
**CFIT, Butler Aircraft, Inc., Douglas DC-7, N4SW, Klamath Falls, Oregon,
September 14, 1979**

Micro-summary: This Douglas DC-7 was destroyed after it crashed into a mountain.

Event Date: 1979-09-14 at 2047 PDT

Investigative Body: National Transportation Safety Board (NTSB), USA

Investigative Body's Web Site: <http://www.nts.gov/>

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NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

**BUTLER AIRCRAFT, INC.,
DOUGLAS DC-7, N4SW
KLAMATH FALLS, OREGON
SEPTEMBER 14, 1979**

NTSB-AAR-80-9

UNITED STATES GOVERNMENT



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Adopted: June 10, 1980

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SYNOPSIS

About 2047 Pacific daylight time, on September 14, 1979, a Douglas DC-7 (N4SW) owned and operated by Butler Aircraft, Inc., was transporting company employees to Medford, Oregon, when it crashed 24 miles west-northwest of Klamath Falls, Oregon. The 2 crewmembers and 10 passengers on board were killed. The aircraft struck trees on the crest of Surveyor Mountain about 7 minutes after takeoff from the Kingsley Field Municipal Airport. The aircraft was destroyed by impact and ground fire. Although the night was dark, visibility was 10 miles and the wind was calm.

The National Transportation Safety Board determines that the probable cause of this accident was the flightcrew's decision to undertake a direct point to point high-cruise-speed flight at low altitudes. The crew's judgment in the selection of a low-altitude flight profile may have been influenced by their familiarity with the terrain.

1. FACTUAL INFORMATION

1.1 History of the Flight

On September 14, 1979, a Douglas DC-7 operated by Butler Aircraft, Inc. (N4SW), and using the radio call Tanker 88, was on a company business flight from Redmond, Oregon, to Medford, Oregon, with an en route stop at Klamath Falls, Oregon. At Redmond, about 600 gallons of 100/130-grade fuel were added to the 1,000 gallons on board, 8 employees were enplaned, and the aircraft departed Redmond for Klamath Falls about 1945. ^{1/} The purpose of the flight was to transport Butler employees to an end-of-season barbecue in Medford that had

^{1/} All times are Pacific daylight time based on the 24-hour clock.

started between 1930 and 2000. Tanker 89 landed at Klamath Falls at 2029. Two additional Butler employees were enplaned, and the aircraft departed runway 14 at Klamath Falls at 2040. The flightcrew did not file a flight plan, and the weather was such that none was required. Witnesses saw the aircraft begin a steep right turn about 1 mile south of the runway and momentarily disappear from their view behind hangars and airport buildings; it then proceeded on a westerly course. A few minutes later, a pilot located 11 miles west-southwest of the airport saw the aircraft pass overhead at an altitude he estimated to be 750 ft above ground level. ^{2/} He said that the aircraft lights were on and that engine sounds were normal.

About 2047, witnesses located 25 miles west-northwest of the airport heard sounds, which they first thought to be from a car or truck with loud mufflers. Subsequently, they determined that the sounds were an approaching aircraft. They heard engine sounds become "choppy," resembling the noise made by a helicopter blade, and saw a fireball on Surveyor Peak, about 3 1/2 miles south of their location. Weyerhaeuser Company and Oregon State Forestry Department personnel located about 12 miles from Surveyor Peak also saw the fireball on the peak. After notifying authorities, they took firefighting equipment to the scene.

The aircraft crashed at night during hours of darkness (about 2047) at latitude 42° 13' N and longitude 122° 11' W, at an elevation of about 6,400 ft.

1.2 Injuries to Persons

<u>Injuries</u>	<u>Crew</u>	<u>Passengers</u>	<u>Others</u>
Fatal	2	10	0
Serious	0	0	0
Minor/None	0	0	0

1.3 Damage to Aircraft

The aircraft was destroyed by impact and ground fire.

1.4 Other Damage

The aircraft crashed in a heavily wooded area, and ground fire consumed about 5 acres of timber.

1.5 Personnel Information

The pilot was employed by Butler Aircraft, Inc., in 1968 and the copilot was hired in 1976. They had been flying as a firefighting crew in the western Oregon-northern California area for several years. The crewmembers were certificated and qualified for the flight. (See appendix B.) The company did not assign a flight engineer to this flight.

^{2/} All altitudes are mean sea level, unless otherwise indicated.

1.6 Aircraft Information

The aircraft was certificated, equipped, and maintained in accordance with Federal Aviation Administration (FAA) requirements. The gross weight of the aircraft was 81,500 pounds, and the center of gravity was within prescribed limits at takeoff. (See appendix C.) Since the aircraft logbooks and weight and balance records were destroyed in the crash, gross weight and center of gravity were derived from company records.

Butler Aircraft, Inc., provides contract aerial application services to firefighting agencies, principally, the United States Forest Service. On September 14, 1979, N4SV and crew were on standby firefighting duty at Redmond. According to United States Forest Service records, the aircraft was launched on a mission from Redmond at 1631, landed at Medford, Oregon, at 1806, and departed at 1813, arriving back at Redmond at 1923. This was the only mission of the day for the aircraft and crew. The aircraft and crew were released from firefighting duties at sunset.

Discussions with personnel of the United States Forest Service Regional Aviation Group, who were familiar with the aircraft, indicated that normal climb power settings consistent with the grade of fuel used, at 81,500 pounds gross weight, and at a normal climb speed of 165 to 170 knots would produce a steady rate of climb of more than 1,000 ft/min.

1.7 Meteorological Information

The skies at Klamath Falls on the evening of September 14 were clear. Visibility was at least 10 miles and the winds were calm. At the time of the accident, there was a new moon on the horizon at 42° latitude, but it may not have been visible in the mountainous terrain. Local sunset was at 1922. The altimeter setting was 29.98 inHg at Redmond and 30.12 inHg at Klamath Falls.

A U.S. Forest Service official recalled that between 2000 and 2015 on the night of the accident, he could not see the skyline of the Cascade Mountains, there was no visible moon, and it was a dark night.

1.8 Aids to Navigation

There is no evidence to indicate that the crew was utilizing navigational aids on this flight; however, those most likely to have been used were available and operating normally. These include the Klamath Falls and Medford VORTAC stations.

There is a segment of Federal airway V122 between Klamath Falls and Medford, a distance of 57 nmi. The airway runs outbound from the Klamath Falls VORTAC on the 263° radial for 25 nmi, turns north 15°, then runs inbound to the Medford VORTAC on the 098° radial for 32 nmi. Minimum en route altitude on the Klamath Falls-Medford segment of V122 is 9,000 ft. Since westbound IFR air traffic is assigned even altitudes, the lowest IFR altitude possible between Klamath Falls to Medford is 10,000 ft. However, since the crew did not file an IFR flight plan, they would have been required to comply with the visual flight rules

(VFR) altitude restriction. Since the flightpath was over mountainous terrain, which is not considered a congested area, the pilot-in-command was responsible to select an altitude that would assure terrain clearance and the aircraft may not be operated closer than 500 ft to any person, vessel, vehicle, or structure.

1.9 Communications

There were no communications difficulties.

1.10 Aerodrome Information

Not applicable.

1.11 Flight Recorders

No flight recorders were required, and none were installed in N4SW.

1.12 Wreckage and Impact Information

The aircraft struck trees at the crest of Surveyor Mountain, 1/2 mile south of Surveyor Peak and 24 miles west-northwest of Kingsley Field Municipal Airport. The crest at this point is 6,400 ft. The area surrounding the site is mountainous, wooded, and sparsely populated. Impact marks in the trees began about 70 ft above ground level. Both wingtips and a portion of the left horizontal stabilizer and elevator were found at the bases of the trees. From this point, the aircraft wreckage was scattered along a path 200 ft wide and 2,250 ft long and was oriented on a magnetic bearing of 240° over a 10° downslope on the west face of the ridge. Numerous large trees were broken off at 40 to 50 ft above ground level over the first 900 ft of the path. Major components of structure from both wings, including the left outboard engine, were scattered throughout the area. A row of trees located 900 ft beyond the left outboard engine, was broken off at 10 to 25 ft above ground level. These trees marked the edge of the area which had been burned by ground fire; the burned area extended an additional 450 ft. The fuselage, inboard wing panels, empennage, and the other three engines were located in the burned area. Large portions of the structure had been consumed by ground fire. Except for a small localized ground fire near the oil tank from the No. 1 engine, no evidence of fire was present on any aircraft structure outside the main burn area.

The aircraft broke up extensively. Breakup was most severe in the forward fuselage and wing area. Both the left side and the right side of the aircraft were damaged severely. Disintegration was extensive. In most cases, heavy fittings and actuators separated from their attaching structures. Compressive damage to the structure generally was rearward.

All components of the aircraft were found in the immediate wreckage area. The pilot and copilot altimeters were destroyed. Examination of the available control systems, control surfaces, and components disclosed no evidence of prior structural failure or malfunction. The hopper tank for fire retardant was found adjacent to the main fuselage hulk in the burned area. Examination of attachment bolts showed no evidence of preimpact separation.

Because of the extensive breakup and fire damage to N4SW, a similar DC-7 belonging to Butler Aircraft, N6318C, was examined thoroughly at Klamath Falls. By comparative relationship of "parts to the whole," the structure of N4SW was identified and accounted for.

1.13 Medical and Pathological Information

The casualties were examined at the scene by the Klamath County medical examiner. All casualties had sustained massive multiple impact and thermal trauma to the entire musculoskeletal system. Therefore, complete autopsies could not be performed on all of the occupants. The identification process was concluded on September 19.

The FAA's Aviation Toxicology Laboratory, Civil Aeromedical Institute, analyzed specimens for acidic, neutral, and basic drugs; carbon monoxide; and ethanol from the pilot, copilot, and two passengers. No evidence of drugs was found; 1-percent saturation of carbon monoxide was found in the blood of a passenger.

An ethanol level of 0.039 percent in gastric contents and 0.050 percent in tissue fluid was found from the copilot. A laboratory culture of the tissue fluid produced a heavy growth of organisms and 0.015 percent ethyl alcohol after 24 hours' incubation. An ethanol level of 0.060 percent in blood was found in one passenger. A culture of the blood produced a moderate growth of organisms and 0.011 percent ethyl alcohol after 24 hours' incubation.

A review of the pilot's FAA medical file disclosed that in 1961, while in the U.S. Air Force, he was hospitalized for severe gastrointestinal bleeding. In May 1962, he was hospitalized after passing blood and feeling faint and weak. Tests revealed a completely normal gastrointestinal tract. His application on April 21, 1964, for a second-class medical certificate was denied by the FAA due to a "history of hemorrhage, gastrointestinal, cause undetermined." Following an examination by a U.S. Air Force physician which showed no evidence of a peptic ulcer or any other lesion prone to bleeding, the pilot, on November 17, 1966, was issued a second-class medical certificate valid for only 6 months because of his past history of gastrointestinal hemorrhage. From March 1967 until May 1974, he was issued nine second-class medical certificates.

On April 21, 1975, the pilot was hospitalized for spontaneous atrial fibrillation with rapid ventricular response, and the FAA denied a second-class certificate. In March 1976, the pilot submitted the results of a stress test to the FAA to demonstrate that he was capable of receiving a second-class certificate. The FAA denied the exemption and the pilot then underwent a left ventriculography and coronary arteriography to demonstrate further his fitness to the FAA. These tests showed no evidence of organic heart disease. On November 16, 1976, the FAA issued him a second-class medical certificate valid for 6 months. All subsequent second-class certificates were valid for only 12 months each. The FAA's June 1, 1977, limitation also cited hypoglycemia diagnosed on the basis of an April 25, 1977, glucose-tolerance test. Because of trauma, it was not possible to conclude at autopsy the preaccident condition of the pilot's heart or gastrointestinal system.

A U.S. Forest Service official stated that before the mission from Redmond at 1631, the pilot did not appear fatigued and was in good spirits. He said that the pilot had not complained of gastrointestinal illness or of his earlier coronary history. He said the pilot always appeared fit and in good physical condition, and he walked to and from work each day--a roundtrip distance of 3 to 4 miles. The official described the copilot as being in good physical condition.

An executive of Butler Aircraft, Inc., who had seen and had spoken to each man on the afternoon before the accident, also described the pilots as being in good physical condition. He said they appeared fit, had no physical complaints, were in good spirits, and did not appear fatigued.

1.14 Fire

The Weyerhaeuser Corporation Fire Service responded to the accident, arriving on scene at 2205 with 31 firefighters and 12 pieces of equipment. The fire was contained by a fire trail at 0300 on September 15. The extensive postcrash fire destroyed 5 acres of timber and burned until 0600 on September 15. Because of extremely dry conditions and presence of numerous decomposing logs in the area, small smoldering fires tended to break out for the next 5 days. Fire crews remained on scene throughout this time and assisted in providing area security.

1.15 Survival Aspects

This accident was not survivable.

1.16 Tests and Research

1.16.1 Powerplant Examination

The engines, including all accessories and propeller hubs, were moved to a hangar at Klamath Falls for partial disassembly and detailed examination. No evidence was found of preimpact powerplant malfunction. Shim plates removed from the propeller hub spiders showed impact marks at 40° blade angle on the No. 1 propeller and marks ranging from 44° to 47° on the other three propellers.

The propeller blades were shattered in a manner consistent with instantaneous overload. Hamilton Standard power reference curves show that the blade angles determined from the shim plate marks equate to a governed rpm in the range of maximum continuous power.

1.16.2 Aircraft Flight Track

Information extracted from the computer memory banks at Seattle Air Route Traffic Control Center was fed into the Target Analysis Program. No definitive track from N4SW could be obtained. A straight-line track between the point of departure at 2040 and the point of crash at 2047 would necessitate an average groundspeed of about 205 knots. In order to make up for takeoff roll and the turn described by witnesses, the aircraft would have had to be flown at some higher speed after takeoff. The normal aircraft cruise speed is about 235 knots.

1.17 Other Information

None.

1.18 New Investigation Techniques

None.

2. ANALYSIS

The flightcrew was certificated and qualified for this operation. Although the medical certificate of the pilot-in-command contained a 12-month restriction because of previous coronary problems, there was no evidence to show that either pilot was incapacitated because of a medical condition. The positive findings of ethanol in the specimens obtained from the copilot probably resulted from postmortem changes due to sample putrefaction.

The aircraft was maintained in accordance with applicable Federal Aviation Regulations. The gross weight and center of gravity were within prescribed limits. There was no evidence of a preimpact failure or malfunction of the aircraft's structure, powerplants, flight controls, or systems. Although the witnesses who heard the aircraft pass near their ground position heard variations in engine sounds just before sighting the fireball, the Safety Board concludes that these sounds were produced by the propellers striking the first trees.

The aircraft was configured with a fuselage hopper tank that holds and dispenses firefighting chemicals. The Safety Board considered the possibility that failure of the front tank attachment bolts or a malfunction of the tank could disrupt air flow sufficiently to cause performance degradation. The fire-retardant hopper tank was found in the wreckage adjacent to the fuselage, and all of those attachment bolts examined showed no evidence of preimpact damage. The wreckage pattern through the trees was either ascending or near level, but not descending. This pattern indicates the aircraft was in either climbing or cruise flight when it first struck the trees. The length of the wreckage pattern and the severity of aircraft disintegration indicate that the aircraft struck the trees at high-cruise speed. Therefore, the high-cruise speed, the ascending flight pattern, and the position and condition of the tank in the wreckage rule out hopper-tank malfunction as a factor in the accident.

Although damage to both altimeters precluded obtaining direct reading or functional testing, it is not likely that both altimeters would have malfunctioned simultaneously. A barometric pressure differential existed between Redmond and Klamath Falls; however, the pressure at Klamath Falls was .14 inHg higher. Thus, had the crew not reset altimeters at Klamath Falls, they would have been flying at a higher altitude than that indicated by the instruments.

The elevation of the crash site was about 2,300 ft higher than the Kingsley Field Municipal Airport, and the site was 24 miles to the west of the airport. About 7 minutes elapsed between the start of the takeoff roll and witness'

sighting of the fireball. The aircraft was capable of climbing at least 7,000 ft above the takeoff point using normal climb power and speed. Consequently, the aircraft was not flown in accordance with the normal climb schedule.

Witnesses described the aircraft as flying at low level with the engines operating normally. Further, the reconstructed ground track indicates that an airspeed in the high-cruise range would be required for course reversal and in-flight cruise to Surveyor Peak in the time interval between takeoff and impact.

The flightcrew did not file a flight plan, and the weather was such that none was required. However, the flight took place on a dark night; the low elevation of the new moon in mountainous terrain would have shut out the moonlight. While the skies were basically clear with good visibility, there was sufficient high haze from forest fires to obscure stars. Because of the lack of moonlight and starlight and the scarcity of ground lighting, the flightcrew probably could not distinguish the horizon nor see the dimensions of the mountains. The Safety Board therefore concludes that the flightcrew failed to maintain sufficient altitude to clear the undistinguishable terrain.

The collision-type accident involved a number of operational factors that should be considered. The flight profile flown by the pilot from takeoff to the accident was not in conformance with accepted standards. The normal climb schedule was not followed and it appears that the aircraft was on a direct point to point high-cruise-speed flight from Klamath Falls to Medford when it collided with the trees. A flight plan was not filed and appropriate altitudes were not selected for the in-flight cruise portion of the flight. The flightcrew had flown as a crew in the area for several years and they were familiar with the Klamath Falls-Medford route.

This accident resulted in spite of a functioning crew, an airworthy aircraft, and visual meteorological flight conditions. Notwithstanding the crew's familiarity with the area over which they planned to travel, prudence would dictate that a crew select a safer terrain clearance altitude when flying over mountainous terrain at night.

3. CONCLUSIONS

Findings

1. The aircraft was certificated and maintained in accordance with approved procedures.
2. The crewmembers were certificated and qualified for the flight, and there was no evidence that either pilot was incapacitated because of a medical condition.
3. The weather was suitable for VFR flight, even though the night was totally dark and moonlight was shut off by mountainous terrain.

4. There was no evidence of a preimpact malfunction or failure of the aircraft's structure, powerplants, flight controls, or other systems.
5. The aircraft struck trees at 6,400 ft.
6. The aircraft must have been operated at a high-cruise speed in order to have reached the crash site in the time elapsed from takeoff.
7. There was no evidence that the hopper tank malfunctioned and degraded aircraft performance.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the flightcrew's decision to undertake a direct point to point high-cruise-speed flight at low altitudes. The crew's judgment in the selection of a low-altitude flight profile may have been influenced by their familiarity with the terrain.

4. SAFETY RECOMMENDATIONS

None

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PATRICIA A. GOLDMAN
Member

ELWOOD T. DRIVER, Vice Chairman, and G.H. PATRICK BURSLEY, Member, did not participate.

June 10, 1980

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5. APPENDIXES

APPENDIX A **INVESTIGATION AND HEARING**

1. Investigation

The Safety Board was notified of the accident at 0215 on September 15, 1979. Investigators from the Safety Board's Seattle Field Office and Washington, D.C., headquarters went directly to the scene. Working groups were established for operations, structures/systems, powerplants, human factors, records, witnesses, and weather. The Federal Aviation Administration participated in the investigation.

2. Public Hearing

A public hearing was not held.

APPENDIX B **PERSONNEL INFORMATION**

Pilot-in-Command--Victor L. Morton

Mr. Morton, 59, was employed by Butler Aircraft in 1968. He held Airman Certificate No. 368194 with commercial pilot privileges and airplane single-engine, multiengine, and instrument ratings. He also held type ratings in DC-B26, B-B17, and DC-6/7 aircraft. His second-class medical certificate was dated November 1, 1978, and contained the following limitations: "Valid for 12 months following the month examined" and "must wear glasses for distant vision when flying."

Mr. Morton's application for air tanker crewmember approval, dated May 7, 1979, shows a total of 8,200 hours as pilot-in-command, including 2,000 hours at night and 475 hours in the DC-7. According to United States Forest Service records, in the 24-hour, 30- and 90-day periods preceding the accident, he had flown 6.3, 13.8, and 132.5 hours.

Copilot Donnie F. Baxter

Mr. Baxter, 37, was employed by Butler Aircraft in 1976. He held Airman Certificate No. 1923016 with commercial pilot privileges and airplane single-engine, multiengine, and instrument ratings. His first-class medical certificate was dated December 29, 1978. The certificate had no limitations.

Mr. Baxter's application for air tanker crewmember approval, dated June 10, 1979, shows a total of 3,500 flight-hours, including 500 hours at night and 250 hours as copilot in DC-6/7 type aircraft. According to United States Forest Service records, in the 24-hour, 30- and 90-day periods preceding the accident, he had flown 6.3, 13.8, and 132.5 hours, respectively.

APPENDIX C
AIRCRAFT INFORMATION

N4SW, a Douglas DC-7, serial No. 44287, was operated by several corporations after delivery from the factory on December 30, 1954, until it was acquired by Butler Aircraft, Inc., on August 23, 1973. Since that time, annual and 100-hour inspections and all maintenance support for the aircraft were provided by Butler Aircraft, Incorporated.

An annual inspection was conducted on April 4, 1979. A 100-hour inspection was conducted on July 28, 1979. At that time, the following data were recorded:

Aircraft total time--21,025.9 hours
Wright Aeronautical Division, Type 335,
Model 972TC18DA3 engines

	<u>Serial Number</u>	<u>Time Since Overhaul</u> (E.s.)
Number 1	700411	1143.7
Number 2	700553	151.1
Number 3	W580280	676.9
Number 4	548312	819.3

A review of aircraft discrepancy sheets showed no major maintenance work had been required over the past 3 months. The date of the latest recorded minor repair, a hose change, was August 18, 1979.

The aircraft underwent conversion to aerial tanker configuration in the fall of 1973. The work was accomplished by Aero-Union Corporation of Chico, California.

The computed takeoff weight for N4SW was 81,500 pounds; allowable takeoff gross weight was 107,000 pounds. The center of gravity was calculated to be within limits based on loading at takeoff.

All logbooks and the weight and balance documents were reportedly on board the aircraft at the time of the accident. Only the No. 1 propeller logbook was retrieved from the wreckage.