



# Aviation Investigation Final Report

<b>Location:</b>	Hanson, Massachusetts	<b>Accident Number:</b>	ERA18FA230
<b>Date &amp; Time:</b>	August 24, 2018, 15:35 Local	<b>Registration:</b>	N65HM
<b>Aircraft:</b>	Aeronca 7AC	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	1 Fatal, 1 Serious
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The commercial pilot and passenger were departing on a local personal flight in the single-engine airplane. Review of airport security video showed the airplane level off about 100 ft above ground level as it passed the departure end of the runway. The airplane then entered a left turn and descended to ground contact. Damage to the propeller blades was consistent with a lack of engine power at the time of impact; however, examination of the wreckage revealed no evidence of preimpact mechanical anomalies that would have prevented normal engine operation. Based on the temperature and dew point about the time of the accident, the conditions were favorable for serious carburetor icing at a glide power setting.

Video showed that the airplane operated on the ground at an idle engine power setting for about 7 minutes before takeoff, and it is probable that carburetor ice formed during this time, subsequently resulting in the loss of engine power during the initial climb. Following the loss of power, the pilot attempted to turn back to the runway with insufficient altitude and, during the turn, failed to maintain airspeed, resulting in an exceedance of the airplane's critical angle of attack, an aerodynamic stall/spin, and impact with terrain.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A loss of engine power due to carburetor icing, the pilot's decision to turn back to the runway shortly after takeoff, and his failure to maintain airspeed during the turn, which resulted in an exceedance of the airplane's critical angle of attack, and subsequent aerodynamic stall.

## Findings

<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Personnel issues</b>	Aircraft control - Pilot
<b>Aircraft</b>	Angle of attack - Not attained/maintained
<b>Aircraft</b>	Airspeed - Not attained/maintained
<b>Environmental issues</b>	Conducive to carburetor icing - Effect on operation
<b>Environmental issues</b>	Conducive to carburetor icing - Contributed to outcome

## Factual Information

### History of Flight

<b>Standing</b>	Miscellaneous/other
<b>Initial climb</b>	Loss of engine power (total) (Defining event)
<b>Uncontrolled descent</b>	Collision with terr/obj (non-CFIT)

On August 24, 2018, around 1535 eastern daylight time, an Aeronca 7AC Champion, N65HM, was substantially damaged when it impacted terrain shortly after takeoff from Cranland Airport (28M), Hanson, Massachusetts. The commercial pilot was fatally injured and the passenger was seriously injured. The airplane was privately owned and was being operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight, which was originating at the time of the accident.

A review of airport security video showed the airplane about 100 ft above ground level as it passed the departure end of the runway during takeoff. The airplane was not climbing and began to bank to the left; the left turn continued as the airplane descended behind trees and impacted terrain. The video also indicated that the airplane operated at idle engine power on the ground for about 7 minutes before beginning the takeoff roll.

First responders reported that the airplane came to rest in a nose-down, near-vertical position and that they had to move the airplane in order to perform rescue operations. The passenger stated to a first responder that the airplane "stalled."

### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	33,Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea	<b>Seat Occupied:</b>	Front
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Helicopter	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	October 10, 2017
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	April 19, 2016
<b>Flight Time:</b>	195 hours (Total, all aircraft), 4 hours (Total, this make and model), 116 hours (Pilot In Command, all aircraft), 4.5 hours (Last 90 days, all aircraft), 4.5 hours (Last 30 days, all aircraft)		

According to Federal Aviation Administration (FAA) records, the pilot held a commercial pilot certificate with ratings for rotorcraft-helicopter, instrument helicopter, and private pilot privileges for airplane single-engine land and sea. The pilot was issued a first-class FAA

medical certificate on October 10, 2017, with no limitations. According to the pilot's logbook, he had accumulated 195.7 hours of civilian flight experience, of which 4 hours were in the accident airplane in the previous 3 years.

### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Aeronca	<b>Registration:</b>	N65HM
<b>Model/Series:</b>	7AC No Series	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1946	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	7AC-3708
<b>Landing Gear Type:</b>	Tailwheel	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	October 1, 2017 Annual	<b>Certified Max Gross Wt.:</b>	1320 lbs
<b>Time Since Last Inspection:</b>	110 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	1631.4 Hrs at time of accident	<b>Engine Manufacturer:</b>	Continental Motors Inc.
<b>ELT:</b>	C91A installed, not activated	<b>Engine Model/Series:</b>	C90-12F
<b>Registered Owner:</b>		<b>Rated Power:</b>	95 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

According to FAA records, the airplane was manufactured in 1946. It was equipped with a Continental Motors Inc. C90 series, 90-horsepower engine that drove a fixed-pitch propeller. According to airplane maintenance logbooks, an annual inspection was completed on October 1, 2017, at a total time of 1,521.4 hours and a tachometer time of 3,215.1 hours. Following the accident, the tachometer indicated 3,325.1 hours.

The airplane was flown the day before the accident by the owner's son and the accident pilot. The owner's son reported that there were no anomalies with the airplane during their flight, which lasted about an hour. He stated that he usually applied carburetor heat while operating the engine at idle power on the ground because of the "carburetor icing possibilities."

The engine operating instructions stated that, during the pretakeoff ground test (engine run-up), the carburetor heat control should be moved "to full HOT position, and observe decrease in engine speed if air heater and control are operating properly. [Then] return control to full COLD position." The instructions noted, "under some conditions, ice may form in the carburetor during ground test. It must be eliminated before takeoff."

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	PYM, 149 ft msl	<b>Distance from Accident Site:</b>	8 Nautical Miles
<b>Observation Time:</b>	15:52 Local	<b>Direction from Accident Site:</b>	145°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	9 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	210°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.2 inches Hg	<b>Temperature/Dew Point:</b>	27°C / 12°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Hanson, MA (28M )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Hanson, MA (28M )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	15:35 Local	<b>Type of Airspace:</b>	Class G

The 1552 recorded weather observation at Plymouth Municipal Airport (PYM), Plymouth, Massachusetts, about 8 miles southeast of the accident location, included wind from 210° at 9 knots, 10 miles visibility, clear skies, temperature 27°C, dew point 12°C; and an altimeter setting of 30.20 inches of mercury.

The carburetor icing probability chart from FAA Special Airworthiness Information Bulletin (SAIB): CE-09-35 Carburetor Icing Prevention, showed a probability of serious icing at glide power at the temperature and dew point reported at the time of the accident.

## Airport Information

<b>Airport:</b>	Cranland 28M	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	71 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	18	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	1760 ft / 60 ft	<b>VFR Approach/Landing:</b>	None

Cranland Airport was a public, nontower-controlled airport located 3 miles southeast of Hanson, Massachusetts. The airport was equipped with an asphalt runway designated as 18/36, which was 1,760 ft long by 60 ft wide. The airport elevation was 71 ft above mean sea level (msl); the airport was surrounded by cranberry bogs, ponds, and wooded terrain.

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	1 Serious	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal, 1 Serious	<b>Latitude, Longitude:</b>	42.022499,-70.835281

The airplane impacted a bog 470 ft east of the departure end of runway 18. The main wreckage was located at an elevation of 59 ft msl. All components of the airplane were located in the vicinity of the wreckage.

The nose section was impact crushed aft. Flight control continuity was confirmed from the flight controls in the cockpit to all flight control surfaces. The carburetor heat control was in the OFF position. The leading edges of the right and left wings were impact crushed along the entire span of each wing. A fuel sample was taken from both fuel tanks and the samples tested negative for water contamination. The empennage and aft flight control surfaces remained intact and attached to the fuselage. The airplane was not equipped with a stall warning system or angle of attack indicator.

The engine remained attached to the airframe and the propeller remained attached to the engine. One propeller blade was bent slightly aft and the other blade remained straight. Engine crankshaft continuity was confirmed from the propeller flange to the accessory section. All cylinders remained attached to the crankcase and thumb compression and suction was observed on all cylinders when the propeller was rotated through the entire range of motion. The rocker box covers were removed and no anomalies were noted with the valve springs and rocker arms. Valvetrain continuity was confirmed when the propeller was rotated by hand.

The carburetor hot air inlet was impact crushed aft. Carburetor heat control continuity was confirmed from the airbox to the cockpit, and the control was cut to facilitate further examination. The control could not be moved as a result of impact damage. The carburetor was removed and disassembled. The gasket was examined with no anomalies noted. The float assembly remained intact with no anomalies noted. The butterfly valve and fuel pump operated when the throttle arm was moved by hand. The needle and seat remained in place. The carburetor bowl was examined and contained brownish fluid similar to the water in the bog; the fluid smelled similar to 100LL aviation fuel.

The left and right magnetos were removed. When each magneto was rotated by hand, spark was observed on all towers. The top spark plugs were removed. The spark plugs were in "normal" condition when compared to the Champion Check a Plug Chart, with the exception of the No. 2 top spark plug, which exhibited "normal-worn out" condition.

## Additional Information

FAA Special Airworthiness Information Bulletin (CE-09-35) – Carburetor Icing Prevention, stated that:

*...pilots should be aware that carburetor icing doesn't just occur in freezing conditions, it can occur at temperatures well above freezing temperatures when there is visible moisture or high humidity. Icing can occur in the carburetor at temperatures above freezing because vaporization of fuel, combined with the expansion of air as it flows through the carburetor, (Venturi Effect) causes sudden cooling, sometimes by a significant amount within a fraction of a second. Carburetor ice can be detected by a drop in rpm in fixed pitch propeller airplanes and a drop in manifold pressure in constant speed propeller airplanes. In both types, usually there will be a roughness in engine operation.*

## **Medical and Pathological Information**

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The Office of the Medical Examiner, Boston, Massachusetts, performed an autopsy on the pilot. The autopsy report indicated that the cause of death was multiple blunt force injuries.

Toxicology testing of the pilot was performed at the FAA Forensic Sciences Laboratory. Fluid and tissue specimens tested negative for ethanol. Ketamine, norketamine, midazolam, lorazepam, and morphine were all detected in the blood and liver. In addition, fentanyl was detected in the blood. All detected medications were consistent with emergency medical treatment after the accident.

## **Tests and Research**

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An exemplar airplane with a Continental Motors Inc. C90 engine was started and the fuel selector was moved to the OFF position. The engine operated for 31 seconds before the engine lost total power without sputtering.

The airplane was restarted and operated at idle power for about 5 minutes. After that time, the engine was shut down and condensation was noted on the carburetor and intake of the engine. At the time of the test, the ambient temperature was 28°C and the dew point was 15°C, which showed a probability of serious icing at glide power on the Carburetor Icing Probability Chart.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Kemner, Heidi
<b>Additional Participating Persons:</b>	Raymond Savard; FAA/FSDO; Boston, MA
<b>Original Publish Date:</b>	April 20, 2020
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=98152">https://data.nts.gov/Docket?ProjectID=98152</a>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).