier...7 total" and the company telephone number.

No radar coverage is available in the area of the accident.

WRECKAGE AND IMPACT INFORMATION

Two investigators from the NTSB, and representatives of the FAA, American Eurocopter Corporation, and Turbomeca Engine Corporation, began the on-site investigation about 1000 on June 10.

The helicopter fuselage and cabin came to rest inverted about the 3,400 feet msl level of the Herbert Glacier. The surface of the glacier consisted of smooth, soft, snow. There was a 0.5 degree upward slope in the direction of the helicopter's flight path. The longitudinal centerline of the helicopter was oriented 140 degrees magnetic. The fuselage, and all major components, were located in a crater which measured 16 feet wide, 24 feet long, and 6 feet deep. The manufactured dimensions of the helicopter cabin and fuselage (excluding tail boom) was about 6 feet wide, 15 feet long, and 6 feet high. The long axis of this crater was oriented 140 degrees magnetic. The leading edge of the crater was angled between 30 and 45 degrees below the horizon.

The upper surface of the tail boom remained oriented upwards. The tail boom remained aligned with the centerline of the fuselage underside. The tail boom buckled downward immediately aft of the bulkhead where it joined the fuselage. The vertical stabilizer and tail rotor assembly separated from the tail boom immediately forward of the tail gear box, and was located in the crater on top of the fuselage.

The debris field was oriented along a main axis of 140 degrees magnetic, and extended in a fan shaped pattern 60 degrees to the right, and 55 degrees to the left, of 140 degrees.

Lightweight debris, such as plexiglass, plastic, and aluminum, was distributed for a distance of 110 feet on the right side, and a distance of 185 feet on the left side, of the debris field. No marks were observed in the unbroken snow surface leading to the impact crater.

The engine was partially broken free of its mounts, and was resting on the aft end of the main transmission housing. The main transmission mounts were fractured, and the transmission was rotated forward, and to the right of, its normal location on the upper deck of the cabin structure.

The main rotor head composite star had a complete fracture of both the red and yellow star arms. Both fractures extended from near the star tip on the leading edge, toward the star hub at the trailing edge. The blue star arm was intact.

The tip of the red main rotor blade was located 10 feet below the snow surface, with the leading edge pointed opposite the direction of debris travel, 40 degrees below the horizon. The red blade grip was completely splintered and delaminated. The trailing edge of the red blade was splintered and delaminated along its entire length. The red pitch change rod was bowed opposite the direction of rotation, and fractured at midspan.

The yellow main rotor blade trailing edge was delaminated along its entire length. The yellow pitch change rod was bowed opposite the direction of rotation of the hub.

The blue main rotor blade trailing edge was delaminated along its entire length. The blue blade was fractured vertically downward, perpendicular to the spar, about 1/3 span out from the blade hub.

All six main rotor vibration damper spring assembly retaining bolts were sheared off flush with their mounting plate, with metal smearing opposite the direction of rotation.

The trailing edge of the right horizontal stabilizer had two upward cuts which aligned with the tail rotor blades' plane of rotation. All tail rotor hanger bearings were dislodged from their support races. The tail rotor drive shaft was deformed in a downward direction, and had black rotational smears in the area of each hanger bearing. The tail rotor gearbox and pitch change mechanism turned and functioned freely. Both tail rotor pitch change links were deformed opposite the direction of normal rotation. One tail rotor blade spar was completely fractured at the blade root. The fracture was oriented 90 degrees to the spar. The other tail rotor blade had three fractures oriented 90 degrees to the spar, spaced equally along the length of the blade, with broom straw type delaminations. The three ears on the engine output flange flexible coupling to the tail rotor drive shaft were deformed opposite the normal direction of rotation. No preaccident anomalies were noted with the tail rotor controls.

No preaccident fuel system anomalies were noted. The fuel tank was ruptured, and contained about 10 gallons of a clear fluid which smelled and felt like jet fuel.

An external inspection of the engine revealed torsional deformation of the flexible couplings at the output drive to the tail rotor drive shaft. The aft flexible coupling connecting the engine to the main transmission drive shaft was separated from the drive shaft and was not recovered. The engine front support cover surrounding this shaft flange was fractured around its internal circumference and had extensive rotational damage and scoring. The exhaust duct had ductile crushing. The spinner on the engine centrifugal compressor inlet had uniform, circumferential scoring on its entire surface.

The helicopter was airlifted from the glacier to a hangar in Juneau on June 11 for detailed inspection. Continuity of flight controls was established from the cyclic and collective, to the rotating swashplate, except for one missing section of input rod to the right-hand roll servo. Microscopic inspection of the fracture surfaces on the matching surfaces of the missing section revealed no indication of preimpact damage.

The inside of the coupling tube covering the drive shaft between the engine output and the main transmission input had rotational scoring and machining marks. The three ears on the main transmission input flange were all deformed in a forward direction, toward the transmission. The flange at the engine end of the engine to transmission drive shaft was not located. Machining marks and smeared metal were evident on the teeth of the engine to main transmission output shaft spline. Microscopic inspection of the fracture surface on the engine end of the drive shaft joining to the missing flange did not reveal any indication of progressive failure or preimpact anomalies. The edges of the fractured shaft did not appear deformed forward, toward the main transmission, nor did the edges have impact damage in an aft-to-forward direction.

No evidence of preimpact mechanical anomalies was found.

MEDICAL AND PATHOLOGICAL INFORMATION

A postmortem examination was performed on the pilot by the Alaska State Medical Examiner, 5700 East Tudor Avenue, Anchorage, Alaska, on June 11, 1999. The cause of death was noted to be deceleration injuries sustained in the accident.

Toxicological samples were tested at the FAA Civil Aeromedical Institute, Oklahoma City, Oklahoma, on July 12, 1999. All tests were negative.

SURVIVAL ASPECTS

The helicopter cabin collapsed, with no livable volume remaining. The helicopter came to a stop within a distance of 16 feet.

TESTS AND RESEARCH

The engine was disassembled at the Turbomeca Engine Corporation's factory in Grand Prairie,

Texas, on July 27, 1999. The disassembly inspection was attended by the NTSB IIC, the operator's president, and a technical representative of Turbomeca. Uniform circumferential rotational damage was found on all blades in the axial compressor, and on the leading edges of all vanes of the centrifugal compressor. Pieces of red-colored drive shaft flexible couplings were found in the compressor outlet diffuser. Rotational rub marks and metal scrapings were evident on both compressor stage shrouds, and on both the gas generator and power turbine shrouds. Molten metal deposits were found throughout the gas path. No preaccident anomalies were noted.

The main transmission was disassembled at the American Eurocopter Corporation's factory in Grand Prairie on July 28, 1999. The inspection was attended by the NTSB IIC, the operator's president, and a technical representative of Eurocopter. No preaccident anomalies were noted with the main transmission.

The main rotor head uniball bearing assembly was distorted, with no sharp lips or grooves. The NTSB IIC did a side-by-side comparison to two other uniball assemblies involved in accidents involving severe ground impact with the rotor system under power. No difference between the damage patterns on the three uniballs was apparent.

Microscopic inspection of the main transmission input quill gear conical roller bearing assembly at the NTSB materials laboratory on September 9, revealed severe rotational metal flow and heat damage to the forward faces of the bearing rollers. This bearing assembly is located at the forward end of the engine to main transmission drive shaft. The assembly is mechanically connected to the engine through the drive shaft and two couplings. During normal operation, the tapered bearing rollers are radially loaded, and the bearing end faces have no loads applied to them.

The front engine support cover was tested at the NTSB materials laboratory on September 9, for comparison to samples of metallic debris removed from the engine gas path. The energy dispersive spectroscopic (EDS) analysis showed the elemental peaks from the gas path debris samples did not match the spectrum from the front engine support cover, or the engine to transmission drive shaft.

Numerous flight control system components were examined at the NTSB materials laboratory on September 7. No preimpact anomalies were noted with any of the fractured surfaces.

The following instrument needle readings were determined by examination at the NTSB materials laboratory on September 7: Airspeed = 130 knots Turbine Outlet Temperature = 750 degrees Celsius (maximum continuous is 775 degrees Celsius) Vertical Speed = minus 3,000 feet per minute Fuel Quantity = 65%

ADDITIONAL INFORMATION

Company Induced Pressure

On June 30, the NTSB IIC interviewed the owner of the New Zealand helicopter company which had provided the pilot with initial helicopter flight training prior to his relocation to the United States. The owner has accrued over 20,000 hours of flight experience, and is the New Zealand equivalent of a U.S. designated pilot examiner (DPE). The accident pilot called the New Zealand owner about June 2, immediately after returning from a tour flight in Juneau, and inquired about employment opportunities. The New Zealand owner told the NTSB IIC that the pilot was displeased with the environment and pressures to fly in marginal weather. He told the NTSB IIC that the pilot was uncomfortable flying a load of tourists in marginal conditions, and so his boss had taken another aircraft, and told the pilot to follow him. According to the New Zealand owner, the accident pilot told him "he had been in a clear cell following his boss in between and surrounded by clouds, unable to land because of terrain." The New Zealand owner told the IIC that the accident pilot's exact words were that "he was living on borrowed time, and that it was bull----." The New Zealand owner said the accident pilot felt pressured by his company to fly in bad weather.

The company president stated to the NTSB IIC that he had not flown tourists within three days either side of when the pilot had called New Zealand. He indicated that the chief pilot occasionally would take a separate helicopter and "lead" new employees on routes where they may not have been before, or recently. Neither could remember this specific incident.

The NTSB IIC interviewed the owner of Guidance Helicopters, Inc., the previous company for whom the pilot worked. The owner said that about June 1 (8 days prior to the accident) the pilot had called him, and expressed dissatisfaction with the training he had received, and also indicated he felt pressured to fly tours in marginal weather.

Company Information

At the time of the accident, the company operated a fleet of two BHT-206, and four AS-350 helicopters. The operator was authorized to conduct on-demand passenger carrying operations, under day and night, VFR conditions. None of the helicopters were equipped with radar altimeters, nor were they required to be. Radar altimeters are designed to depict the actual altitude above the surface over which an aircraft is flying. All helicopters operated by Coastal Helicopters, Inc., were equipped with standard flight instruments including airspeed, vertical speed, barometric altimeters, and gyroscopic pitch-and-bank indicators.

The company president/director of operations functions as the only FAA approved check airman. He performs the FAR 135.293/299 proficiency checks for company. He is the only instrument rated management pilot. He also holds a flight instructor certificate in helicopters.

The chief pilot for the company holds a flight instructor certificate in helicopters. He did not hold an instrument rating at the time of the accident. The chief pilot performs the majority of flight training for pilots, who then receive flight checks from the president/director of operations/company check airman.

Manuals-General

Flight crewmember training is affected by several documents: Company Operations Manual, Company Training Manual, Operating Specifications, Federal Aviation Regulations (FARs), and FAA Orders.

The FARs require an air carrier operating under 14 CFR Part 135 to have an approved training program. Without an approved training program, a company may not legally operate. An original training program must be submitted to the FAA Principal Operations Inspector (POI) prior to any operations. This training program is to be reviewed and approved by the FAA POI, who is required to follow the guidance contained in FAA Order 8400.10 (Air Transportation Operations Inspector's Handbook). Any changes to the operator's Training Manual must be approved by the POI prior to being implemented.

FAA Order 8400.10 does not have the binding force of regulation for an air carrier. It is the guidance provided to FAA inspectors, and is considered the national policy guidelines for the Flight Standards Service of the FAA. These guidelines are passed to the air carriers by incorporation into the Operating Specifications, and issuance or withdrawal of approvals for Company Training Manuals.

Company Ground and Flight Training

The FAA approved training program for Coastal Helicopters, Inc., states on page 1-15 that pilots-in-command (PIC) must have 500 hours time as a pilot.

FAA Order 8400.10, paragraph 373, table 3.2.3.1, states that Initial New-Hire Flight Crewmember Basic Indoctrination Training hours for VFR Only Helicopters should be a minimum of 16 hours. The company's FAA approved training program requires that pilots undergoing new hire and initial training be given 12 hours of basic indoctrination training, and 4 hours of hazardous material training, for a total of 16 hours. Company records indicated the pilot received a total of 16 hours of Basic Indoctrination and Aircraft Ground Training between May 8, and May 11, 1999.

Table 3.2.5.1, Flightcrew Aircraft Ground Training Hours - National Norms (Thresholds), specifies a national norm for Helicopter-VFR Only-Initial New Hire training of 24 hours, and a (threshold) of 16 hours. The FAA approved Aircraft Ground Training Hours in the company Training Program was 16 hours. No record of separate Aircraft Ground Training other than that provided during Basic Indoctrination Training was found.

FAA Order 8400.10, chapter 3, paragraph 433, Training Hours, states in part: "Table 3.2.5.1 provides direction and guidance for determining acceptable training hours for aircraft ground training curriculum segments....The table provides two sets of training hours...(1) The first set is considered to be the national norms and reasonable training support is presumed such as

proficient instructors, well-organized courseware, and modern training devices or aids. The national norm must not be construed as always acceptable....A POI (Principal Operations Inspector) may need to require more hours because of inadequate training support. Conversely, training hours less than the national norm may be fully acceptable due to the use of highly sophisticated and modern training methods, the use of less complex aircraft, or the use of a less complex type of operation. (2) The second set of training hours, in parenthesis, is an established threshold for training hours....When granting approval to a curriculum segment with training hours below the established threshold training hours, POI's must notify AFS-200..."

FAA Order 8400.10, Table 3.2.6.3, Flight Training Hours (National Norms) specifies 4 hours of flight training for Helicopter-VFR Only operations. The FAA approved training program specified 4 hours of flight training. The FAA approved training program specifies 4 hours of aircraft specific ground training (for the BHT-206), and 5 hours of aircraft specific ground training (for the AS-350). Company records indicated the pilot received 4.5 hours of aircraft specific ground training in the BHT-206, and 5.5 hours in the AS-350.

On one page of the Training Manual, the FAA approved training program specifies 1 hour be spent on "special subjects" training. On another page of the Training Manual, 4 hours is specified. It is not clear which was used during the actual training. Seven special subjects modules are to be covered. Modules 24, 27, and 30, include "flight techniques in adverse weather," "gathering and interpreting weather information and trends," and "mountain flying-general and specific pass flying.

A review of the Training Manual syllabus outline revealed module 24 ("flight techniques in adverse weather") included "problems-no horizontal visibility," and "escaping from severe weather situations, in case of inadvertent encounters." Subjects include ice fog, recognizing and avoiding severe weather situations, and escaping from severe weather situations, in case of inadvertent encounters. No specific mention of whiteout or flat light conditions caused by overcast clouds over glaciers, or flight techniques over large expanses of snow, was mentioned in the training syllabus outline.

Module 27, "gathering and interpreting weather information and trends," included the objective "to provide the pilot with the knowledge and resources to safely and efficiently cope with the changing weather situation." The subjects section of this module included, in part: "inflight techniques-warm front flying, cold front flying, mountain passes."

Module 29, "techniques for landings and takeoffs" included the subjects "deep snow, and hard packed and drifting snow."

Module 30, "mountain flying" included "weather, and specific pass flying."

Check Airman Procedures

FAA Order 8400.10, Change 7, chapter 3, paragraph 539 states, in part: "PART 135 BASIC CHECKING MODULE. The flight test required to qualify a pilot for revenue service is termed a basic checking module.... Operators must design the basic checking module to satisfy the requirements of FAR 135.293. FAR 135 does not specify the maneuvers (events) which must be accomplished on a competency check. The rule authorizes the Administrator or check airman to make this determination. ...Since operators may be authorized to conduct VFR-only operations...separate requirements have been established for VFR-only competency checks....As a matter of national safety policy, however, some demonstration of competency of the pilot's ability to maneuver the aircraft solely by reference to instruments will be included on each competency check. For VFR competency checks, this demonstration will be appropriate to the aircraft's installed equipment and the operating environment."

FAA POIs, and FAA approved company check airmen, conduct pilot flight checks of the maneuvers listed on FAA Form 8410.3, "Airman Competency/Proficiency Check." The person conducting the check may waive some of the maneuvers listed on the 8410.3 if the ability to successfully complete that maneuver can be demonstrated through a combination of the remaining maneuvers which are performed. FAA Order 8400.10 provides POIs guidance on which items must be accomplished based on the type of operation the company is authorized to conduct, and the types of aircraft being operated by the company and the pilot.

FAA Order 8400.10, paragraph 545, Conduct of Proficiency and Competency Checks, states in part: "The use of waiver authority is not automatic. Check airmen are cautioned to exercise judgment in the use of this authority." Figure 3.2.7.4, Part 135 Checking Modules-Helicopters, specifies, under VFR COMPETENCY, that pilots should demonstrate proficiency in unusual attitude recoveries, maneuvering by partial panel, and be able to complete an instrument approach. The following note is appended to the instrument approach section: "POI's shall ensure applicants accomplish this event in an aircraft the operator uses in revenue operations. The event should reflect a realistic course of action the pilot might take to escape from an inadvertent encounter with IFR conditions. POI's should approve methods appropriate to the aircraft, equipment, and facilities available."

The FAA POI did not require that any instrument proficiency training, or any instrument competency evaluation, be included in the company training manual.

The NTSB IIC asked the chief pilot if he conducted any training for emergency use of basic flight instruments. He replied that he never did, and emphasized the company policy was to "go down, and slow down, but never go into instrument conditions." When asked what he would personally do if he found himself in a whiteout, or instrument meteorological conditions (IMC) situation, he indicated he was not sure, because he never intended to be in that situation.

The company president, who also functions as the director of operations, was questioned by the NTSB IIC regarding the training and use of the gyroscopic pitch-and-bank indicator, and basic aircraft control by reference to instruments. He stated that the company policy was that no basic instrument or emergency instrument training was conducted. The company policy

was that a pilot just does not fly into instrument conditions.

Pilot Records Improvement Act of 1996 (PRIA)

The PRIA (Public Law 104-264-October 1996) requires that new employers request employment information for the previous five year period, but allows helicopter companies, for unscheduled operations, to employ a pilot for 90 days while waiting for background information. The company had not received complete employer responses under PRIA at the time of the accident. Coastal had received a favorable letter of recommendation from Guidance Helicopters, Inc., about six months prior to the accident. Additionally, the president of Coastal told the NTSB IIC he had received three additional written, favorable, responses concerning the accident pilot's abilities prior to employing the pilot.

The records that must be provided are records pertaining to the training, qualifications, proficiency or professional competence of the individual, including comments and evaluations made by a check airman. Flight and duty records of a pilot are not required to be provided.

The PRIA states that the FAA and air carriers shall maintain pilot for a period of at least 5 years. 14 CFR Part 135.63(b) requires an air carrier to maintain records on a pilot crewmember for 12 months.

The records required to be maintained for this 12 month period include: "135.63(a)(iii) The pilot's aeronautical experience in sufficient detail to determine the pilot's qualifications to pilot aircraft in operations under this part. (iv) The pilot's current duties and the date of the pilot's assignment to those duties....(vi) The date and result of each...competency and proficiency and route checks required by this part...(vii) The pilot's flight time in sufficient detail to determine compliance with the flight time limitations of this part....(ix) Any action taken concerning the pilot's release from employment...(x) The date of the completion of...each...phase of the training required by this part."

Under PRIA, previous employers were not required to provide total flight time flown while employed as a flight crewmember. Coastal Helicopters, Inc., would not have received flight time information to validate the accuracy of the pilot's resume or application.

Wreckage release

The retained components were released to the owner's representative on June 13, and September 15, 1999.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	29,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	March 15, 1999
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	650 hours (Total, all aircraft), 8 hours (Total, this make and model), 604 hours (Pilot In Command, all aircraft), 38 hours (Last 90 days, all aircraft), 36 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Eurocopter	**Registration:**	N6099S
Model/Series:	AS-350BA AS-350BA	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2810
Landing Gear Type:	Emergency float; High skid	**Seats:**	7
Date/Type of Last Inspection:	May 5, 1999 100 hour	**Certified Max Gross Wt.:**	4630 lbs
Time Since Last Inspection:	62 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	1827 Hrs	**Engine Manufacturer:**	Turbomeca
ELT:	Installed, not activated	**Engine Model/Series:**	ARRIEL 1B
Registered Owner:	COASTAL HELICOPTERS, INC.	**Rated Power:**	641 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	XCHA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	
Lowest Ceiling:	Overcast / 800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	, AK (JNU)	**Type of Flight Plan Filed:**	Company VFR
Destination:		**Type of Clearance:**	None
Departure Time:	10:10 Local	**Type of Airspace:**	Class G

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	6 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	7 Fatal	**Latitude, Longitude:**	58.579051,-134.770751(est)

Administrative Information

Investigator In Charge (IIC):	Thomas, Matthew
Additional Participating Persons:	BOYCE BINGHAM(FAA FSDO); JUNEAU , AK ARCHIE WHITTEN (TURBOMECA); GRAND PRAIRIE , TX ROBERT REUHLIN(EUROCOPTER); GRAND PRAIRIE , TX CLINTON O JOHNSON (NTSB); ANCHORAGE , AK
Original Publish Date:	August 3, 2000
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=46562