



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

March 31, 2017

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Chief Medical Officer

A. ACCIDENT: CEN17LA101; Ellendale, MN

On February 2, 2017, at 1950 central standard time, N9149V, a Mooney M20C, collided with a field in Ellendale, Minnesota, following a pilot incapacitation. The pilot was seriously injured. The airplane was substantially damaged. The aircraft was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as a business flight. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed. The flight originated from the Duluth International Airport (DLH), Duluth, Minnesota, with an intended destination of the Winona Municipal Airport (ONA), Winona, Minnesota.

B. GROUP IDENTIFICATION

No group was formed for the medical evaluation in this accident.

C. DETAILS OF INVESTIGATION

1. Purpose

This investigation was performed to evaluate the pilot for any medical conditions, the use of any medications/illicit drugs, and the presence of any toxins.

2. Methods

The FAA blue ribbon medical file, personal medical records from post accident medical care, and the investigator's reports were reviewed.

FAA Blue Ribbon Medical File

According to the 39 year old male pilot's FAA medical file, he was first medically certified in 1993. His most recent medical examination was dated 8/25/2016. At that time, he reported 2100 total hours of flight experience and was found to be 75 inches tall and to weigh 213 pounds. He reported an admission to the hospital in 2014 and surgery during that

admission for appendicitis. He had previously reported a thumb injury that had also required surgery (2004) and had intermittently reported hay fever and allergy symptoms. He had not reported any medications to the FAA. At his last exam, he received a third class medical certificate without limitations.

Personal Medical Records

According to the discharge summary dictated by the physician caring for the pilot during his hospitalization following the accident, the pilot left "his home in Winona on that morning and flying to Thunder Bay with plans to return that night. He remembered that he was feeling unwell with a headache on the morning flight... he was using the plane's heater more than usual given the cold weather. On the return trip that evening, he also noticed himself feeling ill with nausea and lightheadedness. He landed in Duluth for customs where he started feeling better, so he decided to go ahead as planned with his flight home to Winona. While sitting in the plane with the heater on, doing pre-flight preparations, his symptoms returned, but he received clearance for takeoff and proceeded to do so. After takeoff, he felt even more unwell and remembered thinking he should ask for clearance to turn back and land again in Duluth, but did not. At some point he placed the plane on autopilot and the next thing he remembered was waking up and realizing that his plane had crashed." The pilot was able to extricate himself from the wreckage and reach a nearby house where emergency medical services were notified.

On arrival to the emergency department the pilot was evaluated by the trauma team and found to have significant acidosis with a lactate of 7.36 mmol/L, a venous pH of 7.1 and a base excess of -12 mEq at 22:38 on the day of the accident. (Normal values are less than 1 mmol/L for lactate, about 7.31 for venous pH, and between +2 and -2 mEq for base excess.) During the initial evaluation, the pilot was found to have a comminuted facial fracture, lacerations of the lip and left knee, an avulsed tooth, a compression fracture of L1, fractures of the transverse processes of L1-L3 and hypothermic injuries (frostbite) of the upper extremities.

Since the pilot recalled feeling unwell and passing out before the accident and took significant time after the crash to come to, he and the treating physicians attempted to uncover the cause of his loss of consciousness (syncope). No intracranial trauma was identified. At 00:18 on the morning following the accident, the team obtained a blood gas including a carbon monoxide (CO) level. At that time, the CO level was 13.8%

Carbon monoxide is an odorless, tasteless, colorless, nonirritating gas formed by hydrocarbon combustion. CO binds to hemoglobin with much greater affinity than oxygen, forming carboxyhemoglobin; elevated levels

result in impaired oxygen transport and utilization.¹ Nonsmokers may normally have up to 3 percent carboxyhemoglobin in their blood; heavy smokers may have levels of 10 to 15 percent.² This pilot was not a smoker.

Carbon monoxide and oxygen compete for the same receptor site on hemoglobin. Once CO is bound to a hemoglobin molecule, any oxygen molecules also attached to that hemoglobin are stuck and unable to offload from blood into tissues. This magnifies the negative effect on oxygen delivery to tissues. Finally, CO also binds to cellular proteins involved in the utilization of oxygen, further impairing tissue oxygenation.

The degree of carboxyhemoglobinemia is primarily related to the relative amounts of CO and oxygen in the environment and the duration of exposure. Once exposure to the carbon monoxide decreases or ends, oxygen molecules batter the receptor and slowly knock the carbon monoxide off so it can be exhaled. This process is more efficient when there are more oxygen molecules in the blood. The half life (the time it takes to get rid of ½ the CO) of carbon monoxide with a patient breathing ambient air at sea level (21% oxygen) is about 4-5 hours; once the person is breathing high flow oxygen, the half life of CO drops to about 90 minutes.¹

D. SUMMARY OF MEDICAL FINDINGS

The 39 year old male pilot in this accident had reported hay fever not requiring routine medications and surgical treatment of a hand injury and appendicitis to the FAA. During the accident, he recalled becoming unconscious after placing the airplane on autopilot. Some time after he crashed into a field, he was able to extricate himself from the wreckage and seek medical attention. Initial laboratory studies indicated significant acidosis with a lactate of 7.36 mmol/l, a venous pH of 7.1 and a base excess of -12mEq at 22:38 on the day of the accident. At 00:18 the following day, approximately 4 ½ hours after the accident, the pilot's carboxyhemoglobin level was found to be 13.8%.

¹ Clardy PF, Manaker S, Perry H. Carbon monoxide poisoning. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA <http://www.uptodate.com/contents/carbon-monoxide-poisoning?source=preview&language=en-US&anchor=H9&selectedTitle=1~34#H9> Accessed 3/28/2017.

² Ernst A, Zibrak JD. Carbon monoxide poisoning. N Engl J Med 1998; 339:1603.