



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

MEDICAL FACTUAL REPORT

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A. ACCIDENT: CEN16FA146 - Taylor, Texas

On April 9, 2016, at about 0951 central daylight time, a Rockwell International 690B, twin-engine airplane, N690TH, owned and operated by a private individual, departed controlled flight and impacted terrain near Taylor, Texas. The pilot and the flight instructor on board were fatally injured and the airplane was destroyed by impact forces and a post-impact fire. The local instructional flight was being conducted under the provisions of 14 *Code of Federal Regulations* Part 91 without a flight plan. Visual meteorological conditions prevailed. The flight departed from Georgetown Municipal Airport, Georgetown, Texas at 0941.

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 any medical conditions, the use of any medications/illicit drugs, and the presence of any toxins.

Methods

The FAA medical case review, FAA medical certification files, FAA Bioaeronautical Sciences Research Laboratory toxicology reports, Central Texas Autopsy LLC. autopsy reports and NMS Labs toxicology reports, were reviewed.

Pilot - Left Seat

FAA Medical Case Review and Medical Certification Records

According to the FAA medical files, the 54-year-old pilot was first medically certified in May 2010. His most recent medical certification examination was dated July 07, 2014. The exam documented he was 71 inches tall, weighed 208 pounds, and had accrued a total of 1,100 flight hours. The pilot reported high blood pressure treated with valsartan and no other medical issues. Valsartan is a blood pressure control medication

marketed as Diovan, it is generally not considered impairing.¹ The certification examination did not identify any disqualifying medical conditions and the Aviation Medical Examiner (AME) issued a third class medical certificate with the limitation "must wear corrective lenses."

Personal Medical Records

The pilot's family practice physician records from April 2014 through March 2015 were reviewed. The records documented the pilot had high blood pressure treated with valsartan and hydrochlorothiazide. Valsartan is described above, it is often prescribed in combination with the diuretic medication hydrochlorothiazide to control blood pressure, the combination medication is generally not considered impairing.² The records did not identify any other significant medical conditions.

Autopsy

According to the Central Texas Autopsy LLC pathologist's autopsy report, the cause of death was multiple blunt force injuries and the manner was accident. Due to the extent of injuries, the autopsy was limited to an external examination and a majority of the body and internal organs were not identified. As a result, significant natural disease could not be identified. The autopsy report describes comingled remains and identification was done by DNA analysis of muscle tissue.

Toxicology

NMS Labs toxicology analysis, conducted as part of the autopsy, detected caffeine (a mild stimulant found in coffee and tea);³ acetaminophen (a non-narcotic pain and fever medication often marketed as Tylenol);⁴ and ethanol in muscle. Testing did not detect any other tested-for-drugs muscle.^{5,6} 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.⁷ The NMS lab report had a toxicologist's comment that stated: "The ethyl alcohol concentration increased from 45 to 78 mg/100 g of muscle over multiple analyses. The nature of the specimen and/or

¹ National Institutes of Health. US National Library of Medicine. *MedlinePlus* 2017. DIOVAN- valsartan. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5ddba454-f3e6-43c2-a7a6-58365d297213> Accessed 12/21/2017

² National Institutes of Health. US National Library of Medicine. *MedlinePlus* 2017. DIOVAN HCT- valsartan and hydrochlorothiazide. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=d76a0419-05ee-437e-884c-65807aea9569> Accessed 12/21/2017

³ National Institutes of Health. US National Library of Medicine. *MedlinePlus* 2017. Caffeine. <https://medlineplus.gov/caffeine.html> Accessed 12/18/2017

⁴ National Institutes of Health. US National Library of Medicine. *MedlinePlus* 2017. TYLENOL 8HR- acetaminophen. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5d7d1300-bcb8-466a-880b-310b360ee132> Accessed 12/18/2017

⁵ The NMS Labs toxicology laboratory tested for the drugs including: alcohol, anesthetics, anticoagulant agents, antifungal agents, antihypertensive agents, anxiolytics (benzodiazepine and others), hypnotosedatives (barbiturates, non-benzodiazepine hypnotics and others), non-steroidal anti-inflammatory agents (excluding salicylates), amphetamines, analgesics, anorectics, antiarrhythmics, anticholinergic agents, anticonvulsant agents, antidepressants, antiemetic agents, antihistamines, antiparkinsonian agents, antipsychotic agents, antitussive agents, antiviral agents, buprenorphine/metabolite, calcium channel blocking agents, cannabinoids, cardiovascular agents (non-digitalis), cocaine/metabolites, local anesthetic agents, muscle relaxants and stimulants (amphetamine-like and others), opiates, oxycodone/oxymorphone,

⁶ The NMS Labs cannabinoid reporting limit is 40 ng/g.

⁷ Federal Aviation Administration. Forensic Toxicology Drug Information. Ethanol. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=60> Accessed 03/02/2015

the container type, which may not contain preservative, may explain the variable quantitative results. Small amounts of ethanol may also be produced by decomposition of the tissue.”

Instructor Pilot - Right Seat

FAA Medical Case Review and Medical Certification Records

According to the FAA medical records, the 66-year-old male instructor pilot's oldest available record was dated November 1998. On that exam, he reported over 16,000 hours total flight time and had no significant medical concerns. His most recent medical certification examination was dated November 05, 2015. The exam documented he was 71 inches tall, weighed 267 pounds, and had accrued a total of 25,975 flight hours. The pilot reported the use of the aspirin and obstructive sleep apnea treated with CPAP. The records contained diagnostic information from a sleep medicine specialist concerning the pilot's successfully treated OSA. (see pulmonary medicine records below). The examination did not identify any other significant medical conditions and the Aviation Medical Examiner (AME) issued a time limited second class medical certificate with the limitation "not valid for any class after November 30, 2016."

Personal Medical Records

The pilot's internal medicine records from June 2013 until February 2016 were reviewed. The records documented the pilot had high blood pressure treated with the prescription blood pressure medicine metoprolol and elevated cholesterol treated with the prescription lipid lowering medication fenofibrate; these medications are generally not considered impairing.^{8,9} His most recent examination dated February 26, 2016 was for medication refill and other than treated high blood pressure and elevated cholesterol, did not identify any significant medical concerns.

The pilot's pulmonary medicine records from August 2014 until April 2015 were reviewed. The records documented the pilot's history of high blood pressure and elevated cholesterol treated with medications described above. Additionally, the records documented obstructive sleep apnea diagnosed in October 2014. The pilot's diagnostic sleep study documented and apnea hypopnea index of 20.2 and an oxygen saturation less than 90% for 8.6 minutes of sleep with the lowest level of 87%.¹⁰ He was treated with positive airway pressure. The most recent pulmonary medicine visit was dated April 20, 2015 the physician documented the pilot had good response to positive airway pressure treatment. The records did not include information about the nightly use of treatment by the pilot.

Autopsy

According to the Central Texas Autopsy LLC pathologist's autopsy report, the cause of death was multiple blunt force injuries and the manner was accident. Due to the extent

⁸ National Institutes of Health. US National Library of Medicine. *MedlinePlus* 2017. METOPROLOL. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=a8374722-d2b5-4eb3-bbcd-6ddc52e763ba> Accessed 12/21/2017

⁹ National Institutes of Health. US National Library of Medicine. *MedlinePlus* 2017. FENOFIBRATE. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f99eb8fd-2f27-64c1-5b37-7745643db63e> Accessed 12/21/2017

¹⁰ An *apneic episode* is the complete absence of airflow through the mouth and nose for at least 10 seconds. A *hypopnea episode* is when airflow decreases by 50 percent for at least 10 seconds or decreases by 30 percent if there is an associated decrease in the oxygen saturation or an arousal from sleep. The AHI sums the frequency of both types of episodes per hour. An AHI of less than 5 is considered normal. An AHI of 5-15 is mild; 15-30 is moderate and more than 30 events per hour is considered severe sleep apnea.

of injuries, autopsy was limited to an external examination and a majority of the body and internal organs were not identified. The autopsy was unable to identify any significant natural disease. The autopsy report describes comingled remains and identification was done by DNA analysis of muscle tissue.

Toxicology

NMS Labs toxicology analysis, conducted as part of the autopsy, detected acetaminophen (described earlier in this report), beta-phenethylamine (according to the NMS lab report this is a product of tissue decomposition) and ethanol (described earlier in this report) in muscle tissue.

FAA Bioaeronautical Sciences Research Laboratory Toxicology

FAA Bioaeronautical Sciences Research Laboratory conducted toxicology testing on specimens that were obtained from victims during the autopsies, the reports described comingled remains. The investigation was unable to reliably determine which specimen came from which individual.

The report of testing attributed to the 54-year-old pilot documented that valsartan was not detected in muscle or lung and ethanol was not detected in muscle or liver.^{11,12} Testing detected tetrahydrocannabinol (THC) at 35.2 ng/g in liver, at 52.9 ng/g in lung, and a non-quantified amount in muscle; tetrahydrocannabinol carboxylic acid (THC-COOH) was detected at 50.4 ng/g in liver, 18.8 ng/g in lung, and a non-quantified amount in muscle. Tetrahydrocannabinol (THC) is the psychoactive compound found in marijuana and tetrahydrocannabinol carboxylic acid (THC-COOH) is its inactive metabolite.¹³ 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.¹⁴

The report of testing attributed to the 66-year-old male instructor pilot documented ethanol at 20 mg/dl in liver and heart (ethanol is described above); dextromethorphan (a cough suppressant) in liver, kidney and muscle; and valsartan (a blood pressure medication described above) in liver but not muscle.¹⁵ Additionally, the report states that THC and THC-COOH were not detected in muscle.

D. SUMMARY OF MEDICAL FINDINGS

The 54-year-old left-seated pilot held a current third class medical certificate. He had high blood pressure treated with the non-impairing blood pressure medication valsartan. The Central Texas Autopsy LLC pathologist determined the pilot died from multiple blunt force injuries, but the autopsy was limited to an external examination due to the extent of the injuries and was unable to identify any significant natural disease. The autopsy report describes the remains as comingled and identification was done by DNA analysis of muscle tissue. NMS Labs toxicology analysis, conducted as part of the autopsy, detected caffeine (a mild stimulant found in coffee and tea),

¹¹ The 54-year-old pilot's high blood pressure was treated with valsartan.

¹² FAA Bioaeronautical Sciences Research Laboratory volatile concentrations are determined by headspace gas chromatography at a cut off of 10 mg/dL.

¹³ FAA Bioaeronautical Sciences Research Laboratory testing included more than 1300 toxins, prescription, and over-the-counter medications, illicit drugs and their metabolites, see <http://jag.cami.jccbi.gov/toxicology/default.asp?offset=0> for a complete listing.

¹⁴ 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 12/22/2017

¹⁵ The 66-year-old instructor pilot's high blood pressure was treated with metoprolol and not valsartan.

acetaminophen (a non-narcotic pain and fever medication often marketed as Tylenol) and ethanol (a central nervous system depressant found in beer and wine but also produced after death by decomposition) in muscle. The toxicologist commented: "The ethyl alcohol concentration increased from 45 to 78 mg/100 g of muscle over multiple analyses. The nature of the specimen and/or the container type, which may not contain preservative, may explain the variable quantitative results. Small amounts of ethanol may also be produced by decomposition of the tissue."

The 66-year-old male right-seated instructor pilot held a current second class medical certificate. He had high blood pressure treated with the non-impairing blood pressure medication metoprolol and obstructive sleep apnea treated with a CPAP device. The Central Texas Autopsy LLC pathologist determined the instructor pilot died from multiple blunt force injuries, but the autopsy was limited to an external examination due to the extent of the injuries and was unable to identify any significant natural disease. The autopsy report describes the remains as comingled and identification was done by DNA analysis of muscle tissue. NMS Labs toxicology analysis, conducted as part of the autopsy, detected acetaminophen (a non-narcotic pain and fever medication often marketed as Tylenol), beta-phenethylamine (a product of tissue decomposition) and a non-quantified amount of ethanol (described above) in muscle tissue.

FAA Bioaeronautical Sciences Research Laboratory toxicology testing was conducted on specimens from comingled remains and the investigation was unable to reliably determine which specimen came from which individual. Testing of specimens attributed to the 54-year-old pilot documented that valsartan was not detected in muscle or lung and ethanol was not detected in muscle or liver. However, testing detected the primary psychoactive compound of marijuana, tetrahydrocannabinol (THC) at 35.2 ng/g in liver, at 52.9 ng/g in lung, and identified a non-quantified amount in muscle. THC's inactive metabolite tetrahydrocannabinol carboxylic acid (THC-COOH) was detected at 50.4 ng/g in liver, 18.8 ng/g in lung, and identified a non-quantified amount in muscle. Additionally, testing of specimens attributed to the 66-year-old male instructor pilot documented ethanol at 20 mg/dl in liver and heart (ethanol is described above); dextromethorphan (a cough suppressant) in liver, kidney and muscle; and valsartan (a blood pressure medication) in liver but not muscle. Finally, the report states that THC and THC-COOH were not detected in muscle.