



**Federal Aviation
Administration**

DOT/FAA/AM-08/22
Office of Aerospace Medicine
Washington, DC 20591

Alcohol-Related Aviation Accidents Involving Pilots With Previous Alcohol Offenses

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October 2008

Final Report

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Technical Report Documentation Page

1. Report No. DOT/FAA/AM-22		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Alcohol-Related Aviation Accidents Involving Pilots With Previous Alcohol Offenses				5. Report Date October 2008	
				6. Performing Organization Code	
7. Author(s) Botch SR, Johnson RD				8. Performing Organization Report No.	
9. Performing Organization Name and Address FAA Civil Aerospace Medical Institute P.O. Box 25082 Oklahoma City, OK 73125				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Office of Aerospace Medicine Federal Aviation Administration 800 Independence Ave., S.W. Washington, DC 20591				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplemental Notes This work was accomplished under approved task AM-B-05-TOX-204.					
16. Abstract <p>The Federal Aviation Administration (FAA) requires airmen to report legal actions involving ethanol and/or other drugs, including driving while impaired by or while under the influence of alcohol. Pilots are also required to report any administrative action resulting in denial, suspension, cancellation, or revocation of driving privileges or mandatory attendance at an educational or rehabilitation program. The purpose of this study was to evaluate fatal civil aviation accidents between the years 2000 and 2007 in which ethanol was present in the pilot, and the pilot had previously documented drug and/or alcohol offenses and/or dependence. Toxicological and aeromedical findings from pilots were collected for an 8-year period, 2000 - 2007. Case histories, accident information, and the probable cause of the accidents were obtained from the National Transportation Safety Board. Toxicological information was obtained from the Civil Aerospace Medical Institute's Forensic Toxicology Research Laboratory. During the examined time period, 215 pilots (9%) of the 2,391 received for analysis had documented alcohol- or drug-related offenses. Of the 215 pilots, 23 (11%) had consumed ethanol prior to the fatal incident. Of these 23 pilots, 16 (~70%) had ethanol concentrations above the FAA's legal limit of 40 mg/dL and 7 (~30%) between 20 and 40 mg/dL. Providing more detailed documentation to aviation medical examiners would aid in the determination of eligibility for medical certification and could potentially save pilots as well as their passengers' lives. Identifying pilots with substance abuse problems is paramount for providing a safe environment to fly but also benefits the pilots who may not have addressed these issues.</p>					
17. Key Words Alcohol Abuse, Offenses, DUI, Toxicology, Aircraft Accident Investigation, Safety			18. Distribution Statement Document is available to the public through the Defense Technical Information Center, Ft. Belvoir, VA 22060; and the National Technical Information Service, Springfield, VA 22161		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 12	22. Price

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ALCOHOL-RELATED AVIATION ACCIDENTS INVOLVING PILOTS WITH PREVIOUS ALCOHOL OFFENSES

INTRODUCTION

The Federal Aviation Administration (FAA) requires airmen to report legal actions involving ethanol and/or other drugs. Legal actions of concern include driving while impaired by or while under the influence of alcohol or other drug(s). Certified pilots are required to report any administrative action resulting in denial, suspension, cancellation, or revocation of driving privileges or mandatory attendance at an educational or rehabilitation program.¹ Furthermore, a National Driver Register (NDR) inquiry is periodically performed to verify that all relevant convictions are in fact reported by pilots to the FAA. Airmen are also asked to report any history of substance dependence on their Application for Airman Medical Certificate. Pilots with a documented history of substance dependence may still be certified to operate an aircraft through an Authorization for Special Issuance (SI). Under current FAA regulations, pilots who are certified via an SI may be subsequently certified without such authorization after a documented 2-year period of abstinence.

Airmen, being a small subset of the general population, are subject to the same temptations as anyone in the general public. Every aviation accident is tragic. However, from an aviation safety standpoint the most serious cases are those caused by repeat offenders of the FAA's drug and alcohol policies. The purpose of this study was to evaluate, on a case by case basis, fatal aviation accidents between the years 2000 and 2007 in which ethanol was present in the pilot, and the pilot had previously documented alcohol offenses and/or a documented history of alcohol dependence.

METHODS

The Civil Aerospace Medical Institute's (CAMI's) Forensic Toxicology Research Laboratory analyzes post-mortem specimens collected from pilots involved in civil aviation accidents.^{2,3} Toxicological information for cases in which pilots had elevated ethanol values was obtained from CAMI's ToxFlo™ (DiscoverSoft Development, LLC, Oklahoma City, OK) toxicology database. The pilot's medical history as reported in his/her medical certification was obtained from the FAA's Document Information

Workflow System (DIWS). This system records drug/alcohol offenses and dependence as reported by the pilot to the Aviation Medical Examiner (AME), as well as other information including class, certificate type(s) held by the pilot, and if the pilot was formerly a SI case which was discontinued after the 2 year monitoring program.⁴ All information pertaining to accident information and the probable cause of aviation accidents are available through the National Transportation Safety Board (NTSB). The NTSB's database can be accessed by the public via the World Wide Web.

RESULTS

During the examined time period (2000-2007) specimens from 2,391 pilots involved in fatal accidents were received by CAMI for toxicological analysis. Two hundred fifteen of these pilots (9%) had a documented alcohol or drug related offense in their past (i.e. driving under the influence, driving while intoxicated, public intoxication, or reckless driving involving alcohol), a history of either alcohol or drug dependence, or were formally issued an Authorization for Special Issuance (SI) for alcohol or drug dependence. Alcohol-related offenses were the most commonly encountered. Out of the 215 pilots with a past substance related offense 117 (54%) of those were related to ethanol. Forty nine of these 215 pilots (23%) had been cited for a combination of illicit drugs and ethanol, while 16 of these pilots (7%) had been cited for offenses related to illicit drugs only. Finally, 33 of these pilots (15%) had a documented history of alcohol and/or drug dependence.

Following toxicological evaluation of the 215 pilots that had a previous drug or alcohol related offense and were involved in a fatal aviation accident it was determined that 23 (11%) had consumed ethanol prior to the fatal incident. Out of these 23 pilots, 16 (70%) were found with ethanol concentrations above the FAA's legal limit of 40 mg/dL. The remaining 7 pilots (30%) had ethanol present in their system at a concentration below the FAA's legal limit of 40 mg/dL, but above 20 mg/dL, a cutoff for the reporting of the presence of ethanol by the NTSB. For comparative purposes, from the 2,391 aviation accidents evaluated during the examined time period the percentage of all pilots with ethanol concentrations above 40 mg/dL

at the time of the accident was approximately 5%, while the percentage of pilots with ethanol values between 20 and 40 mg/dL was approximately 2%.

The NTSB attributed impairment by alcohol as a cause or factor in 11 of the 16 (67%) accidents involving repeat offenders in which the ethanol concentrations were above 40 mg/dL. In addition to these 11 pilots, the NTSB deemed one accident a suicide in which the ethanol values were elevated and the pilot had also used cocaine. In 3 of the 16 accidents the FAA was held accountable for failing to identify existing evidence of substance dependence and for failure to obtain additional information concerning a pilot's self-reported drivers license suspension.

Case Histories

The following are brief descriptions of 12 of the 16 fatalities involving repeat offenders with ethanol values above 40 (mg/dL, mg/hg) in which the NTSB deemed impairment by alcohol as a cause/factor in the accident including one accident that was deemed a suicide. Ethanol concentrations, other compounds found in these cases, and the NTSB's determination are presented. A summary of all 16 case histories is presented in Table 1.

Case 1

A 40-year-old male died after his rented aircraft crashed into the ocean. As described in the NTSB's final report, the victim had left an envelope in a friend's car, and had instructed the friend not to open it until after the plane had departed. The envelope contained a power of attorney declaration, transferring all of the pilot's property to his brother. A passing airplane received a distress call from the pilot stating the he had lost engine power, and that he was going down. The pilot had a history of substance abuse with two reported previous alcohol-related offenses, had previously been convicted of first-degree arson, and was being sought by local police for a recent arson. Ethanol was found in the victim at concentrations of 42 mg/dL in the blood, and 27, 105, 98, 116, 69, and 106 mg/hg in the liver, muscle, spleen, kidney, lung, and heart respectively. Cocaine and two of its metabolites were also present in the pilot's blood as well as several benzodiazepines including; diazepam, nordiazepam, oxazepam, and temazepam The NTSB determined the cause of the accident to be a suicide.

Case 2

A 37-year-old male died after his plane collided with power lines. The pilot had one previously reported alcohol-related offense. Ethanol values found in the victim were 124 mg/dL in the blood, 214 mg/dL in the urine, 125 mg/hg in the muscle, and 74 mg/hg in the brain. Additionally, tetrahydrocannabinol was present in the

victim's blood and tetrahydrocannabinol carboxylic acid was found at concentrations of 0.006 µg/mL in the blood and 0.04 µg/mL in the urine. The NTSB determined a factor in the accident to be the pilot's misjudgment of his altitude and distance from the airport due to impairment by alcohol.

Case 3

A 46-year-old male died after his Cessna 152 aircraft crashed. A witness and the pilot of another aircraft traveling a similar route both stated to the NTSB that the victim may have consumed beer or wine prior to his flight. In addition, the pilot had two previous alcohol-related offenses listed in his airman file. Ethanol was found in the victim at concentrations of 174 mg/hg in the kidney and 180 mg/hg in the muscle. The NTSB determined the factors causing the accident were the pilot's consumption of alcoholic beverages prior to the flight and the dark night.

Case 4

A 30-year-old male initially survived an aircraft accident involving a Helicopters & Airplanes, Inc. Exec 162F helicopter in which he received minor injuries. A passenger who flew with the pilot earlier on the day of the incident reported smelling vodka on the pilot's breath before the flight departed. The witness stated to the NTSB that they did not believe the pilot was drunk and that they had asked the pilot if he had been drinking. The NTSB report states that the pilot's reply was that he was not "drunk". Hospital records indicate a blood specimen taken approximately 1.5 hours after the accident was positive for ethanol at a concentration of 136 mg/dL. The blood ethanol concentration determined by the FAA from specimens obtained near the same time was 105 mg/dL. Additionally, citalopram (0.017 µg/ml in the blood) and zolpidem (0.433 µg/ml in the blood) were also detected. NTSB personnel did not have an opportunity to discuss the circumstances of the accident with the pilot due to the fact that he was fatally injured in another airplane accident, involving a Cessna 172S, the following morning at approximately 0830 hours, which was approximately 10 hours after the helicopter accident and 6 hours after being released from the hospital. From the specimens collected at autopsy, citalopram was detected at a concentration of 0.205 µg/ml in the blood and zolpidem at a concentration of 1.54 µg/ml in the blood. The ethanol values from the postmortem samples were 69 mg/dL blood, 84 mg/hg kidney, and 105 mg/hg muscle. The NTSB determined the first accident to be the pilot's intentional operation of the helicopter while impaired by alcohol and a drug (zolpidem) resulting in

the in-flight collision with a house. The second accident was attributed to a suicidal act by the pilot resulting in the in-flight collision with trees and then the ground. A contributing factor in the accident was the pilot's depression. Findings in the investigation were the pilot's consumption of zolpidem and citalopram before the accident flight departed, and his intentional operation of the airplane while impaired by alcohol. This airman had two previously reported alcohol-related offenses.

Case 5

A 50-year-old male died after his Rans, Inc. S-14 aircraft collided with the terrain. The pilot had a history of alcoholism with documented evidence of sobriety and at least one alcohol-related offense. Ethanol values were 171 mg/dL in the blood, 363 mg/dL in the urine, and 231 mg/dL in the vitreous humor. The NTSB determined a physical impairment due to alcohol was a factor in the accident.

Case 6

A 48-year-old male, who was not rated for instrument assisted flight died after his Piper PA-24-180 aircraft was destroyed during an in-flight collision with terrain, at night, in instrument meteorological conditions. The airman had one previous alcohol-related offense. Ethanol was found in the pilot at concentrations of 54 mg/dL in the blood, 106 mg/dL in the vitreous, and 95 mg/hg in the muscle. The NTSB determined a contributing factor in the incident to be the pilot's impairment due to alcohol.

Case 7

A 48-year-old male died after crashing a Cessna 150L into the ground at a high rate of speed. Ethanol values were 263 mg/dL in the blood, 235 mg/dL in the vitreous, 275 mg/dL in urine, and 190 mg/hg in the brain. The NTSB report stated that the pilot had a history of alcohol abuse beginning at the age of 16, as well as a history of driving while under the influence of alcohol with one alcohol-related offense documented in his airman file. He received inpatient treatment for "alcohol dependence" in 1993 and was noted to be "high risk for relapse" in documentation provided to the FAA. The pilot's first application for a 3rd Class Medical Certificate and Student Pilot Certificate in 1995 was denied. The pilot subsequently obtained a valid medical certificate in 1997, but was cautioned by the FAA that any further alcohol related offenses, or evidence of alcohol abuse could require re-evaluation of his medical certification. The NTSB determined a contributing factor to the accident was the physical impairment of the pilot due to an elevated blood alcohol level.

Case 8

A 42-year-old male died after his Raytheon Aircraft Company G36 aircraft collided with the terrain during an aborted landing. A bartender reported to the NTSB that ~5.5 hours prior to the accident she served the pilot four alcoholic beverages and that he never appeared to be intoxicated. The pilot and two passengers were transported to the airport, by a designated driver, ~1 to 2 hours prior to the accident. The designated driver reported to the NTSB that the pilot did not appear to be intoxicated. On the airman's application for a medical certificate, he reported one Driving Under the Influence (DUI) conviction, which occurred over 5 years prior to the accident (2 years prior to submitting the application); FAA medical records contained no details of that DUI, but review of the arrest records noted that the pilot's blood alcohol content (BAC) was 0.28% during that arrest. Review of Federal Bureau of Investigation (FBI) records by the NTSB indicated that the pilot actually had three additional convictions for drug and/or alcohol related offenses, including another DUI about 12 years prior to the accident. Ethanol values found after the fatal incident were 365 mg/dL in the blood, 357 mg/dL in the urine, 245 mg/hg in the muscle, and 267 mg/hg in brain. The NTSB determined the cause of the accident to be the pilot's misjudgment of distance and speed that led to a long landing, and his inadequate recovery from a bounced landing, all due to the effects of impairment from alcohol consumption. A contributing factor was the FAA's failure to identify existing evidence of substance (alcohol) dependence in the pilot due to an inadequate and incomplete process of screening medical applications.

Case 9

A 66-year-old male died after his Arter RV6 aircraft crashed into a field. The pilot had one documented alcohol-related offense as well as one drug-related offense. Ethanol values were 61 mg/dL in the blood, 183 mg/dL in the urine, and 112 mg/dL in the vitreous. The NTSB determined the factors in the accident were the pilot's ostentatious display and impairment due to alcohol.

Case 10

A 50-year-old male died after his Brown Pitts S-1 experimental bi-plane collided with the frozen surface of a lake. Located within the pilot's flight suit was a broken beer bottle. The pilot's driver's license was suspended 10 months prior to the accident. This incident had been reported, but the details of the arrest had not been obtained by the FAA. The arrest record obtained by the NTSB for that suspension detailed that this pilot had been driving a vehicle with a BAC of more than 0.25%. In addition, the pilot had a least one other documented

alcohol-related offense. Postmortem toxicological analysis revealed ethanol concentrations of 155 mg/dL in the blood, 279 mg/dL in the urine, 155 mg/hg in the heart, and 151 mg/hg in the muscle. Additionally, the serotonin metabolite ratio was established in this case revealing that ethanol was consumed prior to the accident.⁵ The NTSB determined that contributing to the accident was the pilot's intentional operation of the airplane while impaired by alcohol and the FAA's failure to obtain additional information about the pilot's self-reported driver's license suspension.

Case 11

A 52-year-old male certified flight instructor (CFI) operating a Cessna 172S with a student pilot were performing touch-and-go landings in the vicinity of an uncontrolled airport. The student pilot survived the accident. The student pilot reported to the NTSB that the CFI failed to respond to the aircraft's stalled condition and the aircraft crashed due to insufficient altitude to recover from the stall. Postmortem toxicological analysis revealed ethanol at a concentration of 285 mg/dL in the blood. The NTSB report stated that the level of alcohol tolerance exhibited by the pilot suggests a minimum period of weeks or months of sustained increased alcohol intake, rather than a single binge event, particularly given that witnesses saw the instructor consume alcohol before the flight, a prior DUI conviction, and the liver cirrhosis found during the autopsy. The NTSB deemed the pilot's judgment and performance were undoubtedly impaired

by alcohol. The NTSB report also notes that the CFI had reported to the FAA his prior DUI, but the FAA did not request details, nor require an additional substance dependence evaluation. The NTSB found the cause of the accident to be due to the flight instructor's failure to maintain sufficient airspeed to avoid a stall during takeoff-initial climb, and his impairment from alcohol.

Case 12

A 46-year-old male operating a Cessna 182Q was performing a flight to patrol a pipeline. The pilot was found to be flying in an erratic manner away from the pipeline and in telephone communications with the pipeline company a witness reported that he seemed "weird and disorientated." Post-accident toxicological tests on specimens from the pilot found a blood ethanol level of 373 mg/dL and a urine ethanol level of 556 mg/dL. Toxicology tests also detected a high level of citalopram (0.863 ug/mL), a prescription antidepressant, and its metabolites in the pilot's blood and urine. The pilot had three previous drug and/or alcohol related offenses. The NTSB found the cause of the accident to be the pilot's failure to maintain aircraft control due to the effects of impairment from alcohol consumption resulting in the collision with the trees. A contributing factor was the Federal Aviation Administration's failure to identify existing evidence of substance (alcohol) dependence in this commercial pilot due to an inadequate and incomplete process of screening medical applications.

Table 1. Case Demographics

Case	Age	Sex	Blood Ethanol Concentrations (mg/dL) Unless Otherwise Noted	Other Compounds Detected	Previous Alcohol or Drug Related Offenses	NTSB Findings
1	40	Male	42	Cocaine Benzodiazepines	Alcoholism/Alcohol Related Offense	Suicide
2	37	Male	124	Tetrahydrocannabinol	Alcohol Related Offense	The pilot's misjudgment of his altitude and distance from the airport was due to impairment by alcohol.
3	55	Male	41 (mg/hg Muscle)	—	Alcohol Related Offense	Failure of both pilots to maintain an adequate visual lookout.
4	46	Male	180 (mg/hg Muscle)	—	Drug and Alcohol Related Offenses	Factors in the accident was the pilot's consuming alcoholic beverages before the flight and the dark night.
5	30	Male	69	Citalopram Zolpidem	Drug and Alcohol Related Offenses	Suicidal act by the pilot, contributing factor was the pilot's depression. Findings were the pilot's consumption of zolpidem and citalopram and intentional operation of the airplane while impaired by alcohol.
6	50	Male	171	—	Alcoholism/Alcohol Related Offense	Physical impairment due to alcohol was a factor.
7	50	Male	106 (mg/hg Muscle)	Cocaine	Alcohol and Drug Related Offenses	Pilot's in-flight loss of control due to spatial disorientation, and failure to maintain airspeed, which resulted in a stall/spin.
8	48	Male	54	—	Alcohol Related Offenses	Contributing factors were the pilot's impairment due to alcohol
9	48	Male	263	Doxylamine	Alcohol Related Offenses	A factor contributing to the accident was the physical impairment of the pilot due to an elevated blood alcohol level.
10	42	Male	365	—	Alcohol Related Offense	The pilot's misjudged distance and speed that led to a long landing, and his inadequate recovery from a bounced landing, all due to the effects of impairment from alcohol consumption, which resulted in an in-flight collision with terrain during an aborted landing attempt. A contributing factor was the Federal Aviation Administration's failure to identify existing evidence of substance (alcohol) dependence in the pilot due to an inadequate and incomplete process of screening medical applications.

Table 1. Case Demographics (Continued)						
Case	Age	Sex	Blood Ethanol Concentrations (mg/dL) Unless Otherwise Noted	Other Compounds Detected	Previous Alcohol or Drug Related Offenses	NTSB Findings
11	66	Male	61	—	Alcohol and Drug Related Offenses	Factors in the accident were the pilot's ostentatious display and impairment due to alcohol.
12	50	Male	155	—	Drug and Alcohol Related Offenses	Contributing to the accident was the pilot's intentional operation of the airplane while impaired by alcohol and the FAA's failure to obtain additional information about the pilot's self-reported driver's license suspension.
13	45	Male	48 (mg/hg Muscle)	—	Drug Abuse/Alcohol and Drug Related Offenses	The pilot's failure to maintain sufficient altitude above the surface of water during an intentional buzzing maneuver. Contributing to the accident was the nighttime lighting environment.
14	25	Male	270	Citalopram	Drug and Alcohol Related Offenses	N/A
15	52	Male	285	Atropine	Alcohol Related Offense	The flight instructor's failure to maintain sufficient airspeed to avoid a stall during takeoff-initial climb, and his impairment from alcohol.
16	46	Male	373	—	Drug and Alcohol Related Offenses	The pilot's failure to maintain aircraft control due to the effects of impairment from alcohol consumption. A contributing factor was the Federal Aviation Administration's failure to identify existing evidence of substance (alcohol) dependence in this commercial pilot due to an inadequate and incomplete process of screening medical applications.

DISCUSSION

The use of alcohol and drugs is not uncommon in the pilot community. The FAA has studied this topic extensively and has made tremendous strides in developing programs to help pilots with substance abuse issues. Per “Alcohol Rehabilitation of Airline Pilots,” by Russell et al. the Special Issuance (SI) program, implemented in 1976, was developed to monitor airline pilots suffering from ethanol dependence.⁶ The FAA in conjunction with the Airline Pilots Association (ALPA) and several airline companies initiated a plan for the certification of rehabilitated alcoholic pilots. The study evaluated 587 records of airline pilots that were granted special issuance after treatment for alcoholism from 1972 to 1984. The researchers found that the SI program had an 85% success rate. It also noted that if a pilot experienced a relapse they were immediately removed from their flight duty and recycled through the program. Russell et al. stated that in no case that involved a relapse was it felt that aviation safety was compromised.⁶

There is a high probability that a pilot convicted for driving while under the influence of alcohol and/or other drugs had driven under similar conditions before. The National Highway Traffic Safety Administration (NHTSA) estimates that on average, an individual makes approximately 1,000 drunken driving trips prior to being arrested.⁷ As stated in the NTSB Safety Alert, “Hard Core Drinking Drivers”, repeat offenders represent about one-third of all drivers arrested or convicted of driving while intoxicated or under the influence of alcohol. Additionally, the NTSB found that in 2006, people identified as “hard core drinking drivers” — which was defined as those with blood alcohol concentrations (BACs) of 0.15% or greater or who were repeat offenders with a drunk driving arrest or conviction in the past 10 years — were involved in more than 53% of the alcohol-related fatalities and more than 22% of all highway deaths. The NTSB recommends that DWI offenders maintain a zero BAC level as these measures have resulted in a 25% reduction in the proportion of repeat offenders involved in fatal crashes.⁷

Clinical diagnosis of substance dependence is disqualifying for airmen duties, except under certain specific circumstances. For airmen who do not meet the regulatory criteria for medical certification for any reason, including substance dependence, the FAA may permit certification under a time-limited Authorization for Special Issuance (14

CFR 67.401).¹ Per 14 Code of Federal Regulations (CFR) 67.107(a)(4)(ii), 67.207(a)(4)(ii) and 67.307(a)(4)(ii), alcohol and other substance dependence is defined as evidenced by (A) increasing tolerance, (B) manifestation of withdrawal symptoms, (C) impaired control of use, or (D) continued use despite damage to physical health or impairment of social, personal, or occupation functioning.¹

Accurate history of driving while under the influence or intoxication can be limited by what is reported by airmen on the Application for Airman Medical Certificate (FAA Form 8500-8), what information is available through NDR inquiries, and verification through the state/municipality of record. It is required by the FAA that Aviation Medical Examiners (AMEs) suspend issuance of a medical certificate for airmen with a history of substance abuse or dependence. Also, pilots with a history of substance dependence or abuse who desire certification are required to submit to the FAA a current status report from a physician certified in addictive disorders and familiar with aviation standards. Authorization for Special Issuance (SI) is granted when an airmen has shown evidence that the public is not endangered by the performance of the duties permitted under the certificate.¹ Without accurate medical history, including legal actions that arise from the use of alcohol and other drugs, a pilot could be granted a medical certificate that they are not qualified for and could put lives in jeopardy.

In 2007, the NTSB made three recommendations to the FAA concerning aircraft accident investigations where the pilot’s history of substance dependence was relevant to the cause of the accident. As a result of the investigation the NTSB recommended that the FAA require airmen, following a traffic conviction or administrative action, to provide a complete copy of the relevant arrest report and/or court records which would be placed in the airman’s FAA medical file prior to clinical evaluation for certification. It was also recommended that a copy of an airman’s complete medical record be provided to any individual performing a clinical evaluation related to the airman’s application for medical certificate to help establish, rule out, or monitor a history or diagnose substance dependence prior to the completion of such an evaluation. Finally, it was recommended that all airmen clinically diagnosed with substance dependence, who were medically certified by the FAA prior to the diagnosis, be monitored under the guidelines for SI of medical certificates for the period in which they hold these certificates.¹

CONCLUSION

The number of pilots involved in aviation accidents from 2000 to 2007 who had a history of alcohol offenses accounted for 9% (215 of 2391) of the aviation accidents during that time period that were received at CAMI for toxicological analysis. Of the pilots with previous alcohol offenses, 11% (23 of 215) had consumed ethanol prior to the fatal incident. Providing more detailed documentation to Aviation Medical Examiners to aid in the determination of eligibility for medical certification is important and could potentially save the lives of pilots, their passengers, and people on the ground. Additionally, identifying pilots with substance abuse problems is not only paramount for providing a safe environment to fly but also benefits pilots who may not have previously addressed these issues.

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