



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

November 19, 2018

Mary Pat McKay, MD, MPH
Chief Medical Officer

A. ACCIDENT: CEN18FA078; Raton, NM

On January 17, 2018, about 1800 mountain standard time, N658H, registered as a Bell UH-1H helicopter, impacted terrain near Raton, New Mexico. A ground fire and explosion subsequently occurred. The commercial pilot sustained serious injuries and subsequently died from the sustained injuries. A pilot rated passenger, and three other passengers were fatally injured. One passenger sustained serious injuries. The helicopter was destroyed during the impact and ground fire. The helicopter was registered to and operated by Sapphire Aviation LLC as a Title 14 Code of Federal Regulations Part 91 personal flight. Night visual meteorological conditions prevailed in the area about the time of the accident, and the flight was not operated on a flight plan. The flight originated from the Raton Municipal Airport/Crews Field (RTN), near Raton, New Mexico about 1750 and was destined for Folsom, New Mexico.

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 and pilot rated passenger for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

2. Methods

The FAA medical case review, autopsy reports, toxicology findings, and the investigator's reports were reviewed.

Pilot

FAA Medical Case Review

According to the FAA medical case review, the 57 year old male pilot had reported 6,416 total hours of flight experience as of his last aviation medical exam, dated 12/7/2017. At that time, he was 74 inches tall and weighed 262 pounds. The pilot had reported previous orthopedic surgery and at his last exam reported using aspirin and sildenafil. Aspirin is an anti-platelet analgesic used daily to prevent heart attacks.¹ Sildenafil, often marketed with the name Viagra, is used to treat erectile dysfunction.² Neither are considered impairing. He was issued a second class medical certification limited by a requirement that he wear lenses for distant, and have glasses for near vision.

Autopsy

According to the autopsy performed by the New Mexico Office of the Medical Investigator, the cause of death was blunt force trauma with atherosclerotic and hypertensive cardiovascular disease as contributing conditions. The manner of death was accident. (The pilot initially survived but decompensated en route to the hospital.)

The heart was enlarged (cardiomegaly) and weighed 475 grams. Average weight for a 260 pound man is 425 grams with a range of 322 to 561 grams.³ Both ventricles were thickened; the left measured 1.6 cm thick and the right measured 0.4 cm (average is 1.3 and 0.3 cm respectively). There was severe coronary artery disease with up to 75% stenosis of the left anterior descending coronary artery and up to 40% stenosis of the left circumflex coronary artery. In addition, there was microscopic evidence of previous ischemia with focal areas of fibrous tissue which dissected between and replaced cardiomyocytes.

Toxicology

Toxicology testing performed by the FAA's Bioaeronautical Sciences Research Laboratory identified etomidate in heart blood and diphenhydramine in femoral blood (0.032 ug/ml) and liver tissue.

¹ National Institutes of Health. US National Library of Medicine. DailyMed. Aspirin.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=7369cf7e-b1b8-4faf-982c-454e2ac6cbfa>
Accessed 11/19/2018.

² 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 11/19/2018.

³ 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.

Etomidate is an intravenous anesthetic agent that was administered as part of resuscitation efforts in the helicopter.⁴

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). The therapeutic range for diphenhydramine is 0.0250 to 0.1120 ug/ml.⁵ Blood concentrations following a single dose of 50 mg diphenhydramine in 10 healthy adults produced an average peak plasma concentration of 66 ng/ml at 2.3 hours.⁶ Compared to other antihistamines, diphenhydramine causes marked sedation; 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 50 mg dose of diphenhydramine impaired driving ability more than a blood alcohol concentration of 0.100 gm/dl.⁷

Pilot Rated Passenger (left seat)

FAA Medical Case Review

According to the FAA medical case review, the 67 year old male pilot had reported 3,140 total hours of flight experience as of his last aviation medical exam, dated 12/11/2017. At that time, he was 73 inches tall and weighed 203 pounds. The pilot had reported headaches controlled with over the counter medication, hay fever, supraventricular tachycardia treated with an ablation in 2003, high blood pressure, diabetes, previous surgery for a ruptured colon, and kidney stones to the FAA. At the time of his last exam he reported taking allopurinol (used to prevent attacks of gout); atorvastatin (a cholesterol lowering agent); metformin, glipizide and liraglutide (all used to treat type 2 diabetes); metoprolol and losartan (for high blood pressure); inhaled flunisolide (an inhaled steroid to prevent attacks of asthma); and tamsulosin (used to treat symptoms from an

⁴ National Institutes of Health. US National Library of Medicine. DailyMed. Etomidate. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=94cde4e7-3b46-419f-8dda-87675da8d89d> Accessed 12/19/2018. Confirmed via communication with the service provider.

⁵ Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50> Accessed 03/13/2018.

⁶ Baselt RC Disposition of Toxic Drugs and Chemicals in Man, 10th Edition. Diphenhydramine. Pages 684-687 Copyright 2014, Biomedical Publications, Seal Beach, California.

⁷ 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.

enlarged prostate).^{8,9,10,11,12,13,14,15,16} None of these medications are considered impairing. He was issued a special issuance second class medical certification limited by a requirement for corrective lenses and marked, “Not valid for any class after 12/31/2018.”

Autopsy

According to the autopsy performed by the New Mexico Office of the Medical Investigator, the cause of death was blunt head trauma and the manner of death was accident.

The heart was enlarged (cardiomegaly) with biventricular dilation and weighed 435 grams. Average weight for a 203 pound man is 375 grams with a range of 284 to 495 grams.¹⁷ The ventricles were of average thickness; the left measured 1.3 cm thick and the right measured 0.3 cm (average is 1.3 and 0.3 cm respectively). There was early coronary artery disease with up to 40 stenosis of the distal third of the left anterior descending coronary artery. In addition, there was microscopic evidence of previous ischemia with focal areas of fibrous tissue which dissected between and replaced cardiomyocytes.

⁸ National Institutes of Health. US National Library of Medicine. DailyMed. Allopurinol.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=682dd8b8-fc6e-47c5-95b7-82d7ad96b750>
Accessed 11/19/2018.

⁹ National Institutes of Health. US National Library of Medicine. DailyMed. Atorvastatin.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=4d7150a0-9593-46ab-b8a2-8f6fe0e483b6>
Accessed 11/19/2018.

¹⁰ National Institutes of Health. US National Library of Medicine. DailyMed. Metformin.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6d6ee6f8-9650-ff4f-e053-2991aa0acf19>
Accessed 11/19/2018.

¹¹ National Institutes of Health. US National Library of Medicine. DailyMed. Glipizide.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5565ccce-8000-48ab-a6af-37eca2d8c993>
Accessed 11/19/2018.

¹² National Institutes of Health. US National Library of Medicine. DailyMed. Liraglutide.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5a9ef4ea-c76a-4d34-a604-27c5b505f5a4>
Accessed 11/19/2018.

¹³ National Institutes of Health. US National Library of Medicine. DailyMed. Metoprolol.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=2d948600-35d8-4490-983b-918bdce488c8>
Accessed 11/19/2018.

¹⁴ National Institutes of Health. US National Library of Medicine. DailyMed. Losartan.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=3cdcf8cc-4964-4c53-e054-00144ff88e88>
Accessed 11/19/2018.

¹⁵ National Institutes of Health. US National Library of Medicine. DailyMed. Flunisolide.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=3f3d300d-a843-4da8-90d1-7a1a4c283c51>
Accessed 11/19/2018.

¹⁶ National Institutes of Health. US National Library of Medicine. DailyMed. Tamsulosin.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=339c3b57-a339-4578-bfd7-46b25d911ff6>
Accessed 11/19/2018.

¹⁷ 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.

Toxicology

Toxicology testing performed by the FAA's Bioaeronautical Sciences Research Laboratory identified glipizide in heart blood as well as hydrochlorothiazide, metoprolol, tamsulosin, and yohimbine in femoral blood. All of these and acetaminophen and aspirin were identified in urine.

Glipizide, metoprolol, and tamsulosin are described above.

Hydrochlorothiazide is another medication used to control high blood pressure.¹⁸ Yohimbine is a plant extract used in veterinary medicine that is available on the internet and elsewhere, touted as a supplement to aid in sexual function.¹⁹ Acetaminophen is an analgesic available over the counter, commonly marketed with the name Tylenol. Aspirin is another over the counter analgesic which also has antiplatelet properties and is used to prevent recurrent heart attacks.

D. SUMMARY OF MEDICAL FINDINGS

Pilot

The 57 year old male pilot had reported previous orthopedic surgery and at his last exam reported using aspirin and sildenafil. Aspirin is an anti-platelet analgesic used daily to prevent heart attacks. Sildenafil, often marketed with the name Viagra, is used to treat erectile dysfunction. Neither are considered impairing. He was issued a second class medical certification limited by a requirement that he wear lenses for distant, and have glasses for near vision.

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¹⁸ National Institutes of Health. US National Library of Medicine. DailyMed. Hydrochlorothiazide. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=7b38ac8a-4540-4eb2-aedd-9aa966d22190> Accessed 11/19/2018.

¹⁹ National Institutes of Health. US National Library of Medicine. DailyMed. Yohimbine. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=83ace5e2-cc88-46c6-8bc4-0a2be6684c8f> Accessed 11/19/2018.

Toxicology testing identified etomidate in heart blood and diphenhydramine in femoral blood (0.032 ug/ml) and liver tissue. Etomidate, an anesthetic agent, had been administered during resuscitation attempts.

Pilot Rated Passenger (left seat)

The 67 year old male pilot rated passenger had reported headaches controlled with over the counter medication, hay fever, supraventricular tachycardia treated with an ablation, high blood pressure, diabetes, previous surgery for a ruptured colon, and kidney stones to the FAA. At the time of his last exam, he reported taking allopurinol (used to prevent attacks of gout); atorvastatin (a cholesterol lowering agent); metformin, glipizide and liraglutide (all used to treat type 2 diabetes); metoprolol and losartan (for high blood pressure); inhaled flunisolide (an inhaled steroid to prevent attacks of asthma); and tamsulosin (used to treat symptoms from an enlarged prostate). None of these medications are considered impairing. He was issued a special issuance second class medical certification limited by a requirement for corrective lenses and marked, "Not valid for any class after 12/31/2018."

According to the autopsy performed by the New Mexico Office of the Medical Investigator, the cause of death was blunt head trauma and the manner of death was accident.

The heart was enlarged (cardiomegaly) with biventricular dilation and weighed 435 grams. Average weight for a 203 pound man is 375 grams with a range of 284 to 495 grams. The ventricles were of average thickness; the left measured 1.3 cm thick and the right measured 0.3 cm (average is 1.3 and 0.3 cm respectively). There was early coronary artery disease with up to 40 stenosis of the distal third of the left anterior descending coronary artery. In addition, there was microscopic evidence of previous ischemia with focal areas of fibrous tissue which dissected between and replaced cardiomyocytes.

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