



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	SPARREVOHN, AK	<b>Accident Number:</b>	ANC97FA024
<b>Date &amp; Time:</b>	01/29/1997, 2310 AST	<b>Registration:</b>	N702SC
<b>Aircraft:</b>	de Havilland DHC-4A	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	1 Fatal, 1 Serious
<b>Flight Conducted Under:</b>	Part 135: Air Taxi & Commuter - Non-scheduled		

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## Analysis

The CFR Part 135 cargo flight (flt) departed at night on an IFR flt with a load of mining equipment. Route of flt was over remote/mountainous terrain. About 2 hrs after takeoff, while cruising at 12,000' msl, the right engine (#2 eng) & propeller began to overspeed. The captain (capt) feathered the #2 eng & declared an emergency. He began to divert to an alternate destination, about 120 miles away in an area of lower terrain, but the aircraft (acft) would not maintain altitude (single eng service ceiling, as loaded, was about 8,700'). The capt increased power to the #1 eng, but it began to produce banging & coughing noises. The capt elected to perform an emergency landing at a nearby, remote, military airfield (A/F). The A/F was located in mountainous terrain & had a one-way, daylight only approach. The capt lowered the gear & flaps, & began a visual approach while attempting to keep the runway end identifier lights (REIL) in view. The acft encountered severe turbulence, & the capt applied full throttle to the #1 eng in an attempt to climb. The REIL disappeared from view, & the acft collided with snow covered terrain about 2 miles west of the A/F. Ground personnel at the A/F reported high winds & blowing snow with limited visibility. Postcrash exam of the #2 eng revealed a loss of the propeller control system hydraulic oil. Flt at 12,000' was conducted without crew oxygen. The crew had exceeded their maximum allowable duty day without adequate crew rest.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: loss of the right engine propeller control oil, which led to an overspeed of the right engine and propeller, and necessitated a shut-down of the right engine; and failure of the pilot to maintain adequate altitude/distance from terrain during visual approach for a precautionary landing at an alternate airport. Factors relating to the accident were: fluctuation of the left engine power, premature lowering of the airplane flaps, and an encounter with adverse weather conditions (including high winds, severe turbulence, and white-out conditions) during the approach.

## Findings

Occurrence #1: PROPELLER FAILURE/MALFUNCTION

Phase of Operation: CRUISE

### Findings

1. (C) PROPELLER SYSTEM/ACCESSORIES, HYDRAULIC PITCH CTL - LEAK
2. MISCELLANEOUS, ENGINE - OVERSPEED
3. PROPELLER FEATHERING - PERFORMED - PILOT IN COMMAND

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Occurrence #2: LOSS OF ENGINE POWER

Phase of Operation: EMERGENCY DESCENT/LANDING

### Findings

4. (F) 1 ENGINE - FLUCTUATING
5. PRECAUTIONARY LANDING - INITIATED - PILOT IN COMMAND
6. (F) LOWERING OF FLAPS - PREMATURE - PILOT IN COMMAND
7. (C) ALTITUDE/CLEARANCE - NOT MAINTAINED - PILOT IN COMMAND
8. OXYGEN SYSTEM - NOT USED - FLIGHTCREW
9. FATIGUE (FLIGHT AND GROUND SCHEDULE) - FLIGHTCREW

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Occurrence #3: IN FLIGHT ENCOUNTER WITH WEATHER

Phase of Operation: APPROACH

### Findings

10. (F) WEATHER CONDITION - HIGH WIND
11. (F) WEATHER CONDITION - TURBULENCE, TERRAIN INDUCED
12. (F) WEATHER CONDITION - WHITEOUT

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Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: APPROACH

### Findings

13. TERRAIN CONDITION - MOUNTAINOUS/HILLY
14. TERRAIN CONDITION - SNOW COVERED

## Factual Information

### HISTORY OF THE FLIGHT

On January 29, 1997, about 2310 Alaska standard time, a De Havilland DHC-4A, N702SC, collided with terrain about 2.2 miles west of Sparrevohn Long Range Radar Station (LRRS), Sparrevohn, Alaska. The airplane was being operated as an instrument flight rules (IFR) cargo flight to Kenai, Alaska, under Title 14 CFR Part 135 when the accident occurred. The airplane, operated by South Central Air, Kenai, Alaska, was destroyed. The captain, a certificated commercial pilot, received serious injuries. The first officer, a certificated airline transport pilot, received fatal injuries. Visual meteorological conditions prevailed. An IFR flight plan was filed. The flight originated from St. Mary's, Alaska, about 2105 hours.

The captain reported the crew was involved in transporting mining equipment from Pilot Station, Alaska, to St. Mary's, and had made three trips between the two areas throughout the day. The final load of the day was a large mining air compressor that was secured in the cargo compartment. The flight landed at St. Mary's for fuel and service before departing on the accident flight to Kenai. The captain reported the fuel load was 2,800 pounds, and the cargo weighed 5,300 pounds.

After departure, the first officer was flying the airplane and the flight was progressing at 12,000 feet mean sea level (msl). The intended route of flight was from St. Mary's, via the Sparrevohn VOR, to Kenai. About 10 miles east of the Sparrevohn VOR, the right engine propeller began to overspeed. The captain feathered the right engine, and at 2252:25, the crew declared an emergency with the Anchorage Air Route Traffic Control Center (ARTCC), and reported the flight was diverting to Aniak, Alaska. The captain advised the first officer to perform a 180 turn back to the Sparrevohn VOR, and the flight was cleared by the ARTCC to descend to 6,000 feet. The captain considered making a landing at the Sparrevohn Airport, and requested the ARTCC obtain permission to land at Sparrevohn. The crew requested the weather conditions at Sparrevohn, and the ARTCC controller informed them the wind was calm, the visibility was 10 miles, and the sky condition was 8,000 feet with scattered clouds. At 2254:54, the crew canceled the request for landing at Sparrevohn, stating: "...center, 2SC, yea cancel that request, we'll just go back to Aniak, ah, there's not enough visibility down here to make a visual approach."

En route to Aniak, the captain advanced the power on the left engine, and he reported it began to produce banging and coughing noises. The airplane was unable to maintain altitude, and began descending about 300 feet per minute. At 2258:44, the ARTCC requested the crew change radio frequencies to receive the weather conditions reported in Aniak. The controller asked the crew to verify the flight was descending to 6,000 feet. The crew replied they were unable to maintain altitude. The controller verified the airplane was descending out of 7,700 feet.

At 2302:25, the crew informed the ARTCC of additional engine trouble, and requested the VOR/DME instrument approach to runway 34 at Sparrevohn. The captain took control of the airplane, and with the assistance of the first officer, began preparations for an emergency landing at Sparrevohn. At 2304:40, the crew requested the safest altitude for descent. The controller replied that the minimum altitude within 25 nautical miles is 5,800 feet. At 2305:42, the crew indicated they would fly the published approach and the controller requested the crew advise when they were over the VOR to proceed outbound on the 111 degree

radial to intercept the 12 DME arc. At 2305:58, the crew indicated they were unable to maintain 5,800 feet. At 2306:19, the controller advised the crew to report over the VOR and at 2306:54 the controller stated: "...after you pass the VOR and you're established outbound on the 111 radial, the highest terrain is physically 3,436 feet and that is about half way out to the arc that will be on your left."

At 2307:36, the controller indicated that he observed the airplane at 5,400 feet and the crew concurred. At 2307:57, the crew stated: "...center, ah, we can pick up the runway identifier lights from this position, can we go straight in." The controller replied "... affirmative, if you have the runway, you're cleared for the visual approach, try to report your arrival this frequency." The crew replied in the affirmative, and the captain selected 15 degrees of flap and gear down, and began descending toward the airport while attempting to maintain visual contact with the runway.

At 2308:12, the controller inquired: "... 2SC roger, is that your intention and do you have the runway lights now." The crew replied, "...'unintelligible' have the lights and we're going for them 2SC." The controller inquired if the airplane was landing toward the north or toward the south. At 2309:09, the crew replied: "...only one approach to Sparrevohn sir 'unintelligible' north."

The captain reported the airplane encountered severe turbulence from the surrounding mountainous terrain, and he applied full power on the left engine to attempt a climb. During the turbulence encounter, the captain lost visual contact with the runway lights, and at 2309:30, the crew stated to the ARTCC controller: "...get them, can you call Sparrevohn sir and have them turn their lights on pronto." The captain recalled that he called for gear and flaps "up." He observed the left engine manifold gauge indicating 50 inches. The airplane then collided with snow covered, upsloping terrain in an area of high winds and blowing snow.

The accident occurred during the hours of darkness at latitude 61 degrees, 06.186 minutes north and longitude 155 degrees, 38.346 minutes west.

#### CREW INFORMATION

The captain holds a commercial pilot certificate with airplane single-engine land, single-engine sea, multi-engine land, and instrument airplane ratings. In addition, the captain holds a mechanic certificate with airframe and powerplant ratings, and a type rating for the DHC-4 airplane. The most recent first-class medical certificate was issued to the pilot on December 13, 1996, and contained no limitations.

The captain is a check airman for all company pilots. He received an FAA proficiency check pilot authorization for DHC-4 airplanes, second-in-command only, on April 16, 1996. The captain received his initial and upgrade training for pilot-in-command in DHC-4 airplanes on September 29, 1995, which included 9 hours of flight training.

According to pilot records provided by the operator, the captain's total aeronautical experience consists of about 4,987 hours, of which about 220 hours were accrued in the accident airplane. In the preceding 90 and 30 days prior to the accident, the captain accrued a total of 120 and 41 hours respectively.

Examination of the captain's flight and duty records revealed he accrued .7 flight hours between 0700 and 1730 on January 27, 1997. On January 28, 1997, the captain's duty hours from 0700 and 1700, did not include any flight time. On the accident date, January 29, 1997,

the captain's duty record indicated he reported to work at 0700. The operator reported that company personnel made that entry in error, without the captain's knowledge. The captain indicated he actually started work at 0900. The anticipated arrival time in Kenai for the accident flight was 2400.

The first officer held an airline transport pilot certificate with airplane single-engine land, multi-engine land, and instrument airplane ratings. He also held a flight instructor certificate with airplane single-engine and instrument airplane ratings. In addition, the first officer held a mechanic certificate with airframe and powerplant ratings. The most recent first-class medical certificate was issued to the first officer on August 26, 1996, and contained the limitation that the pilot must wear corrective lenses for near and distant vision.

The first officer was hired by the operator and began initial ground training on August 26, 1996. On August 29, 1996, the first officer concluded his initial flight training and passed a check ride in the DHC-4 airplane with IFR and second-in-command privileges. The first officer's duties also included maintenance work on company airplanes, and as the pilot of Cessna 207 airplanes.

According to the operator, the first officer's total aeronautical experience consisted of about 1,823 hours, of which 589 hours were second-in-command. The first officer had accrued 35 hours in the accident airplane. In the preceding 90 and 30 days prior to the accident, the first officer accrued a total of 37 and 6 hours respectively.

Examination of the first officer's flight and duty records revealed he accrued .7 flight hours between 0800 and 1730 on January 27, 1997. On January 28, 1997, the first officer's duty hours from 0800 and 1700, did not include any flight time. On the accident date, January 29, 1997, the first officer reported to work at 0830.

Title 14, Code of Federal Regulations (FAR) 135.267 Flight time limitations and rest requirements: Unscheduled one and two pilot crews, states, in part: (b) Except as provided in paragraph (c) of this section, during any 24 consecutive hours the total flight time of the assigned flight when added to any other commercial flying by that flight crewmember may not exceed - (1) 8 hours for a flight crew consisting of one pilot; or (2) 10 hours for a flight crew consisting of two pilots qualified under this Part for the operation being conducted. (c) A flight crewmember's flight time may exceed the flight time limits of paragraph (b) of this section if the assigned flight time occurs during a regularly assigned duty period of no more than 14 hours and- (1) If this duty period is immediately preceded by and followed by a required rest period of at least 10 consecutive hours of rest; (2) If flight time is assigned during this period, that total flight time when added to any other commercial flying by the flight crewmember may not exceed - (i) 8 hours for a flight crew consisting of one pilot; or (ii) 10 hours for a flight crew consisting of two pilots; and (3) If the combined duty and rest periods equal 24 hours. (d) Each assignment under paragraph (b) of this section must provide for at least 10 consecutive hours of rest during the 24 hour period that precedes the planned completion time of the assignment.

#### AIRCRAFT INFORMATION

The airplane was maintained according to an approved aircraft inspection program (AAIP). According to the airplane's maintenance records, a phase A2 inspection was completed on December 30, 1996. At that time, the airplane had accrued 13,922.5 hours. All of the engine and component times listed in this report are calculated from the last inspection.

At the time of the last inspection, the left engine, serial number 107257, had accrued 276.6 hours since being overhauled on August 8, 1995. It was installed on the accident airplane on November 25, 1995.

The right engine, serial number 100893, was installed on the airplane on July 11, 1996, and had accrued 152.5 hours since being overhauled on February 20, 1996.

The airplane utilizes constant speed, full feathering, and reversible propellers. The three bladed assembly utilizes an independent oil control (IOC) unit that supplies hydraulic pressure to change the propeller pitch. The IOC is mounted on the propeller shaft at the front of each engine.

The left engine propeller assembly, serial number 194753, was installed on the left engine on November 25, 1995, and had accrued 2,386.9 hours since being overhauled on February 16, 1993. The left engine IOC, serial number 818, was previously overhauled on January 30, 1996. It was installed on the right engine on February 2, 1996, and then removed from the right engine on July 7, 1996, due to leakage. The maintenance records do not reflect when the IOC was last overhauled, or when it was installed on the left engine.

The right engine propeller assembly, serial number 204615, had accrued 682.5 hours since being overhauled on November 12, 1992. The right engine IOC, serial number 538, was also overhauled on November 12, 1992, and was installed along with the propeller assembly on the right engine on January 5, 1993. At that time, the propeller and the IOC had accrued 16.5 hours since being overhauled. The maintenance records do not reflect when the IOC was removed from the right engine. The records reflect that it was overhauled on June 14, 1996, and was again installed on the right engine with propeller assembly 204615, on July 7, 1996. It then accrued 160.1 hours before the last inspection of December 30, 1996.

The operator provided a reconstruction of the airplane's weight and balance sheet for the accident flight. The operator listed the empty weight of the airplane as 19,630 pounds. Examination of the maintenance records indicated the airplane was weighed on August 12, 1994, with a center of gravity of 353.7 inches. An empty weight of 19,630 pounds was noted in the records at that time. On September 24, 1994, 500 pounds of cargo area flooring was removed, and on September 29, 1994, 150 pounds of cargo area carpeting was installed. This resulted in a 350 pound decrease in the airplane's empty weight to 19,280.

In addition to the operator's reconstructed weight and balance sheet that listed the empty weight as 19,630 pounds, the cargo, carried in areas 8 through 11, was listed as 5,300 pounds. Seventy-five pounds of cargo was carried in area 12. The crew weight was listed as 350 pounds, a winch as 180 pounds, and fuel as 2,800 pounds. The takeoff weight of the airplane was listed as 28,335 pounds with a center of gravity as 352.2 inches. The airplane's maximum forward center of gravity is 347.2 inches. The maximum aft limit is 357.1 inches. The airplane's maximum ramp weight is 28,500 pounds. The operator reported the airplane has a fuel burn of about 100 gallons (600 pounds) per hour.

At gross weight, the airplane's single engine service ceiling\* is 8,700 feet.

\*The altitude at which the airplane is able to sustain a steady rate of climb of 100 feet per minute.

#### METEOROLOGICAL INFORMATION

The closest official weather observation station is Sparrevohn, Alaska, located 2.2 miles east of

the accident site. At 2315, a special automated observation was reporting in part: Wind, 170 degrees (true) at 7 knots; visibility, 10 statute miles; clouds, 4,800 feet scattered, 7,000 feet overcast; temperature, -1.7 degrees C; dew point, -6.1 degrees C; altimeter, 28.71 inHg.

At 2235, a special automated observation was reporting in part: Wind, 290 degrees (true) at 4 knots; visibility, 10 statute miles; clouds, 7,000 feet broken; temperature, -2.8 degrees C; dew point, -5.5 degrees C; altimeter, 28.70 inHg.

Sparrevohn facility and rescue personnel reported high winds near 50 knots, and blowing snow with limited visibility.

#### AIDS TO NAVIGATION

The Sparrevohn VOR is located 2 statute miles on a 250 degree magnetic bearing from the airport, at an elevation of 2,501 feet msl. The Sparrevohn radome complex is located about 1.5 miles north of the runway, at 3,034 feet msl.

The NDB/VOR DME approach for runway 34 has an initial approach fix at 5,800 feet on the 064 degree radial at 12 DME from the Sparrevohn VOR. The approach proceeds along a 12 mile arc in a right turn to intercept the 347 degree radial inbound toward the airport. The 111 degree radial from the VOR intersects the arc about half way between the initial approach fix and the final approach course. The instrument approach charts for Sparrevohn include a dialog box that states: "Caution: runway surrounded by mountains. Runway located on slope of 3,236 foot mountain. Approach from south only, land runway 34 only. Successful go-around improbable. Caution: Winds in excess of 20 knots (Radome winds 25 knots) may produce severe turbulence."

#### COMMUNICATIONS

Review of the air-ground radio communications tapes maintained by the FAA at the Kenai Automated Flight Service Station (AFSS) and the Anchorage ARTCC facility revealed that the airplane successively and successfully communicated with each facility.

A transcript of the air to ground communications between the airplane and all involved FAA ATC facilities is included in this report.

#### AERODROME AND GROUND FACILITIES

The airport is a U.S. Air Force facility generally closed to the public and located in remote mountainous terrain. The published elevation of the airport is 1,583 feet mean sea level. The airport is equipped with a single gravel-surfaced runway on a 160/340 degree magnetic orientation. Runway 34 is 4,100 feet long by 150 feet wide, and is equipped with a visual approach slope indicator (VASI). Runway end identifier lights (REIL) that are put into operation upon request only, are installed on runway 34.

The Alaska Supplement/facility directory states, in part: "Caution: Runway surrounded by mountains. Runway located on slope of 3,302 foot mountain. Approach from the south only, land runway 34 only. Successful go-around improbable. Take-off runway 16 only. Caution: Winds in excess of 20 knots (radome winds 25 knots) may produce severe turbulence. Radome winds not always available. Daylight operations only."

#### WRECKAGE AND IMPACT INFORMATION

The National Transportation Safety Board investigator-in-charge (IIC) examined the airplane

wreckage at the accident site on January 31, 1997. At the point of rest, the fuselage was observed on a magnetic heading of 175 degrees in an area of upsloping, snow covered terrain, about 2,000 feet msl. (All heading/bearings noted in this report are oriented toward magnetic north.)

The fuselage was found separated into 3 main segments. The nose section of the airplane, consisting of fuselage and cockpit area, forward of the leading edge of the wing, was torn circumferentially from the center section of the fuselage. The center section, comprised of the entire wing assembly and fuselage, from the leading edge of the wing, aft to the rear loading ramp, was torn and displaced about 4 feet aft of the nose section. A small area of fuselage flooring remained connected between the nose and center sections. The entire tail assembly, beginning at the aft edge of the loading ramp in an aft direction, separated circumferentially from the fuselage and was located about 1/4 mile downslope from the fuselage.

The nose section of the airplane displayed aft and upward crushing of the underside of the cockpit and along the right, lower edge of the cockpit area. The landing gear and flaps both appeared to be in the up position.

The right wing was displaced spanwise in a downward direction about 10 degrees from the fuselage. The left wing was displaced spanwise in a downward direction about 45 degrees. At mid-span, both wings were buckled upward. The wing assembly was canted downward at the leading edge about 15 degrees. A segment of the right wing's leading edge slat, from about 4 feet outboard of the engine nacelle to about midspan was broken and separated from the wing.

Due to the impact damage, the flight controls could not be moved by their respective control mechanisms.

The left engine was displaced downward about 45 degrees. The left engine propeller was broken from the engine case and was located lying between the left engine and the left side of the fuselage. One visible propeller blade was bent aft about midspan.

The right engine appeared undamaged. The propeller assembly remained attached to the engine. One visible propeller blade appeared undamaged and in a near feathered position. Frozen, red hydraulic oil, was visible around the base of the propeller assembly, adjacent to the propeller IOC. Frozen oil was also visible on the ground, around the engine, and on the engine cylinders aft of the propeller assembly. Frozen oil was also visible on the leading edge of the airplane's autofeather pitot tube. The autofeather pitot tube was attached to the airplane at the inboard and aft edge of the right engine cowling, at the upper surface of the wing.

A crew oxygen cylinder was installed behind the first officer's seat. No crew oxygen masks were attached to the cylinder. A portable oxygen cylinder was located in the wreckage. A full-face smoke mask was attached to the cylinder.

#### MEDICAL AND PATHOLOGICAL INFORMATION

A postmortem examination of the first officer was conducted under the authority of the Alaska State Medical Examiner, 5700 E. Tudor, Anchorage, Alaska, on February 3, 1997.

#### SURVIVAL ASPECTS

The airplane's cockpit seats are equipped with lap seat belts and shoulder harnesses. The cockpit area and flooring was deformed and buckled. The captain sustained serious leg and chest injuries. The first officer sustained impact injuries from the instrument panel. Following

the accident, the captain was unconscious for about 40 minutes. He then moved to the cargo area of the airplane in an attempt to remain out of the wind. When search aircraft arrived in the area of the accident, the captain was able to signal the search airplane with a flashlight.

#### SEARCH AND RESCUE

Aerial search personnel located the airplane about 0140. Rescue personnel parachuted to the Sparrevohn runway and with ground personnel from the facility, traveled by military tracked vehicle to a ridge above the wreckage. Rescue personnel reached the airplane about 0340. They reported at the time of the rescue, the tail assembly was still lying adjacent to the aft end of the fuselage.

#### TESTS AND RESEARCH

On May 14, 1997, an examination of the engines and propellers was conducted in Anchorage, Alaska.

The left propeller assembly was broken away from the nose case of the left engine. All three blades were loose in the hub. Disassembly of the propeller revealed the high pitch stop was set at 88 degrees. The low pitch stop was set at -8 degrees. The blades exhibited aft bending and torsional twisting. All of the propeller blade drive pins were bent or sheared. All of the blades exhibited an impact mark on the blade grip shim plate that corresponded to a blade angle of about 21 degrees. The IOC sump was crushed and bent and contained a mix of hydraulic and engine oil. Disassembly of the propeller governor head assembly revealed the input control shaft had several sheared splines on the inboard end of the shaft.

The left engine sustained impact damage to the front portion of the engine. The propeller shaft and reduction drive gear was broken out of the front of the engine. The engine oil screen was free of contaminants. Energizing of the starter, mounted on the rear accessory section of the engine, produced rotation of the accessory gears. No rotation of the supercharger impeller or crankshaft was noted. Two engine cylinders, one each in the front and back row of cylinders, were removed to allow inspection of the engine crankshaft, forward of the intermediate case. No damage to the crankshaft master rod was observed.

The right propeller assembly initially remained attached to the right engine. During recovery of the wreckage, the propeller assembly was removed. An examination and disassembly of the propeller revealed the high pitch stop was set at 88 degrees. The low pitch stop was set at -8 degrees. The blades appeared relatively undamaged. All of the propeller blade drive pins were bent or sheared. One blade exhibited an impact mark on the blade grip shim plate that corresponded to a blade angle of about 86 degrees.

A small amount of red hydraulic oil was present in the IOC sump. The bottom of the IOC sump contained small flakes of carbon. The magnetic chip detector plug was free of metal. The oil filler cap "O" ring was slightly flattened but undamaged. The front and rear sleeve seals were pliable and undamaged. The sump filter screen was free of contaminants. Disassembly of the propeller governor head assembly revealed the input control shaft had several sheared splines on the inboard end of the shaft.

The right engine exhibited a presence of hydraulic oil on the external surface of the engine. The oil screen was free on contaminants. Energizing of the starter, mounted on the rear accessory section of the engine, produced rotation of the accessory gears, the crankshaft, and valve action. Thumb compression in each cylinder was noted, when the crankshaft was

rotated.

The engine propeller governor input control assemblies were submitted to the Safety Board's Materials Laboratory for examination. The governor input spline shafts are manufactured from a hardened steel that is required to be cadmium plated. Examination of both engine input shafts revealed that both were within the design specified hardness. The cadmium coating was damaged on both input shafts. The number 2 engine input shaft displayed evidence of corrosion. Cracking was noted originating from corrosion pits along the spline root surface of several intact splines. An intact spline from both input shafts was purposely broken off. The fracture surfaces were compared to the previously broken splines. The fracture surfaces of both input shaft splines were indicative of ductile overstress separations. No evidence of fatigue cracking was found on any fractured splines.

A Federal Aviation Administration (FAA) airworthiness inspector, Anchorage Flight Standards District Office (FSDO), examined the airplane's emergency locator transmitter (ELT). He reported the ELT batteries were expired, and the "G" switch was inoperative.

#### ADDITIONAL INFORMATION

During the recovery of the airplane, the amount of cargo and the weight of the cargo was noted by recovery personnel. The weight of the mining compressor was recorded by the helicopter pilot from the load meter on the helicopter's external long line. During two lifts of the compressor, the weight totaled 6,500 pounds. The helicopter pilot estimated that each lift weight included 200 pounds of tare weight including the long line, shackles, and straps. The total weight of the compressor was about 6,100 pounds. Additional items in the cargo compartment, including 6 metal loading ramps, were weighed by recovery personnel and totaled 400 pounds. The weight of two hoses, the compressor cover, and tongue, were estimated by recovery personnel at 250 pounds. The total weight of the cargo was about 6,750 pounds. The operator listed an additional 75 pounds of cargo, located in cargo area 12, on the reconstructed weight and balance sheet.

Utilizing the airplane's empty weight of 19,280 pounds, the total weight of cargo of 6,825 pounds, a fuel load of 2,800 pounds, and the remaining weights listed on the operator's reconstructed weight and balance sheet, the airplane's estimated weight at the time of departure from St. Mary's, Alaska, was 29,435 pounds. A fuel burn of 200 gallons (1,200 pounds) utilized during the accident flight, would result in an estimated weight, at the time of the accident, of 28,235 pounds. The center of gravity of the airplane, at the time of the accident, was estimated at 355.03 inches.

The captain reported the accident flight was proceeding at 12,000 feet. Title 14, Code of Federal Regulations (FAR) 135.89 states, in part: Use of oxygen. (a) Unpressurized aircraft. Each pilot of an unpressurized aircraft shall use oxygen continuously when flying - (1) At altitudes above 10,000 feet through 12,000 feet MSL for that part of the flight at those altitudes that is of more than 30 minutes duration; and (2) Above 12,000 feet MSL.

Part 3, section 3.5 of the airplane's operating manual titled "Landing with Engine Inoperative" states in part: 3.5 1 Downwind leg in circuit. a. Flight compartment LANDING CHECK LIST - Complete except for FLAPS. Do not lower flaps until the final approach. b. Maintain 109 mph (95 knots) IAS for all aircraft weights. (Configuration A or B.)

#### WRECKAGE RELEASE

The Safety Board released the wreckage, located at Anchorage, Alaska, to the owner's representatives on May 23, 1997. The left and right engine propeller governor shafts were retained by the Safety Board for examination until their release on September 2, 1997.

## Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	40, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land; Single-engine Sea	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--no waivers/lim.	<b>Last Medical Exam:</b>	12/13/1996
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	4987 hours (Total, all aircraft), 220 hours (Total, this make and model), 4912 hours (Pilot In Command, all aircraft), 120 hours (Last 90 days, all aircraft), 41 hours (Last 30 days, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Manufacturer:</b>	de Havilland	<b>Registration:</b>	N702SC
<b>Model/Series:</b>	DHC-4A DHC-4A	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	126
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	3
<b>Date/Type of Last Inspection:</b>	12/30/1996, AAIP	<b>Certified Max Gross Wt.:</b>	28500 lbs
<b>Time Since Last Inspection:</b>	12 Hours	<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>	13923 Hours	<b>Engine Manufacturer:</b>	P&W
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	R-2000
<b>Registered Owner:</b>	JAMES A. MUNSON	<b>Rated Power:</b>	1450 hp
<b>Operator:</b>	SOUTH CENTRAL AIR	<b>Air Carrier Operating Certificate:</b>	Commuter Air Carrier (135)
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	SOCA

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night/Dark
Observation Facility, Elevation:	SVW, 1583 ft msl	Observation Time:	2315 AST
Distance from Accident Site:	2 Nautical Miles	Direction from Accident Site:	78°
Lowest Cloud Condition:	Scattered / 4800 ft agl	Temperature/Dew Point:	-2° C / -6° C
Lowest Ceiling:	Overcast / 6000 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	6 knots, 170°	Visibility (RVR):	0 ft
Altimeter Setting:	28 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:	ST MARYS, AK (KSM)	Type of Flight Plan Filed:	IFR
Destination:	KENAI, AK (ENA)	Type of Clearance:	IFR
Departure Time:	2105 AST	Type of Airspace:	Class G

## Airport Information

Airport:	SPARREVOHN LRRS (SVW)	Runway Surface Type:	Gravel
Airport Elevation:	1583 ft	Runway Surface Condition:	Snow--dry
Runway Used:	34	IFR Approach:	None
Runway Length/Width:	4100 ft / 150 ft	VFR Approach/Landing:	Forced Landing; Precautionary Landing

## Wreckage and Impact Information

Crew Injuries:	1 Fatal, 1 Serious	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal, 1 Serious	Latitude, Longitude:	

## Administrative Information

Investigator In Charge (IIC):	SCOTT R ERICKSON	Adopted Date:	05/21/1998
Additional Participating Persons:	GERALD ACORD; ANCHORAGE, AK VINCE W COSTELLO; PALMDALE, CA PAUL A KERSTETTER; E. HARTFORD, CT CARY FOSTER; KENAI, AK		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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