

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



WPR22FA309

MEDICAL

Specialist's Factual Report

January 19, 2023

A. ACCIDENT

Location: Watsonville, California
Date: August 18, 2022
Time: 14:55 Local
Airplane: (A2) Cessna 152; N49931 // (A3) Cessna 340A; N740WJ

B. MEDICAL SPECIALIST

Specialist Michelle Watters, MD, PhD, MPH
National Transportation Safety Board, RE-1
Washington, DC

C. DETAILS OF THE INVESTIGATION

Purpose

This investigation was performed to evaluate the Cessna 152 pilot and Cessna 340A pilot for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

Methods

The Federal Aviation Administration (FAA) medical case review and the Cessna pilots' autopsy and FAA Forensic Sciences Laboratory toxicology reports¹ were reviewed. Other relevant medical and regulatory issues were reviewed.

D. FACTUAL INFORMATION

1.0 Cessna 152 Pilot

1.1 FAA Medical Case Review

According to the FAA medical case review, at the time of the accident, the 32-year-old male Cessna 152 pilot held a second class medical certificate without limitation. At his most recent FAA medical certification examination on 8/9/22, he reported 103 total flight hours and was 71 inches tall and weighed 155 pounds. He reported taking no medications or having any medical conditions. He had a 2017 letter of eligibility for a driving under the influence arrest in 2013.

¹ The FAA Forensic Sciences Laboratory has the capability to test for more than 1,300 substances including toxins, common prescription and over-the-counter medications, and illicit drugs. <https://jag.cami.jccbi.gov/toxicology/>

1.2 Autopsy

According to the autopsy report from the Santa Cruz County Coroner, Santa Cruz, California, the cause of death of the Cessna 152 pilot was blunt force injuries of head and torso, and the manner of death was accident. There was no evidence of medical intervention. No significant natural disease was identified by the forensic pathologist.

1.3 Toxicology

Toxicology testing performed for the county coroner on the Cessna 152 pilot's chest cavity blood detected the primary major psychoactive compound of cannabis, delta-9-tetrahydrocannabinol (THC), at 1.1 nanograms per milliliter (ng/mL) and THC's inactive metabolite, carboxy-delta-9-tetrahydrocannabinol (THC-COOH), at 8.4 ng/mL. Caffeine was also detected in his chest cavity blood.

Toxicology testing performed by the FAA Forensic Sciences Laboratory detected THC in the Cessna 152 pilot's cavity blood at 1.1 ng/mL, THC-COOH in his cavity blood at 10.6 ng/mL, and THC-COOH in his urine at 139.7 ng/mL. Benzoyllecgonine, an inactive cocaine metabolite, was detected in his cavity blood and in his urine at 438 ng/mL. Ecgonine methyl ester, a minor inactive metabolite of cocaine, was detected in the Cessna 152 pilot's urine. The anesthetic ketamine was detected in his cavity blood and in his urine at 34 ng/mL. The active metabolite of ketamine, norketamine was detected in his cavity blood at 25 ng/mL and in his urine at 208 ng/mL. The non-sedating pain and fever reducing over-the-counter medication salicylic acid, commonly known as aspirin, was detected in the Cessna 152 pilot's cavity blood and urine.²

2.0 Cessna 340A Pilot

2.1 FAA Medical Case Review

According to the FAA medical case review, at the time of the accident, the 75-year-old male Cessna 340A pilot held a third class medical certificate with the limitation that he must wear corrective lenses. At his most recent FAA medical certification examination on 5/18/22, he reported 1,200 flying hours and was 74 inches tall and weighed 210 pounds. He reported taking no medications or having any medical conditions.

² FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Salicylic Acid.
<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=381>

2.2 Autopsy

According to the autopsy report from the Santa Cruz County Coroner, Santa Cruz, California, the cause of death of the Cessna 340A pilot was multiple blunt force injuries, and the manner of death was accident. While the examination was somewhat limited by injuries, no significant natural disease was identified by the pathologist.

2.3 Toxicology

Toxicology testing performed for the county coroner was negative for ethanol and tested-for drugs in the Cessna 340A pilot's abdominal blood. Toxicology testing performed by the FAA Forensic Sciences Laboratory detected THC in the Cessna 340A pilot's cavity blood at 0.8 ng/mL. THC's short-lived psychoactive metabolite, 11-hydroxy-delta-9-THC (11-OH-THC), was detected in his urine at 5.9 ng/mL, but not in his blood. THC-COOH was detected in his cavity blood at 1 ng/mL and in his urine at 36.3 ng/mL. The high blood pressure medication atenolol and the enlarged prostate treatment medication tamsulosin were detected in his cavity blood and urine. Desloratadine, the metabolite of the non-impairing antihistamine loratadine, was detected in his cavity blood but inconclusive in his urine. Atenolol, tamsulosin, and desloratadine are generally considered non-impairing.³

3.0 Information on Detected Impairing Drugs

Cannabis

The marijuana plant (*Cannabis species*) contains chemicals called cannabinoids; delta-9-tetrahydrocannabinol (THC) is the primary psychoactive cannabinoid compound. THC's mood-altering effects include euphoria and relaxation. In addition, cannabis causes alterations in motor behavior, time and space perception, and cognition. Significant performance impairments are usually observed for at least 1-2 hours following cannabis use, and residual effects have been reported up to 24 hours. Peak concentrations are often 100 to 200 ng/mL.⁴

THC is rapidly metabolized, but the rate of metabolism is not linear and depends on the means of ingestion (smoking, oil, and edibles), potency of the product, frequency of use, and user characteristics. Concentrations of THC peak at the end of smoking and often are below 5 ng/mL in blood at three hours. The primary metabolite of THC, 11-OH-THC, is equally psychoactive, but is rapidly metabolized to the non-psychoactive metabolite THC-COOH. THC is fat soluble, so is stored in fatty

³ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs.

Atenolol. <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=14>

Tamsulosin. <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=285>

Desloratadine. <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=379>

⁴ National Highway Traffic Safety Administration (NHTSA). April 2014 (revised). Drugs and Human Performance Fact Sheets. Cannabis/Marijuana.

<https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf>

tissues and can be released back into the blood long after consumption. So, while the psychoactive effects may last a few hours, THC can be detected in the body for days or weeks. Very little THC is excreted in urine. Instead, THC-COOH can be found in urine days to weeks after the last use of the drug. Thus, both blood and urine test results do not necessarily reflect recent use and cannot be used to prove that the user was experiencing effects of the drug at the time of testing.⁵

Cocaine

Cocaine is a central nervous system stimulant. Initial effects include euphoria, excitation, general arousal, dizziness, increased focus, and alertness. At higher doses, effects may include psychosis, confusion, paranoia, and aggressiveness. Depending upon the method of intake, effects can start within seconds (injection) to an hour (oral ingestion) and general effects last 1 to 2 hours. Late effects begin at about 2 hours and continue for several hours as the drug is metabolized to inactive substances. These effects include dysphoria, depression, agitation, nervousness, drug craving, general central nervous system depression, fatigue, and insomnia. Studies have found that cocaine may enhance performance of simple tasks, but not complex tasks such as driving.

Cocaine is rapidly metabolized to several compounds including *benzoylecgonine* and *ecgonine methyl ester*. Both are inactive metabolites of cocaine, benzoylecgonine is the major urinary metabolite. The half-life of cocaine is short, less than 1 hour; the half-life of benzoylecgonine is around 6 hours. A study found that following intranasal administration of 106 mg of cocaine, average peak plasma concentrations of cocaine and benzoylecgonine were 220 ng/mL at 30 minutes and 610 ng/mL at 3 hours, respectively. Cocaine levels in blood that are thought to cause effects are between 120 and 270 ng/mL. Very low concentrations of cocaine can be detected in urine during the initial few hours, benzoylecgonine may persist in the urine at detectable concentrations from 2 to 4 days.^{6,7}

Ketamine

The impairing medication ketamine is an anesthetic and used for pain management; it is also abused as a recreational drug for its psychedelic and dissociative effects. Effects include decreased awareness, increased reaction time, cognitive impairment, sedation, hallucinations, out-of-body experiences, and lack of coordination. Ketamine's therapeutic range is 100 to 2,200 ng/mL and it has a half-life

⁵ Compton, R. July 2017. Marijuana-Impaired Driving - A Report to Congress. (DOT HS 812 440). Washington, DC: NHTSA. <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/812440-marijuana-impaired-driving-report-to-congress.pdf>

⁶ NHTSA. April 2014. Drugs and Human Performance Fact Sheets. Cocaine. [809725-drugshumanperformfs.pdf \(nhtsa.gov\)](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/809725-drugshumanperformfs.pdf)

⁷ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Cocaine. <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=35>.

of 2 to 4 hours. Ketamine can be detected in the urine for about 3 days. Norketamine is a metabolite of ketamine and produces similar effects to ketamine.^{8,9}

E. SUMMARY OF MEDICAL FACTS

The 32-year-old male Cessna 152 pilot held a second class medical certificate without limitation. At his most recent FAA medical certification examination on 8/9/22, he reported taking no medications or having any medical conditions. According to the autopsy report, the cause of death of the Cessna 152 pilot was blunt force injuries of head and torso, and the manner of death was accident. No significant natural disease was identified.

Toxicology testing detected THC at 1.1 ng/mL in the Cessna 152 pilot's cavity blood. THC-COOH was detected at 8.4 ng/mL and 10.6 ng/mL in his cavity blood and at 139.7 ng/mL in his urine. Benzoylecgonine was detected in his cavity blood and in his urine at 438 ng/mL. Ecgonine methyl ester was also detected in his urine. Ketamine was detected in his cavity blood and in his urine at 34 ng/mL. Norketamine was detected in the Cessna 152 pilot's cavity blood at 25 ng/mL and in his urine at 208 ng/mL.

The 75-year-old male Cessna 340A pilot held a third class medical certificate with the limitation that he must wear corrective lenses. At his most recent FAA medical certification examination on 5/18/22, he reported taking no medications or having any medical conditions. According to the autopsy report, the cause of death of the Cessna 340A pilot was multiple blunt force injuries, and the manner of death was accident. While the examination was somewhat limited by injuries, no significant natural disease was identified.

Toxicology testing detected THC in the Cessna 340A pilot's cavity blood at 0.8 ng/mL and 11-OH-THC was detected in his urine at 5.9 ng/mL. THC-COOH was detected in his cavity blood at 1 ng/mL and in his urine at 36.3 ng/mL. Atenolol and tamsulosin were detected in his cavity blood and urine. Desloratadine was detected in the Cessna 340A pilot's cavity blood but inconclusive in his urine. Atenolol, tamsulosin, and desloratadine are generally considered non-impairing.

Submitted by:

Michelle Watters, MD, PhD, MPH
Medical Officer, RE-1

⁸ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs.

Ketamine. <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=82>

Norketamine. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=303>

⁹ NHTSA. April 2014 (revised). Drugs and Human Performance Fact Sheets. Ketamine. [809725-drugshumanperformfs.pdf \(nhtsa.gov\)](https://www.nhtsa.gov/sites/nhtsa-doherty/docs/809725drugshumanperformfs.pdf)