

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering Washington, DC

Medical Factual Report

November 16, 2020

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A. ACCIDENT: WPR19FA079; Yorba Linda, CA

On February 3, 2019, at 1345 Pacific standard time, a Cessna 414, N414RS, experienced an inflight breakup over Yorba Linda, California, about 11 miles west of the departure airport Fullerton Municipal Airport (FUL), Fullerton, California. The pilot and four individuals on the ground sustained fatal injuries, two individuals on the ground sustained serious injuries and the airplane was destroyed. The airplane was registered to and operated by the private pilot as a 14 Code of Federal Regulations (CFR) Part 91 cross-country personal flight. Visual meteorological conditions (VMC) prevailed over the accident location, and no flight plan was filed. The flight departed at 1339, with a planned destination of Minden-Tahoe Airport (MEV), Minden, Nevada.

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, 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 74-year-old male pilot reported 10,235 total hours of civilian flight experience as of his last

exam, dated 7/7/2017. At that time, he was 73 inches tall and weighed 240 pounds. He had reported no chronic medical conditions and no use of medications to the FAA. No significant abnormalities were identified, and he was issued a third class medical certificate without limitations.

<u>Autopsy</u>

According to the autopsy performed at the request of the Orange County Sheriff-Coroner, the cause of death was multiple blunt force injuries and the manner of death was accident. In addition, the heart showed severe enlargement as well as mild to moderate dilatation of the chambers. It weighed 700 grams (average for a man of his weight is 410gm¹). The ventricular walls were thin, consistent with dilation; the left ventricle and septum both measured 0.9 cm in thickness, and the right ventricle measured 0.3 cm in thickness. Average thickness are 1.3 cm on the left and septum and 0.3 cm on the right.¹

<u>Toxicology</u>

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified sildenafil and its metabolite desmethylsildenafil, sotalol, telmisartan, and amlodipine in heart blood and urine. Acetaminophen was found in urine.

In addition, 0.88 ng/mL of delta-9-tetrahydrocanninol (THC), the primary psychoactive component of marijuana along with its inactive metabolite, carboxy-delta-9-THC (THC-COOH) (2.9 ng/ml) were detected in heart blood. THC-COOH and an active metabolite of THC, 11-hydroxy-delta-9-THC (THC-OH) were found in urine (levels of 135.7 ng/mL and 13.1 ng/mL respectively.

Finally, the sedating antihistamine diphenhydramine was identified at 67 ng/mL in heart blood and also in urine.

Substance Descriptions

Sildenafil is a prescription medication used to treat erectile dysfunction and is commonly marketed with the name Viagra. It is not generally considered impairing.²

Sotalol – also marketed as Betapace - is a prescription antiarrhythmic primarily indicated to treat potentially life-threatening ventricular tachycardia. However, it may also be prescribed to treat arrhythmias that

¹ Kitzman DW, Scholz DG, Hagen PT, Ilstrup DM, Edwards WD. Age-related changes in normal human hearts during the first 10 decades of life. Part II (Maturity): A quantitative anatomic study of 765 specimens from subjects 20 to 99 years old. Mayo Clinic Proc., 1988. 63(2): 137-46.

² National Institutes of Health. US National Library of Medicine. DailyMed. Sildenafil <u>https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f7eec0c1-7054-44da-aa46-f3c33a939471</u> Accessed 10/28/2020.

are less likely to be life-threatening. However, in about 2% of people, it may also *induce* life-threatening arrhythmias; for this risk, sotalol carries a boxed warning to prescribers and patients.³

Telmisartan and amlodipine are prescription medications used to treat high blood pressure and are not generally considered impairing.^{4, 5} Acetaminophen is an over the counter analgesic and fever medicine commonly marketed with the name Tylenol.

Delta-9-tetrahydrocannabinol (THC) is the psychoactive compound found in marijuana and carboxy-tetrahydrocannabinol (THC-COOH) is its inactive marijuana metabolite. THC has mood-altering effects including euphoria, relaxed inhibitions, disorientation, image distortion, and psychosis. Significant performance impairments are usually observed for at least one to two hours following marijuana use, and residual effects have been reported up to 24 hours.⁶ THC concentrations typically peak during the act of smoking, while THC-COOH concentrations occur approximately 9-23 minutes after the start of smoking. Concentrations of both analytes decline rapidly and are often 5ng/mL at 3 hours, although effects may still be detectable at this point. However, THC and its metabolites are fat soluble and undergo postmortem redistribution; after death it can move back into pooled blood from storage sites such as liver, lung, and body fat. Post mortem redistribution may significantly increase both central and peripheral levels compared with antemortem findings.⁷

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter under the names Benadryl and Unisom. Diphenhydramine carries the following FDA warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).⁸ Compared to other antihistamines, diphenhydramine causes

³ National Institutes of Health. US National Library of Medicine. DailyMed. Sotalol. <u>https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=56879738-8662-4f5c-8386-761ab2b5e46f</u> Accessed 10/28/2020.

⁴ National Institutes of Health. US National Library of Medicine. DailyMed. Telmisartan. <u>https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c62d424c-7630-413c-be2c-3932831c3f1d</u> Accessed 10/28/2020.

⁵ National Institutes of Health. US National Library of Medicine. DailyMed. Amlodipine. <u>https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=4c7b1b11-90a3-bc1c-0e45-9e2a14ef0b03</u> Accessed 10/28/2020.

⁶ National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Marijuana. <u>https://www.wsp.wa.gov/breathtest/docs/webdms/DRE_Forms/Publications/drug/Human_Performance_Drug_Fact_Sheets-NHTSA.pdf</u> Accessed 10/28/2020.

⁷ Lemos NP and Ingle EA. Cannabinoids in Postmortem Toxicology Journal of Analytical Toxicology, 2011;35: 394-401.

⁸ Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. Available from: <u>http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50</u>. Accessed 03/18/2018.

marked sedation; it is also classed as a CNS depressant and this is the rationale for its use as a sleep aid. Altered mood and impaired cognitive and psychomotor performance may also be observed. In fact, in a driving simulator study, a single dose of diphenhydramine impaired driving ability more than a blood alcohol concentration of 0.100%.⁹ The therapeutic range of diphenhydramine (range in which it is expected to cause effects) is 25 to 1120 ng/ml.¹⁰ However, diphenhydramine undergoes postmortem redistribution; after death it can move back into pooled blood from storage sites. For diphenhydramine, postmortem central blood levels may increase by about three times.¹¹

D. SUMMARY OF MEDICAL FINDINGS

The 74 year old male pilot in this accident had reported no chronic medical conditions and no use of medications to the FAA.

According to the autopsy performed at the request of the Orange County Sheriff-Coroner, the cause of death was multiple blunt force injuries and the manner of death was accident. In addition, the heart showed severe enlargement as well as mild to moderate dilatation of the chambers. It weighed 700 grams (average for a man of his weight is 410gm. The ventricular walls were thin, consistent with dilation; the left ventricle and septum both measured 0.9 cm in thickness, and the right ventricle measured 0.3 cm in thickness. Average thickness are 1.3 cm on the left and septum and 0.3cm on the right.1

Toxicology testing identified sildenafil and its metabolite desmethylsildenafil, sotalol, telmisartan, and amlodipine in heart blood and urine. Acetaminophen was found in urine. In addition, 0.88 ng/mL of delta-9-tetrahydrocanninol (THC), the primary psychoactive component of marijuana along with its inactive metabolite, carboxy-delta-9-THC (THC-COOH) (2.9 ng/ml) were detected in heart blood. THC-COOH and an active metabolite of THC, 11-hydroxy-delta-9-THC (THC-OH) were found in urine (levels of 135.7 ng/mL and 13.1 ng/mL respectively. Finally, the sedating antihistamine diphenhydramine was identified at 67 ng/mL in heart blood and also in urine.

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): p. 354-63.

¹⁰ Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. Available from: <u>http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50</u>. Accessed 03/13/2018.

¹¹ Han E, et. al., Evaluation of postmortem redistribution phenomena for commonly encountered drugs, Forensic Science International 2012;219: 265–271.