



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

November 23, 2016

Mary Pat McKay, MD, MPH
Chief Medical Officer

A. ACCIDENT: CEN15LA306; Clark, SD

On July 14, 2015, about 1552 central daylight time, an Air Creation model Clipper 582, an unregistered weight-shift control aircraft, was substantially damaged when it impacted terrain shortly after takeoff from Clark County Airport (8D7), Clark, South Dakota. The uncertificated pilot and his passenger sustained serious injuries. The flight was conducted under the provisions of 14 Code of Federal Regulations Part 91 without a flight plan. Day visual meteorological conditions prevailed for the local flight that was originating at the time of the accident.

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

2. Methods

The toxicology results, personal medical records, and the investigator's reports were reviewed. As the pilot lacked a pilot certificate, he had never applied for or obtained an aviation medical certificate. As a result, there were no FAA medical files regarding this pilot.

Toxicology

A breathalyzer test was performed for the pilot by a member of Clark County Sheriff's Office more than two hours after the accident. The result was a blood alcohol level of 0.02%. Hospital records indicate his blood

ethanol on arrival was 0.046% on arrival about 40-60 minutes after the accident.

Toxicology testing performed at the request of the Clark County Sheriff by the South Dakota Public Health Laboratory identified ethyl alcohol at 0.020 gm/dl as well as 628 ng/ml of benzoylecgonine, cannabinoids (specimen insufficient for confirmation), and 35 ng/ml of methamphetamine in peripheral blood obtained some hours after the accident.

Toxicology testing performed by the FAA's Bioaeronautical Research Laboratory on peripheral blood and urine obtained at the hospital some time after the accident. Testing identified ethanol in urine at 0.019 gm/dl. In addition, methamphetamine and its metabolite amphetamine, cocaine and its metabolites benzoylecgonine and cocaethylene, and tetrahydrocannabinol carboxylic acid (the main inactive metabolite of tetrahydrocannabinol the active compound in marijuana), were detected in urine. In peripheral blood, cocaine, benzoylecgonine, methamphetamine, and 0.0114 ug/ml of tetrahydrocannabinol carboxylic acid were identified. Finally, ketamine was identified in both blood and urine.

Ethanol is the type of alcohol present in beer, wine, and liquor. It is a social drug that acts as a central nervous system depressant. After ingestion, at low doses, it impairs judgment, psychomotor functioning, and vigilance; at higher doses ethanol can cause coma and death. Federal Aviation Regulations, Section 91.17 (a) prohibits any person from acting or attempting to act as a crewmember of a civil aircraft while having 0.040 gm/dl or more alcohol in the blood.¹ The effects of alcohol on aviators are generally well understood; alcohol significantly impairs pilots' performance, even at very low levels.²

Methamphetamine is a central nervous system stimulant prescription medication available as a Schedule II controlled substance and is used medically to treat ADHD, ADD and narcolepsy. It is also frequently used illicitly; these users are seeking the intense euphoria produced by higher levels snort, smoke, or inject the drug. Its main metabolite is amphetamine, also a physiologically active sympathomimetic drug. In the early phase, users experience euphoria, excitement, exhilaration, rapid flight of ideas, increased libido, rapid speech, motor restlessness, hallucinations, delusions, psychosis, insomnia, reduced fatigue or drowsiness, increased alertness, a heightened sense of well-being, and poor impulse control. As the initial effects wear off users commonly experience dysphoria, restlessness, agitation, and nervousness; they may

¹ US Government Printing Office .eCFR- Code of Federal Regulations. 91.17. <http://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=14:2.0.1.3.10.1.4.9>. Accessed 11/16/2016.

² Cook, C.C., Alcohol and aviation. *Addiction* (Abingdon, England), 1997. 92(5):539-555.

experience paranoia, violence, aggression, a lack of coordination, delusions, psychosis, and drug craving.³

Cocaine is a central nervous system stimulant prescription medication available as a Schedule II controlled substance and is used medically as a topical solution to anesthetize the mucous membranes of the mouth and nasopharynx for medical or dental procedures. However, it is often used illicitly via snorting, smoking, or injection for its psychoactive effects. Benzoyllecgonine is an inactive metabolite of cocaine. Cocaethylene is another inactive metabolite that only occurs when cocaine and ethanol are co-ingested. Cocaine is rapidly metabolized; its half-life is approximately 0.8 ± 0.2 hours, while the half-life of benzoyllecgonine is 6 hours.⁴ Cocaine use acutely results in euphoria, excitation, feelings of well-being, general arousal, and increased sexual excitement; higher doses may result in psychosis, delusions, hallucinations, irritability, fear, paranoia, antisocial behavior, and aggressiveness. After the brief “high” wears off, users may exhibit dysphoria, depression, agitation, nervousness, drug craving, fatigue, and inability to sleep.³

Tetrahydrocannabinol carboxylic acid, or THC-COOH, is an inactive metabolite of tetrahydrocannabinol, the active component in marijuana. Tetrahydrocannabinol (THC) has mood altering effects including inducing euphoria and relaxation, alterations in motor behavior, perception, cognition, and memory; it decreases ability to concentrate and maintain attention, and impairs hand-eye coordination, retention time, and tracking. Tetrahydrocannabinol concentrations typically peak during the act of smoking, while peak tetrahydrocannabinol carboxylic acid concentrations occur approximately 9-23 minutes after the start of smoking. Concentrations of both analytes decline rapidly and are often < 0.005 ug/mL after 3 hours.⁵

Ketamine is a non-barbiturate anesthetic available only in injectable forms and often used for sedation of critically ill patients in hospital settings.⁶

³ National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Methamphetamine. <http://www.nhtsa.gov/people/injury/research/job185drugs/methamphetamine.htm>. Accessed 11/22/2016.

⁴ National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Cocaine. <http://www.nhtsa.gov/people/injury/research/job185drugs/cocain.htm> Accessed 11/21/2016.

⁵ National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Cannabis/Marijuana. <http://www.nhtsa.gov/people/injury/research/job185drugs/cannabis.htm> Accessed 11/22/2016.

⁶ National Institutes of Health. US National Library of Medicine. DailyMed. Ketamine. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=14b54219-f5fd-42fa-8784-719f9785497f> Accessed 11/22/2016.

Personal Medical Records

According to records obtained from initial treating institution, this was the second visit to the hospital for injuries related to a light aircraft crash; the pilot had required surgery for a broken tibia about 10 years previously. In addition, the 57 year old male pilot had a history of atrial fibrillation, Hepatitis C, and chronic pain, as well as illicit drug use including methamphetamine, cocaine, and marijuana and had previously reported drinking “a pint of brandy a day.” At the first institution, he was resuscitated, sedated, intubated, and placed on a ventilator to control his pain and allow his injuries to be evaluated. He was found to be critically injured and transferred for a higher level of care at another institution.

D. SUMMARY OF MEDICAL FINDINGS

The 57 year old uncertificated pilot flying an uncertified weight-shift-control airplane with a passenger in this accident had a history of injury from a previous aircraft accident. In addition, he had a history of misusing a number of substances. Hospital records indicate his blood ethanol on arrival was 0.046% on arrival about 40-60 minutes after the accident. More than two hours after the accident, he had a measured breathalyzer reading of 0.02%. Blood toxicology testing indicated use of methamphetamine, cocaine, alcohol, and tetrahydrocannabinol (marijuana), with active methamphetamine still in his system. In addition, ketamine was identified in his blood.