



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

September 5, 2019

Mary Pat McKay, MD, MPH
Chief Medical Officer

A. ACCIDENT: ERA18LA083; Carrabelle, FL

On February 5, 2018, at 1125 eastern standard time, an experimental, amateur-built Sonex Trainer airplane, N543SX, sustained substantial damage when it collided with terrain after a loss of engine power during the initial climb after takeoff from the Carrabelle-Thompson Airport (X13), Carrabelle, Florida. The private pilot, who was also the owner/builder of the airplane, was fatally injured. Visual meteorological conditions prevailed near the airport at the time of the accident and no flight plan was filed for the flight that was being conducted as a Title 14 Code of Federal Regulations Part 91 personal flight. The flight was originating at the time of the accident with intentions to stay in the local area.

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 medical conditions, the use of medications/illicit drugs, and the presence of toxins.

2. Methods

The FAA medical case review, autopsy report, toxicology findings, post accident treatment records, and the investigator's reports were reviewed. Relevant regulation and medical literature were reviewed as appropriate.

FAA Medical Case Review

According to the FAA medical case review, the 68 year old male pilot reported 571 total flight hours as of his last exam, dated 5/3/2016. At that time, he was 69 inches tall and weighed 165 pounds. The pilot had

previously reported having cataract surgery but reported no chronic medical conditions or use of any medications. No significant abnormalities were identified on the physical exam and he was issued a third class medical certificate limited by a requirement he have available glasses for near vision.

Autopsy

According to the autopsy performed by the State of Florida Office of the Medical Examiner – District 2, the cause of death was multiple blunt force trauma and the manner of death was accident. No significant natural disease was identified.

Toxicology

Toxicology testing performed by Axis Forensic Laboratory on the leftover blood drawn at the time of the pilot's admission to the hospital at the request of the medical examiner did not identify any tested-for substances.¹

Toxicology testing performed by the FAA's Forensic Science Laboratory on postmortem specimens identified ketamine and its metabolite norketamine, midazolam and its metabolite hydroxymidazolam, etomidate, and fentanyl in cavity blood. In addition, sildenafil and its metabolite desmethylsildenafil were found in cavity blood, diphenhydramine was found in cavity blood (0.265 ug/ml) and liver, and zolpidem was found in kidney but not blood.²

Medication Descriptions

Ketamine is an anesthetic used to induce unconsciousness in order to perform medical procedures.³ Midazolam is an injectable benzodiazepine used to sedate patients during medical procedures.⁴ Etomidate is a general anesthetic used to induce unconsciousness in order to perform medical

¹ Testing was performed for: amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, fentanyl, methadone, opiates, oxycodone, phencyclidine, propoxyphene, alcohol, analgesics, buprenorphine, stimulants, tramadol, and carboxyhemoglobin.

² The laboratory at FAA Forensic Sciences Laboratory has the capability to test for more than 1300 substances including toxins, common prescription and over-the-counter medications as well as illicit drugs. See: <http://jag.cami.jccbi.gov/toxicology/default.asp?offset=0>

³ National Institutes of Health. US National Library of Medicine. DailyMed. Ketamine. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=58487c78-a641-4278-acc0-343596ee8683> Accessed 9/5/2019.

⁴ National Institutes of Health. US National Library of Medicine. DailyMed. Midazolam. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=737361a0-8db1-4d3c-ba5e-44df3f49fa22> Accessed 9/5/2019.

procedures.⁵ Fentanyl is a potent opioid analgesic available in injectable solution for the use of pain control during medical procedures.⁶

Sildenafil is available by prescription, most commonly marketed with the name Viagra, and used to treat erectile dysfunction. It is not considered impairing.⁷ Diphenhydramine, commonly marketed as Benadryl, is a sedating antihistamine available either alone or in combination with a number of other drugs, used to treat allergy symptoms and as a sleep aid.⁸ It is very impairing; in a driving simulator study, a single 50 mg dose of diphenhydramine impaired driving ability more than a blood alcohol concentration of 0.100.⁹ However, diphenhydramine undergoes postmortem redistribution which means after death it can move back into pooled blood from storage sites. For diphenhydramine, postmortem central blood levels may increase by about three times.¹⁰ Zolpidem is a short acting sleep aid often marketed with the name Ambien, available by prescription as a Schedule IV controlled substance.¹¹

Post Accident Treatment Records

According to the post accident treatment records, the pilot was intubated by the flight team as he was transported from the scene. The hospital records do not contain a list of medications given to enable that procedure, but the most common choices would have been ketamine, etomidate, and fentanyl. The records reflect the pilot was given midazolam during his initial resuscitation in the hospital. Of note, during his resuscitation, the pilot received a large volume of blood products (more than 7 liters) while the trauma team was attempting to control the bleeding from his injuries. They were unsuccessful and he succumbed to his injuries several hours after arrival.

⁵ National Institutes of Health. US National Library of Medicine. DailyMed. Etomidate.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=8b6c54d8-3f3f-4290-841c-976bea01086f>
Accessed 9/5/2019.

⁶ National Institutes of Health. US National Library of Medicine. DailyMed. Fentanyl.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ce5db1c2-feb1-4ad2-847a-d02e865bd47e>
Accessed 9/5/2019.

⁷ National Institutes of Health. US National Library of Medicine. DailyMed. Sildenafil.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=56a962e8-de00-4a97-8904-0b1bd217dd83>
Accessed 9/5/2019.

⁸ National Institutes of Health. US National Library of Medicine. DailyMed. Diphenhydramine.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6bde8f0a-a388-77a7-e053-2a91aa0a04b4>
Accessed 9/5/2019.

⁹ Weiler JM, B.J., Woodworth GG, Grant AR, Layton TA, Brown TL, McKenzie DR, Baker TW, Watson GS., Effects of fexofenadine, diphenhydramine, and alcohol on driving performance. A randomized, placebo-controlled trial in the Iowa Driving Simulator. *Ann Intern Med.* 2000;132(5): 354-63.

¹⁰ Han E, et. al., Evaluation of postmortem redistribution phenomena for commonly encountered drugs, *Forensic Science International* 219 (2012) 265–271.

¹¹ National Institutes of Health. US National Library of Medicine. DailyMed. Zolpidem.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=313ccc9f-7b3e-4e42-b5d8-0e27c3c72d8e>
Accessed 9/5/2019.

D. SUMMARY OF MEDICAL FINDINGS

The 68 year old male pilot had previously reported having cataract surgery but reported no chronic medical conditions or use of any medications to the FAA. According to the autopsy performed by the State of Florida Office of the Medical Examiner – District 2, the cause of death was multiple blunt force trauma and the manner of death was accident. No significant natural disease was identified.

Toxicology testing performed by Axis Forensic Laboratory on the leftover blood drawn at the time of the pilot's admission to the hospital at the request of the medical examiner did not identify any tested-for substances.

Toxicology testing performed by the FAA's Forensic Science Laboratory on postmortem specimens identified ketamine and its metabolite norketamine, midazolam and its metabolite hydroxymidazolam, etomidate, and fentanyl in cavity blood. In addition, sildenafil and its metabolite desmethylsildenafil were found in cavity blood, diphenhydramine was found in cavity blood (0.265 ug/ml) and liver, and zolpidem was found in kidney but not blood.

According to the post accident treatment records, the pilot was intubated by the flight team as he was transported from the scene. The hospital records do not contain a list of medications given to enable that procedure, but the most common choices would have been ketamine, etomidate, and fentanyl. The records reflect the pilot was given midazolam during his initial resuscitation in the hospital. Of note, during his resuscitation, the pilot received a large volume of blood products (more than 7 liters) while the trauma team was attempting to control the bleeding from his injuries. They were unsuccessful and he succumbed to his injuries several hours after arrival.