



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

MEDICAL FACTUAL REPORT

October 22, 2018

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Medical Officer

A. ACCIDENT: WPR17FA151 - Marineland, Florida

On July 13, 2017, about 2258 eastern daylight time, a Piper PA-44-180, N2173S, was destroyed during a descent and subsequent inflight breakup near Marineland, Florida. The flight instructor and private pilot receiving instruction were fatally injured. The airplane was registered to and operated by Sunrise Aviation Inc., Ormond Beach, Florida, as a 14 *Code of Federal Regulations* Part 91 instructional flight. Visual meteorological conditions prevailed, and no flight plan was filed for the cross-country flight which originated from Brunswick, Georgia, at an undetermined time with an intended destination of the Ormond Beach Municipal Airport (OMN), Ormond, Florida.

B. GROUP IDENTIFICATION:

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

C. DETAILS OF INVESTIGATION

Purpose

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

Methods

The FAA medical case review, the pilots' FAA Bioaeronautical Sciences Research Laboratory toxicology reports, and autopsy reports.

Certified Flight Instructor (CFI) - Right Seat - Fatal

FAA Medical Case Review

According to the FAA medical case review, the 70-year-old male CFI's most recent FAA medical certification exam was dated June 04, 2016; at that time, he was 72 inches tall, weighed 185 pounds, and reported accruing 34,830 total flight hours. The pilot reported he used no medications and the examination did not identify any significant medical issues. The pilot was issued a third class medical certificate with a limitation requiring him to have glasses available for near vision.

Autopsy

The Florida District 23 Medical Examiner determined the cause of death was multiple blunt force injuries and the manner was accident. The autopsy was limited due to the extent of injury, the brain was not identified and early decomposition was present but no significant natural disease was identified.

Toxicology

The National Medical Services (NMS) Laboratory performed testing as part of the autopsy. Testing of a liver specimen detected ethanol at 0.087 gm/dl. Testing of liver for drugs was not performed.

[**Ethanol** is primarily a social drug with a powerful central nervous system depressant. After absorption, ethanol is quickly distributed throughout the body's tissues and fluids fairly uniformly. The distribution pattern parallels the water content and blood supply of each organ. Ethanol may also be produced in the body after death by microbial activity however vitreous humor and urine do not suffer from such production to any significant extent in relation to other tissues.^{1]}

FAA Bioaeronautical Sciences Research Laboratory toxicology testing did not detect ethanol in the CFI's urine.² Testing detected: 1) anhydroecgonine methyl ester in liver, a product formed when cocaine is smoked; 2) benzoylecgonine, the primary inactive metabolite of cocaine at 22 ng/mg in liver and 25 ng/mg in muscle; 3) ecgonine methyl ester, an inactive metabolite of cocaine, in liver; 4) levamisole, a veterinary medicine and common cutting agent used to dilute the purity of street cocaine, in liver; 5) delta-9-tetrahydrocannabinol (THC), the primary psychoactive compound in marijuana, was detected in muscle at 108 ng/mg but was inconclusive in liver; 6) 11-nor-9-carboxy-delta-9-tetrahydrocannabinol (THC-COOH), the primary inactive metabolite of THC, was detected in muscle at 4.5 ng/mg, in liver at 63.7 ng/mg, and in urine at 184.3 ng/ml.^{3,4,5}

[**Cocaine** is a strong central nervous system stimulant. Initial effects include: euphoria, excitation, general arousal, dizziness, increased focus and alertness. At higher doses, effects may include psychosis, confusion, delusions, hallucinations, fear, antisocial behavior, and aggressiveness. Late effects, beginning within 1 to 2 hours after use, include: dysphoria, depression, agitation, nervousness, drug craving, general central nervous system depression, fatigue, and insomnia. Additionally, more deleterious performance effects are expected after higher doses, with chronic ingestion, and during drug withdrawal including agitation, anxiety, distress, inability to focus on divided attention tasks, inability to follow directions, confusion, hostility, time distortion, and poor balance and coordination.^{6]}

¹ Federal Aviation Administration. Forensic Toxicology Drug Information. Ethanol.

<http://jag.camii.jccbi.gov/toxicology/DrugDetail.asp?did=60> Accessed 05/15/2018

² The FAA Bioaeronautical Sciences Research laboratory tests for more than 1300 substances including toxins, common prescription and over-the-counter medications as well as illicit drugs. See: <http://jag.camii.jccbi.gov/toxicology/default.asp?offset=0> for a complete listing.

³ Testing was limited to solid tissue specimens and urine, blood was not available for testing.

⁴ Kachiu CL, et.al. Complications Associated with Use of Levamisole-Contaminated Cocaine: An Emerging Public Health Challenge Mayo Clin Proc. June 2012;87(6):581–586 Available online at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3498128/>

⁵ Where appropriate, drug levels were converted to ng/ml and ng/mg for comparison with references.

⁶ National Highway Traffic Safety Administration Drugs and Human Performance FACT SHEETS: Cocaine <https://www.nhtsa.gov/document/drugs-and-human-performance-fact-sheets>

[**Marijuana** is a psychoactive central nervous system depressant.⁷ Its use is prohibited under 14 CFR 91.17, which prohibits a person to act or attempt to act as a crew member of a civil aircraft while using any drug that affects the person's faculties in any ways contrary to safety.⁸ Delta-9-tetrahydrocannabinol (THC) is the primary active chemical in marijuana with reported therapeutic levels as low as 1.00 ng/ml. THC has an inactive metabolite, 11-nor-9-carboxy-delta-9-tetrahydrocannabinol (THC-COOH).⁹ Concentrations of parent drug (THC) and metabolite (THC-COOH) are very dependent on pattern of use as well as dose. Concentrations vary depending on the potency of marijuana and the way the drug is used; however, peak plasma concentrations of 100-200 ng/mL are routinely encountered shortly after smoking. Plasma concentrations of THC decline rapidly and are often less than 5.00 ng/ml at 3 hours. Determination of accurate blood levels from known tissue levels is not possible at this time due to limited research and the drug's complex distribution and metabolism

Following smoking marijuana, most behavioral and physiological effects return to baseline levels within 3-5 hours after drug use, although some investigators have demonstrated residual effects in specific behaviors up to 24 hours, such as complex divided attention tasks. In long term users, even after periods of abstinence, selective attention (ability to filter out irrelevant information) has been shown to be adversely affected with increasing duration of use, and speed of information processing has been shown to be impaired with increasing frequency of use.^{10]}

Pilot Receiving Instruction - Left Seat - Fatal

FAA Medical Case Review

According to the FAA medical case review, the 27-year-old male pilot receiving instruction was 68 inches tall and weighed 233 pounds. His most recent FAA medical certification exam was dated August 17, 2016. At that time, he reported no flight experience. The pilot reported he had no medical conditions, used no medications, and the examination did not identify any significant medical issues. The pilot was issued a second class medical certificate without limitations.

Autopsy

The Florida District 23 Medical Examiner determined the cause of death was multiple blunt force injuries and the manner was accident. The autopsy was limited to an external examination and no significant natural disease was described.

⁷ U.S. Department of Justice, Drug Enforcement Agency, Drugs of Abuse - A DEA resource Guide 2017 Edition. https://www.dea.gov/pr/multimedia-library/publications/drug_of_abuse.pdf Accessed 05/15/2018

⁸ 14 CFR 91.17 Date 2018-01-01 <https://www.gpo.gov/fdsys/pkg/CFR-2018-title14-vol2/xml/CFR-2018-title14-vol2-sec91-17.xml> Accessed 05/15/2018

⁹ Federal Aviation Administration. CAMI toxicology Drug Information for: Tetrahydrocannabinol Carboxylic Acid <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=195>. Accessed 05/14/2018

¹⁰ National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Marijuana. <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf> Accessed 05/14/2018

Toxicology

The NMS Laboratory performed testing of urine and blood as part of the autopsy. Results were negative for ethanol, tested-for-drugs, and toxins.¹¹

D. SUMMARY OF MEDICAL FINDINGS

The 70-year-old male certified flight instructor (CFI) was issued a third class medical certificate on June 04, 2016. On that examination he denied any medical concerns or the use of medications. The Florida District 23 Medical Examiner determined the cause of death was multiple blunt force injuries and the manner was accident. The autopsy was limited due to the extent of injury to the brain but did not identify any significant natural disease. NMS Labs toxicology detected ethanol at 0.087 gm/dl in liver. FAA Bioaeronautical Sciences Research Laboratory toxicology testing did not detect ethanol in the CFI's urine. Testing detected: 1) anhydroecgonine methyl ester, a product formed when cocaine is smoked, in liver; 2) benzoylecgonine, the primary inactive metabolite of cocaine at 22 ng/mg in liver and 25 ng/mg in muscle; 3) ecgonine methyl ester, an inactive metabolite of cocaine, in liver; 4) levamisole, a veterinary medicine and common cutting agent used to dilute the purity of street cocaine, was detected in liver; 5) delta-9-tetrahydrocannabinol (THC), the primary psychoactive compound in marijuana, was detected in muscle at 108 ng/mg but was inconclusive in liver; 6) 11-nor-9-carboxy-delta-9-tetrahydrocannabinol (THC-COOH), the primary inactive metabolite of THC, was detected in in muscle at 4.5 ng/mg, in liver at 63.7 ng/mg, and in urine at 184.3 ng/ml.

The 27-year-old male pilot receiving instruction was issued a second class medical certificate on August 17, 2016. On examination he denied any medical concerns or the use of medications. The Florida District 23 Medical Examiner determined the cause of death was multiple blunt force injuries and the manner was accident. The autopsy was limited to an external examination and no natural disease was identified. NMS Labs toxicology was negative for alcohol and tested-for-drugs.

¹¹ **Urine** was tested by enzyme immunoassay for the following compounds at the listed reporting limits: Amphetamines 500 ng/ml; Barbiturates 0.30 mcg/ml; Benzodiazepines 50 ng/ml; Cannabinoids 20 ng/ml; Cocaine/ Metabolites 150 ng/ml; Fentanyl / Metabolite 2.0 ng/ml; Methadone / Metabolite 300 ng/ml; Opiates 300 ng/ml; Oxycodone / Oxymorphone 100 ng/ml; and Phencyclidine 25 ng/ml. **Blood** was tested by enzyme linked immunosorbent assay for the following compounds at the listed reporting limits: Amphetamines 20 ng/ml; Barbiturates 0.040 mcg/ml; Benzodiazepines 100 ng/ml; Buprenorphine / Metabolite 0.50 ng/ml; Cannabinoids 10 ng/ml; Cocaine / Metabolites 20 ng/ml; Fentanyl / Acetyl Fentanyl 0.50 ng/ml; Methadone / Metabolite 25 ng/ml; Methamphetamine / MDMA 20 ng/ml; Opiates 20 ng/ml; Oxycodone / Oxymorphone 10 ng/ml; and Phencyclidine 10 ng/ml. **Blood** was tested by headspace gas chromatography for the following compounds at the listed reporting limits: Acetone 5.0 mg/dl; Ethanol 10 mg/dl; isopropanol 5.0 mg/dl; and Methanol 5.0 mg/dl.