



# Aviation Investigation Final Report

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<b>Location:</b>	MOKULEIA, Hawaii	<b>Accident Number:</b>	LAX99LA190
<b>Date &amp; Time:</b>	May 22, 1999, 19:30 Local	<b>Registration:</b>	N301DK
<b>Aircraft:</b>	Beech B90	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Skydiving		

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## Analysis

Following the 12th sport parachute jump of the day, which occurred after sunset, ground witnesses observed the airplane descend into the ocean in a left wing low, nose down attitude. They did not hear the engines sputtering or popping, or see the airplane make any erratic movements during its descent. Skydivers indicated that the two previous flights had been conducted at altitudes of at least 18,000 feet, and the accident flight and subsequent jump were made at 20,000 feet. During this final jump flight, one of the skydivers stated he had a hard time breathing and felt nauseous. The skydivers also noted that the pilot was unable to maintain a steady course and did not respond well to minor course corrections. No supplemental oxygen was found onboard the airplane during the recovery or subsequent inspection phases of the investigation. No skydiver observed the pilot using supplemental oxygen. The airplane manufacturer noted that the pressurization system would have been rendered inoperable due to a non-sealed cockpit door. Hypoxia is defined as a physiological condition where a person is bereft of needed oxygen. Judgment is poor and reaction time delayed. Total incapacitation coupled with a loss of consciousness can occur with little or no warning. The airframe, engines, and propellers were examined with no preexisting impact anomalies found.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's incapacitation due to the effects of hypoxia from repeated flights to altitudes above 18,000 feet msl without supplemental oxygen.

## Findings

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Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT

### Findings

1. (C) OXYGEN SYSTEM - NOT INSTALLED
2. (C) IN-FLIGHT PLANNING/DECISION - INADEQUATE - PILOT IN COMMAND
3. (C) PROPER ALTITUDE - EXCEEDED - PILOT IN COMMAND
4. (C) INCAPACITATION(ANOXIA/HYPOXIA) - PILOT IN COMMAND

## Factual Information

### HISTORY OF FLIGHT

On May 22, 1999, at 1930 hours Hawaiian standard time, a Beech B90, N301DK, crashed into the Pacific Ocean, near Dillingham Airfield Airport, Mokuleia, Hawaii. The airplane, operated by Pacific International Skydiving Center under 14 CFR Part 91, was destroyed in the impact sequence and sank to a depth of approximately 156 feet of water. The airline transport pilot, the sole occupant, was not found and presumed to have received fatal injuries. Visual meteorological conditions existed for the skydiving flight and no flight plan was filed. The flight originated from the Dillingham airport, the day of the accident, about 1905 to transport skydivers to jump altitude.

The accident location is about 1.5 miles northeast of the approach end of Dillingham's runway 26, which runs approximately parallel to the shoreline.

Federal Aviation Administration (FAA) inspectors interviewed a number of witnesses who either observed the sequence of events or had knowledge of the flight. Several of the witnesses said that the pilot's practice, especially with high altitude jumps, was to land before the jumpers had reached the ground. The witnesses first observed the airplane, as it appeared to be maneuvering toward runway 26 for landing; the location of the airplane and its maneuvers were similar to other approaches made by the pilot that day. The only unusual aspect reported by the witnesses was that the airplane's altitude above the water was lower than on previous flights. Some witnesses estimated the height above water as 200 feet. The airplane was in a turn toward the southwest when the nose dropped and it flew into the water. Some witnesses described the bank angle as steep, while others reported it as normal. The witnesses who observed the airplane descend into the ocean recalled hearing the engines, and stated that there had been a high-pitched sound, but that the engines were not sputtering or popping. They also stated that the airplane did not look out of control, but rather that it was in a steady descent, with no erratic movements evident.

An FAA inspector reported that this was the 11th flight of the day. The inspector interviewed two of the skydivers who jumped from the accident airplane, on previous flights, and on the accident flight. Both skydivers stated that the accident flight was made to 20,000 feet, and that two other flights were done to altitudes of at least 18,000 feet. Neither skydiver reported that the pilot was using supplemental oxygen during these flights.

One of the skydivers stated that on the accident flight, the jump was made after sunset and was performed without any lighting devices. He also stated that he felt sick and was having a hard time breathing because they had been at 20,000 feet for an unusually long time prior to making the jump. He further stated that a couple of the skydivers had paid the pilot in order to

get him to climb to that altitude for the last jump.

Other skydivers asked the pilot prior to exiting the airplane on the accident flight at 20,000 feet, if he was okay. They noted that he had been unable to maintain a steady course, and he did not respond well to minor course corrections.

The FAA inspector further noted that supplemental oxygen was not found onboard the airplane during the recovery.

A compilation of witnesses on the ground agreed that the accident happened about 20-25 minutes after sunset. From their various locations they had all been watching a biplane performing aerobatics when they noticed the accident airplane. They also noticed skydivers in the air with no lighting devices. Witnesses thought this was unusual because it was their experience when the parachutists jump after sunset they have lights on. According to Federal Aviation Regulations (FAR) Part 105.33, each person that jumps between sunset and sunrise should be equipped with a means of producing light that is visible for at least 3 statute miles.

According to the inspector, on the accident flight the pilot had not made any of the required radio calls to Air Traffic Control, which is required under 14 CFR Part 105.14. The inspector further noted that a review of the recorded radar data for the area disclosed that the airplane's transponder had not been turned on.

According to the Chart Supplement for the Pacific region, parachute jumps may be made at Dillingham airfield up to 16,000 feet without filing a NOTAM (appended to report).

## PERSONNEL INFORMATION

A review of the FAA Airman Certification records disclosed that the pilot held an airline transport pilot certificate with a single and multiengine land airplane rating. In addition, he held commercial pilot privileges for single and multiengine airplane sea. The most recent second-class medical certificate was issued to the pilot on May 21, 1998, and contained no limitations. The pilot's personal flight records were not located.

## AIRCRAFT INFORMATION

On May 20, 1999, the Pratt and Whitney PT6A-20 engines installed on the airplane were removed and two Pratt and Whitney PT6A-28 engines were installed in accordance with a Supplemental Type Certificate (STC). Prior to installation of the engines, an overhauled propeller overspeed governor was installed. A flight test was conducted on May 21, 1999, with no discrepancies noted. Later that evening the airplane was flown back to its home base.

## TESTS AND RESEARCH

Pavsek and Associates recovered the wreckage on May 27 and May 28, 1999. The airframe

and engines were examined on May 29, 1999, by representatives from Raytheon Aircraft and United Technologies Pratt and Whitney Engines - Canada, at Rotor Wing Hawaii, Inc., Honolulu, Hawaii. A representative from Hartzell Propeller, at the same location, examined the propellers on July 26, 1999. All the examinations took place under the supervision of FAA inspectors.

The airframe examination revealed no preexisting structural or airplane system anomalies. The manufacturer reported that there was no supplemental oxygen found onboard the airplane during the recovery or subsequent inspection phases of the investigation. He further noted that the configuration of the airplane, a non-sealed cabin door, would have rendered the pressurization system inoperable.

Flight control continuity was established to each wing. The control cable ends exhibited "broomstrawing" and "necking at the ends of the individual strands." The landing gear and flaps were found to be in the retracted position. The pilot's seat was found attached to the seat tracks, with a portion of the cabin floor remaining attached to the seat tracks. The seat belt was found fastened, with localized stretching of the webbing. The shoulder harness was not fastened.

The engine examinations revealed no preexisting impact anomalies. Both engines displayed rotational signatures on their internal components that the manufacturer's representative stated was consistent with both engines being under power at impact.

According to the manufacturer, the propeller examinations revealed "severe" symmetrical bending of the propeller blades. There were no indications that the propellers were in the feathered positions (not generating thrust). It was further noted by the manufacturer's representative that there were gouges on the cylinders walls, which could only occur if the piston was in a forward operating range exposing the cylinder. No discrepancies were noted with the propellers.

The Safety Board's Materials Laboratory examined the annunciator panel and aft elevator down bracket with two sections of cable. The light bulb filaments were examined with an optical stereomicroscope. The glass envelopes on all the bulbs were found intact, but several of the filaments within the various bulbs were fractured. No evidence of filament stretching was found on any of the bulbs. The elevator down bracket was found fractured and the exterior surface "severely" corroded from exposure to salt water. According to the Safety Board's metallurgist, the fracture features had been destroyed by the resulting corrosion. The two sections of cable were also examined; one was "intentionally" cut in order to remove the aft elevator down bracket from the airplane. The other cable was examined and was found deformed and exhibited "fracture patterns consistent with overstress separation of the cable."

## MEDICAL INFORMATION

According to FAR Part 91.211, Supplemental Oxygen:

(a) General. No person may operate a civil aircraft of U.S. registry - (1) At cabin pressure altitudes above 12,500 feet (msl) up to and including 14,000 feet (msl) unless the required minimum flight crew is provided with and uses supplemental oxygen for that part of the flight at those altitudes that is more than 30 minutes duration; (2) At cabin pressure altitudes above 14,000 feet (msl) unless the required minimum flight crew is provided with and uses supplemental oxygen during the entire flight time at those altitudes; and (3) At cabin pressure altitudes above 15,000 feet (msl) unless each occupant of the aircraft is provided with supplemental oxygen.

An FAA publication, Medical Handbook for Pilots, discusses the need for pilots to use supplemental oxygen. The publication notes that without supplemental oxygen at 20,000 feet, vision deteriorates and seeing is almost impossible, breathing is labored, the heart beats rapidly, and the pilot does not know that something may be wrong. At 25,000 feet, collapse and death is imminent unless oxygen is restored.

The condition of hypoxia is discussed in the book, Fundamentals of Aerospace Medicine, Second Edition, and sections are appended to this report. The book states that with the onset of hypoxia, "Judgment is poor, and reaction time is delayed." Effects on performance are slow and unreliable thinking, faulty memory, and severe impairment of motor performance and loss of critical judgment. Total incapacitation coupled with a loss of consciousness follows with little or no warning. Corrective actions to counteract the effects of hypoxia are to obtain supplemental oxygen. Effective Performance Time (EPT) is defined as the amount of time the pilot is able to perform useful flying duties in an inadequate oxygen environment. The EPT at Altitude Chart states at 18,000 feet the EPT is 20 to 30 minutes. At 22,000 feet the EPT is 10 minutes.

Aviation Supplies and Academics, Inc., (ASA) Dictionary of Aeronautical Terms Third Edition, (appended to report) defines hypoxia as a "physiological condition in which a person is deprived of the needed oxygen . . . the effects of hypoxia normally disappear as soon as the person is able to breath air that contains sufficient oxygen."

#### ADDITIONAL INFORMATION

According to the United States Navy Observatory Sun and Moon program, official sunset was 1907.

Attempts were made to obtain additional information from the owner/operator of the airplane; however, the owner/operator did not return Safety Board's form 6120.1/2.

## Pilot Information

<b>Certificate:</b>	Airline transport	<b>Age:</b>	44, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea; Multi-engine land; Multi-engine sea	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	May 21, 1998
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	2000 hours (Total, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Beech	<b>Registration:</b>	N301DK
<b>Model/Series:</b>	B90 B90	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	LJ-372
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	1
<b>Date/Type of Last Inspection:</b>	May 20, 1999 Continuous airworthiness	<b>Certified Max Gross Wt.:</b>	9650 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Turbo prop
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	P&W
<b>ELT:</b>		<b>Engine Model/Series:</b>	PT6A-28
<b>Registered Owner:</b>	PAC INT'L SKYDIVING CENTER	<b>Rated Power:</b>	550 Horsepower
<b>Operator:</b>	PAC INT'L SKYDIVING CENTER	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Dusk
<b>Observation Facility, Elevation:</b>	HNL ,13 ft msl	<b>Distance from Accident Site:</b>	25 Nautical Miles
<b>Observation Time:</b>	18:53 Local	<b>Direction from Accident Site:</b>	125°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 5500 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	7 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	40°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30 inches Hg	<b>Temperature/Dew Point:</b>	26°C / 18°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	(HDH )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>		<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	19:15 Local	<b>Type of Airspace:</b>	Class G

## Airport Information

<b>Airport:</b>	DILLINGHAM AIRFLD AIRPORT HDH	<b>Runway Surface Type:</b>	
<b>Airport Elevation:</b>		<b>Runway Surface Condition:</b>	
<b>Runway Used:</b>	0	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	21.569091,-158.119247(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Cornejo, Tealeye
<b>Additional Participating Persons:</b>	ERIC ROTH; HONOLULU , HI DON KNUTSON; WICHITA , KS THOMAS A BERTHE; S. BURLINGTON , VT TOM MCCREARY; PIQUA , OH
<b>Original Publish Date:</b>	December 4, 2000
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=46389">https://data.ntsb.gov/Docket?ProjectID=46389</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).