National Transportation Safety Board
Office of Research and Engineering
Washington, DC 20594

Medical Factual Memorandum for Record
February 27, 2024

A. CASE

NTSB ID: ERA23FA024
Location: Marietta, Ohio
Date: October 18, 2022

B. MEDICAL SPECIALIST

Specialist JE Tuttle MD MHA FACS
National Transportation Safety Board
Washington, DC

C. DETAILS

1.0 Description of Review

For purposes of evaluating the pilot and copilot for potentially impairing medical conditions and potentially impairing substances, the above Medical Specialist reviewed the following sources of medical information, along with selected relevant regulation, medical literature, and investigator reports.

- Federal Aviation Administration (FAA) medical case review
- Autopsy report– Pilot
- Toxicology report – Pilot
- Autopsy report– Copilot
- Toxicology report – Copilot

2.0 Summary of Medical Facts

2.1 Pilot

According to the FAA medical case review, the 49-year-old-male pilot's last aviation medical examination was March 9, 2022. At that time, the pilot was 70 inches tall and weighed 210 pounds. He reported using atorvastatin (a prescription medication used to treat high cholesterol and reduce cardiovascular risk) and diclofenac (a prescription non-steroidal anti-inflammatory drug used to treat osteoarthritis). These medications are not generally considered impairing. The pilot was issued a first-class medical certificate limited by a requirement to have available glasses for near vision.

The Montgomery County Coroner's Office performed the autopsy of the pilot. According to the autopsy report, the pilot's cause of death was multiple injuries. Due to extent of his injuries, examination of the brain, heart and lungs were limited. A 30% stenosis of the left anterior descending coronary artery was noted in the report; the remainder of the coronary arteries could not be assessed due to injuries. Within these limitations, there was no evidence of other natural disease.

The Montgomery County Coroner's Office/Miami Valley Regional Crime Laboratory performed postmortem toxicology testing of tissue specimens of the pilot and did not detect any tested-for substances.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem tissue of the pilot.[1] Amlodipine and atorvastatin were detected in liver and muscle tissue. Carboxy-delta-8-THC was detected in liver at 96.9 ng/g and lung tissue at 17.7 ng/g.

Amlodipine is a prescription medication commonly used to control high blood pressure.[2] Atorvastatin is a prescription medication used to treat high cholesterol and reduce cardiovascular risk.[3] Both medications are not generally considered impairing.

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[1] The FAA Forensic Sciences Laboratory has the capability to test for around a thousand substances including toxins, prescription and over-the-counter medications, and illicit drugs.

[2] National Institutes of Health National Library of Medicine. Amlodipine Besylate tablet. dailymed.nlm.nih.gov. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6e9a6c82-9f25-4c71-b09a-929bd5d7b1cf. Updated January 23, 2008. Accessed February 9, 2024.

[3] National Institutes of Health National Library of Medicine. Atorvastatin calcium tablet. DailyMed. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6ccdb6f3-22c7-5b48-46bc-ce4a4c65eb4. Updated November 30, 2020. Accessed February 9, 2024.

Carboxy-delta-8-THC is a non-psychoactive metabolite of the psychoactive chemical delta-8-THC (which was not detected here). Delta-8-THC products are often marketed simply as "hemp" or "CBD" products, which consumers may not associate with psychoactive effects. Delta-8-THC is available in a variety of over-the-counter products for oral consumption, smoking, and inhalation [4] Delta-8-THC used in consumer products is typically chemically manufactured from cannabidiol (CBD), a chemical in the cannabis plant.[5,6,7] Delta-8-THC has psychoactive and intoxicating effects that can impair motor coordination, reaction time, decision making, problem solving, and vigilance.[8,9] The potency of delta-8-THC varies widely in consumer products. In one recent report, products were tested to assess how much delta-8-THC was contained within them; only 32 % of tested products had accurate labeling for the amount of delta-8-THC contained.[10,11] Delta-8 THC products have not been evaluated or approved by the Food and Drug Administration for safe use in any context.[12,13]

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[4] Bradley EK, Hoots B, Bradley E, Roehler DR. Unintentional ingestion of putative delta-8 tetrahydrocannabinol by two youth requiring critical care: a case report. *J Cannabis Res* 2023;5(1). doi:https://doi.org/10.1186/s42238-023-00176-x.

[5] Wurz GT, Montoya E, DeGregorio MW. Examining impairment and kinetic patterns associated with recent use of hemp-derived Δ8-tetrahydrocannabinol: case studies. *J Cannabis Res*. 2022;4(1):36. doi:10.1186/s42238-022-00146-9.

[6] Tagen M, Klumpers LE. Review of delta-8-tetrahydrocannabinol (Δ8-THC): Comparative pharmacology with Δ9-THC. *Br J Pharmacol*. 2022;179(15):3915-3933. doi:10.1111/bph.15865. Erratum in: *Br J Pharmacol*. 2023;180(1):130.

[7] United States Centers for Disease Control and Prevention (CDC). Increases in availability of cannabis products containing Delta-8 THC and reported cases of adverse events. CDC Health alert Network. https://stacks.cdc.gov/view/cdc/109759. Updated September 14, 2021. Accessed February 9, 2024.

[8] Testai FD, Gorelick PB, Aparicio HJ, et al. Use of Marijuana: Effect on Brain Health: A Scientific Statement from the American Heart Association. Stroke. . 2022;53(4):e176-e187. doi:10.1161/STR.0000000000000396, 10.1161/STR.0000000000000396.

[9] Wurz GT, Montoya E, DeGregorio MW. Examining impairment and kinetic patterns associated with recent use of hemp-derived Δ8-tetrahydrocannabinol: case studies. Journal of Cannabis Research. 2022;4(1). doi:https://doi.org/10.1186/s42238-022-00146-

[10] LoParco C, Rossheim ME, Walters ST, Zhou Z, Olsson S, Sussman SY. Delta-8 tetrahydrocannabinol: a scoping review and commentary. *Addiction*. 2023; 118(6):1011-28. doi:https://doi.org/10.1111/add.16142.

[11] Oleinik G. New Leafreport research reveals more than 50% of delta-8 THC hemp-derived products tested had illegal levels of delta-9 THC. In: Leafreport. 2021. https://www.leafreport.com/education/delta-8-thc-products-market-report-11339. Accessed March 1, 2024.

[12] 5 Things to Know about Delta-8 Tetrahydrocannabinol – Delta-8 THC. FDA. Published online September 16, 2021. https://www.fda.gov/consumers/consumer-updates/5-things-know-about-delta-8-tetrahydrocannabinol-delta-8-thc. Accessed March 1, 2024.

[13] Leas EC. The Hemp Loophole: A Need to Clarify the Legality of Delta-8-THC and Other Hemp-Derived Tetrahydrocannabinol Compounds. *Am J of Pub Health*. 2021;111(11):1927-1931. doi:https://doi.org/10.2105/ajph.2021.306499.

2.2 Copilot

According to the FAA medical case review, the 45-year-old-male copilot's last aviation medical examination was February 22, 2022. At that time, he reported no medication use or active medical conditions. No significant medical concerns were identified, and he was issued a second-class medical certificate without limitation.

The Montgomery County Coroner's Office performed the autopsy of the copilot. According to the autopsy report, the copilot's cause of death was multiple injuries. Due to extent of his injuries, examination of the brain, heart, and lungs were limited. Within these limitations, there was no evidence of natural disease.

Postmortem toxicology testing by the Montgomery County Coroner's Office/Miami Valley Regional Crime Laboratory did not detect tested-for substances in liver tissue. According to the autopsy report, postmortem blood testing for carboxyhemoglobin (a marker of carbon monoxide exposure) did not detect a significant quantity.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem tissue from the copilot.[1] No tested-for substances were detected.

Submitted by:

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Medical Officer