

National Transportation Safety Board

Office of Research and Engineering

Washington, D.C. 20594

Performance Study

Specialist Report

Marie Moler

A. ACCIDENT

Location:	Iliamna, Alaska
Date:	September 15, 2015
Time:	0600 ADT
Airplane:	de Havilland DHC 3T Otter, N928RK
NTSB Number:	ANC15FA071

B. GROUP

No vehicle performance group was formed.

C. SUMMARY

On September 15, 2015, about 0600 Alaska daylight time (ADT), a single-engine, turbine-powered, float-equipped de Havilland DHC 3T (Otter) airplane, N928RK, sustained substantial damage when it impacted tree and tundra-covered terrain, just after takeoff from East Wind Lake, about 1 mile north of the Iliamna Airport, Iliamna, Alaska (PAIL). Of the 10 people aboard, 3 passengers died at the scene, the airline transport pilot and 4 passengers sustained serious injuries, and 2 passengers sustained minor injuries. The airplane was registered to, and operated by Rainbow King Lodge, Inc., Lemoore, California, as a visual flight rules (VFR) other work-use flight, under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. Dark night, visual meteorological conditions prevailed, and no Federal Aviation Administration (FAA) flight plan was filed for the flight. At the time of the accident, the airplane was en route to a remote fishing site on the Swikshak River, about 75 miles northwest of Kodiak, Alaska.

Performance Study
ANC15FA071, de Havilland DHC 3T Otter, N928RK

PERFORMANCE STUDY

Weather Observation

The weather conditions reported at PAIL for 0553 ADT were winds from 270° at 7 kts, ten miles visibility with scattered clouds at 700 ft and overcast at 4,400 ft. Temperature was 48°F (8.9°C), the dew point was 47°F (8.3°C), and the altimeter was set to 29.61 inHg. Civil twilight was reported to be at 0706 ADT and sunrise at 0748 ADT.

Weight and Balance

Post-accident reconstruction estimated the weight of the aircraft to be 8875 lbs and the center of gravity (CG) to be at 152.4 inches. The aft CG limit for a DHC 3T equipped with floats is 148.3 inches.

Automatic Dependent Surveillance – Broadcast (ADS-B) Data

The aircraft was equipped with ADS-B which recorded the aircraft's latitude, longitude, and altitude. The recording began at 05:49:13 ADT and ended at 06:06:24 ADT. However, for the first fifteen minutes of ADS-B broadcast the aircraft was stationary. The data included four duplicate or incongruous points on the flight path which were removed or smoothed out for consistency. Figure 1 shows the aircraft's path from about 06:05:25 until the last ADS-B point at 06:06:24. The latitude and longitude path was consistent with the flight description.

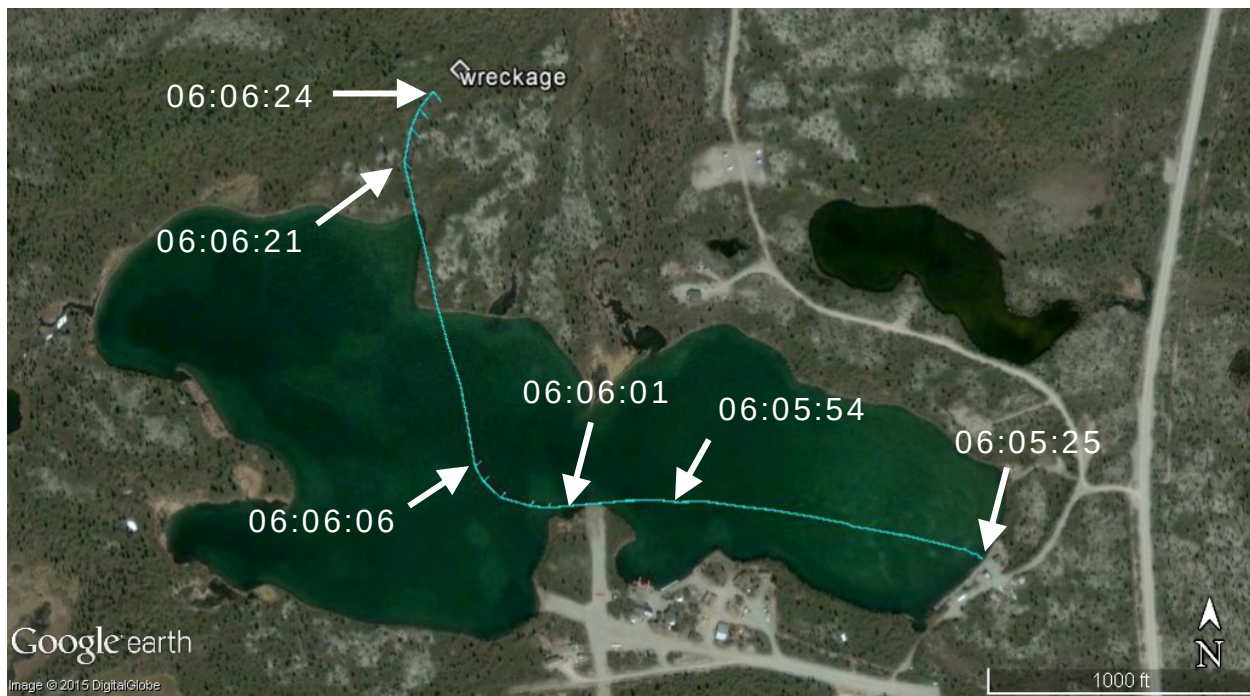


Figure 1. Aircraft flight path from ADS-B. First and last time stamps are noted at beginning and end of flight path.

Performance Study
ANC15FA071, de Havilland DHC 3T Otter, N928RK

The altitude recorded by the ADS-B system is shown in blue in Figure 2. The altitude data had numerous dropouts and many recorded points were not consistent with the terrain in the area or the flight description. The surface of the lake was reported as 46 ft above sea level. That altitude data indicated the aircraft moving along the lake surface until about 1200 ft from shore, taking off, climbing to about 175 ft above the water, and then returning to the water's surface or near the water's surface. The aircraft then climbed again before the data ends. Coupled with the incongruous latitude and longitude points removed, the inconsistent altitude data means that the calculations made in this report have a high level of uncertainty.

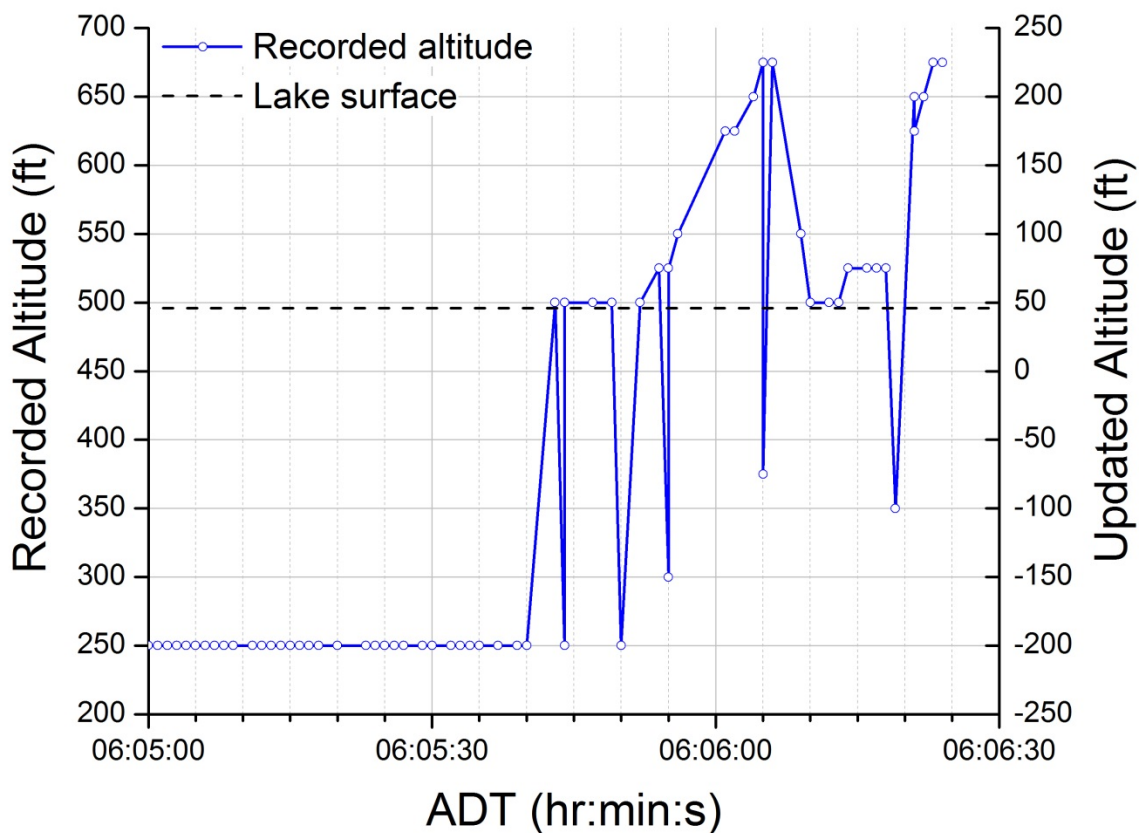


Figure 2. Aircraft recorded altitude versus time from ADS-B.

Figure 3 shows the aircraft's path in latitude and longitude and the aircraft's probable height above the lake surface.

Performance Study
ANC15FA071, de Havilland DHC 3T Otter, N928RK



Figure 3. Aircraft path and altitude with selected points.

After removing the obviously inconsistent data, the altitude and the ADS-B ground path were used to calculate the aircraft's groundspeed, and the winds aloft were used to calculate the calibrated airspeed. The aircraft appeared to have first gained altitude at an airspeed of 49 kts (56 mph) and a groundspeed of 42 kts (48 mph). The aircraft gained speed during its initial descent, but its second ascent shows a similar average speed to the first.

Performance Study
ANC15FA071, de Havilland DHC 3T Otter, N928RK

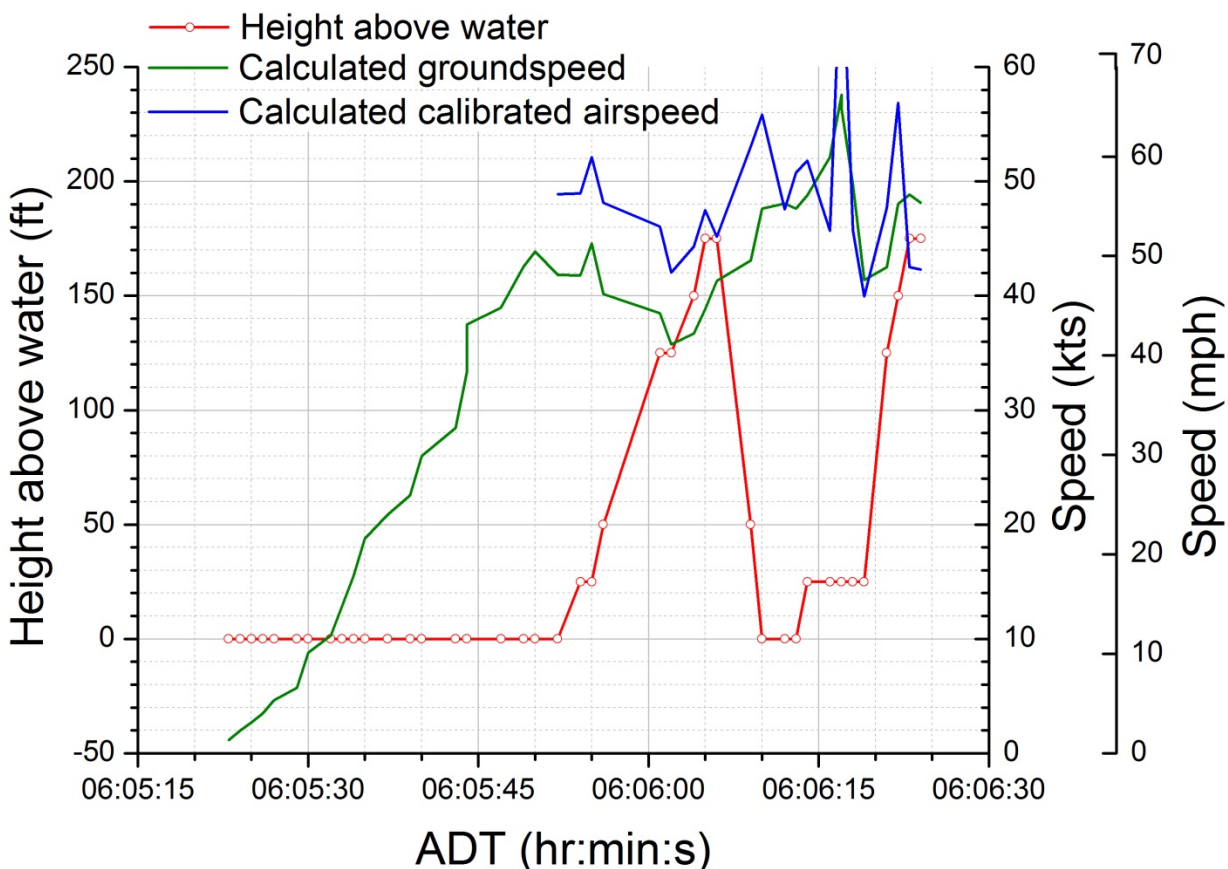


Figure 4. Aircraft calculated groundspeed, calibrated airspeed, and corrected height above water.

The Texas Turbine Conversions, Inc airplane flight manual (AFM) supplement [1] recommends a rotation speed of 48 kts (55 mph) calibrated airspeed. It also recommends that for a maximum angle of climb to use take-off power, take-off flaps, and a calibrated airspeed of 56 kts (64 mph). Stall speeds for ‘climb’ flaps and bank angles between 0° and 60° are reported for power set to zero thrust and a weight of 8,000 lbs (no greater weights are reported). At no bank angle (0°) the stall speed was 49 kts (57 mph), at 20° the stall speed was 51 kts (59 mph), at 40° the stall speed was 56 kts (65 mph), and at 60° the stall speed was 70 kts (81 mph).

The aircraft’s recommended rotation speed was similar to the calculated airspeed at its first recorded altitude gain. The airspeed calculation does not show the speed markedly increasing during the initial climb as recommended by the AFM. From 06:06:01 to 06:06:06 the aircraft would have been banked to complete the right turn. At a calculated airspeed below 50 kts (57 mph), the aircraft was at risk of stalling while banked. During the four seconds after 06:06:06 the aircraft lost 175 ft of altitude. At 06:06:21, after regaining altitude, the aircraft began another turn to the right. Its calculated airspeed at this time was less than 50 kts (57 mph). ADS-B data ends at 06:06:24.

Performance Study
ANC15FA071, de Havilland DHC 3T Otter, N928RK

Figure 5 shows the calculated flight path angle from the ADS-B data. The aircraft's initial climb was more gradual with a lower flight path angle than the second and final climb. The initial climb had a maximum flight path angle of 10° . The second climb showed a much steeper flight path angle approaching 30° .

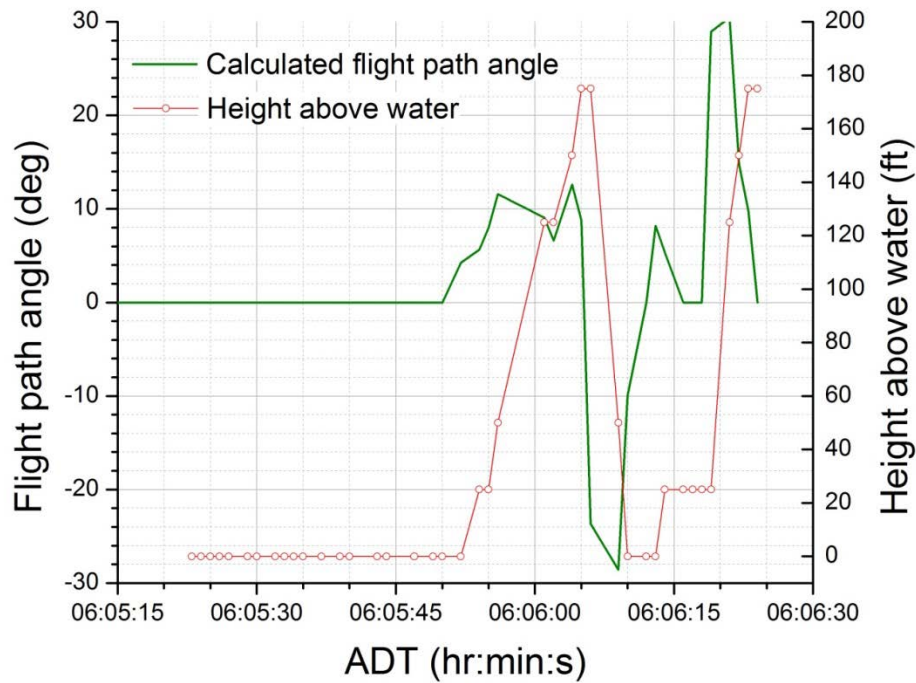


Figure 5. Aircraft calculated flight path angle and corrected height above water.

Performance Study
ANC15FA071, de Havilland DHC 3T Otter, N928RK

D. CONCLUSIONS

The ADS-B data available for this accident was incomplete, with inconsistent altitude data and periodic duplicate or inconsistent latitude and longitude reports. Data showed the aircraft taking off in a westerly direction, traveling about 1,000 ft along the surface of the water, and gaining altitude. The aircraft climbed to a height of approximately 180 ft above the surface of the lake, turned right, and lost altitude. Due to the uncertainty of the altitude data it was unclear if the aircraft returned to the surface of the lake. The aircraft flew for another ten seconds and regained altitude while turning to the right before the data ended. The aircraft wreckage was approximately 100 ft past the final ADS-B recorded location.

The aircraft's airspeed remained below the recommended airspeed during the initial climb. The calculated airspeed was below the stall speed for bank angles greater than 20°. During the second climb, the aircraft's flight path angle increased to near 30°. The calculated airspeed increased, but not above 60 kts and generally stayed below 50 kts. Again, as the aircraft entered a right turn, the calculated airspeed was below the stall speed for bank angles greater than 20°. Airspeed calculations from the smoothed and processed ADS-B have a substantial uncertainty, but as calculated, the aircraft was near stall speeds when banked.

Marie Moler
Specialist – Airplane Performance
National Transportation Safety Board

E. REFERENCES

1. Airplane Flight Manual, de Havilland DHC-3ST Otter, TTC-FMS-1 for Turbine Engine Conversion and Optional Bleed-air Heater. Texas Turbine Conversions, Inc. May 5, 2001.