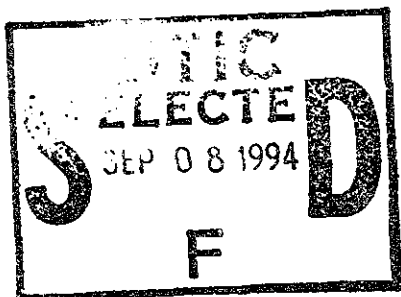


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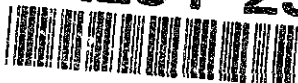
# Unreported Medications Used in Incapacitating Medical Conditions Found in Fatal Civil Aviation Accidents

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16. Abstract One of the major concerns in aviation medicine is sudden incapacitation of the pilot resulting in a fatal accident. The Office of Aviation Medicine (OAM) for the Federal Aviation Administration (FAA) is charged with the medical certification of pilots. All pilots are required by OAM to receive a medical examination by a qualified AME before they can receive medical certification. The pilots must complete a Medical Certification Form listing all of their medical conditions and medications. The Civil Aeromedical Institute's (CAMI) Toxicology and Accident Research Laboratory analyzes all fatal aviation accidents that occur in the United States. This paper reports the cases where drugs used in the treatment of incapacitating illnesses were found along with the frequency with which these drugs and illnesses had been reported on the pilots' medical examinations. Specimens were collected by pathologists near the accident and placed in evidence containers provided by CAMI. These samples were refrigerated and shipped by overnight air. Upon receipt the specimens were inventoried and accessioned for the analysis of drugs, alcohol, carbon monoxide, and cyanide. All data collected by the laboratory were electronically entered into a computer for future analysis. We identified those cardiovascular, neurological, and psychiatric drugs most likely to be associated with the treatment of potentially incapacitating illness. Pilots using drugs for neurological and psychiatric conditions would normally not receive their medical certification. A full review of the complete accident file was conducted in several of the cases reported in this research. The Toxicology and Accident Research Laboratory received specimens from 2192 pilots for postmortem toxicology analysis between 1987 to 1992. Drugs used in the treatment of potentially incapacitating medical conditions were found in 48 of the cases received during this time. Most of the pilots did not report these drugs and medical conditions to their AME and the FAA. Drugs used in the treatment of cardiovascular diseases were found in 13 cases. Neurological medications were found in 7 of the cases. Medications used in the treatment of psychiatric conditions were found in 28 of the cases. In most of the cases reported, the drugs or illnesses found would have caused OAM to reject certification of the pilot. These pilots might not have died in the accident if they had notified their AME and the FAA of the drugs and medical conditions found. Some of the pilots who are deceitful in completing their medical certification forms are not identified and do not receive medical certification. The information in this report will provide useful information to Aviation Medical Examiners regarding cases in which pilots did not report potentially incapacitating illnesses and the drugs used in the treatment of these illnesses.					
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## UNREPORTED MEDICATIONS USED IN INCAPACITATING MEDICAL CONDITIONS FOUND IN FATAL CIVIL AVIATION ACCIDENTS

### INTRODUCTION

The Civil Aeromedical Institute (CAMI) is responsible under the Department of Transportation (DOT) order 8020.11A, Chap 4, Par 170, to "conduct toxicologic analyses on specimens from, and special pathologic studies on, aircraft accident fatalities." In addition, DOT order 1100.2C, Chap 53, Par 53-15 requires that CAMI "investigates selected general aviation and air carrier accidents and searches for biomedical and clinical causes of the accidents, including evidence of disease and chemical abuse." The National Transportation Board (NTSB) Safety Recommendation A-84-93 requested the Federal Aviation Administration "to establish at the Civil Aeromedical Institute the capability to perform state-of-the-art toxicological tests on the blood, urine, and tissue of pilots involved in fatal accidents to determine the levels of both licit and illicit drugs at both therapeutic and abnormal levels." The NTSB has the authority to request an autopsy and testing of specimens from accidents and incidents under 49 CFR Ch. VIII Part 800, App. (e).

On many occasions during the investigation of aviation accidents, it was determined that the pilot had not reported the drug found in his specimens or the medical conditions the drug was used to treat. A study was conducted to determine the actual number of cases that had not been reported and to provide this information to the aviation medical examiners (AMEs).

One of the major concerns in aviation medicine is sudden incapacitation of the pilot, resulting in a fatal accident. The Office of Aviation Medicine (OAM) for the Federal Aviation Administration (FAA) is charged with the medical certification of pilots. All pilots are required by OAM to receive a medical examination by a qualified AME before they can receive medical certification. The pilots must complete a Medical Certification Form listing all of their medical conditions and medications. The Toxicology and Accident Research Laboratory analyzes all fatal aviation accidents that occur in the United States of America. This

paper reports the cases where drugs used in the treatment of potentially incapacitating illnesses were found, along with the frequency with which these drugs and illnesses had been reported on the pilots' medical examinations.

### METHOD

Specimens were collected by pathologists near the accident and placed in evidence containers provided by CAMI. These samples were refrigerated and shipped by overnight air. Upon receipt, the specimens were inventoried and accessioned for the analysis of drugs, alcohol, carbon monoxide, and cyanide. All data collected by the laboratory are electronically entered into a computer for future analysis. We identified those cardiovascular, neurological, and psychiatric drugs most likely to be associated with the treatment of potentially incapacitating illness. The 1987 through 1992 toxicology data base was searched for cases with the types of drugs listed above, using a program developed at CAMI. The aviation medical records and toxicology folders of the cases found above were obtained and reviewed. A full review of the complete accident file and interviews with accident investigators were conducted in several of the cases reported in this research.

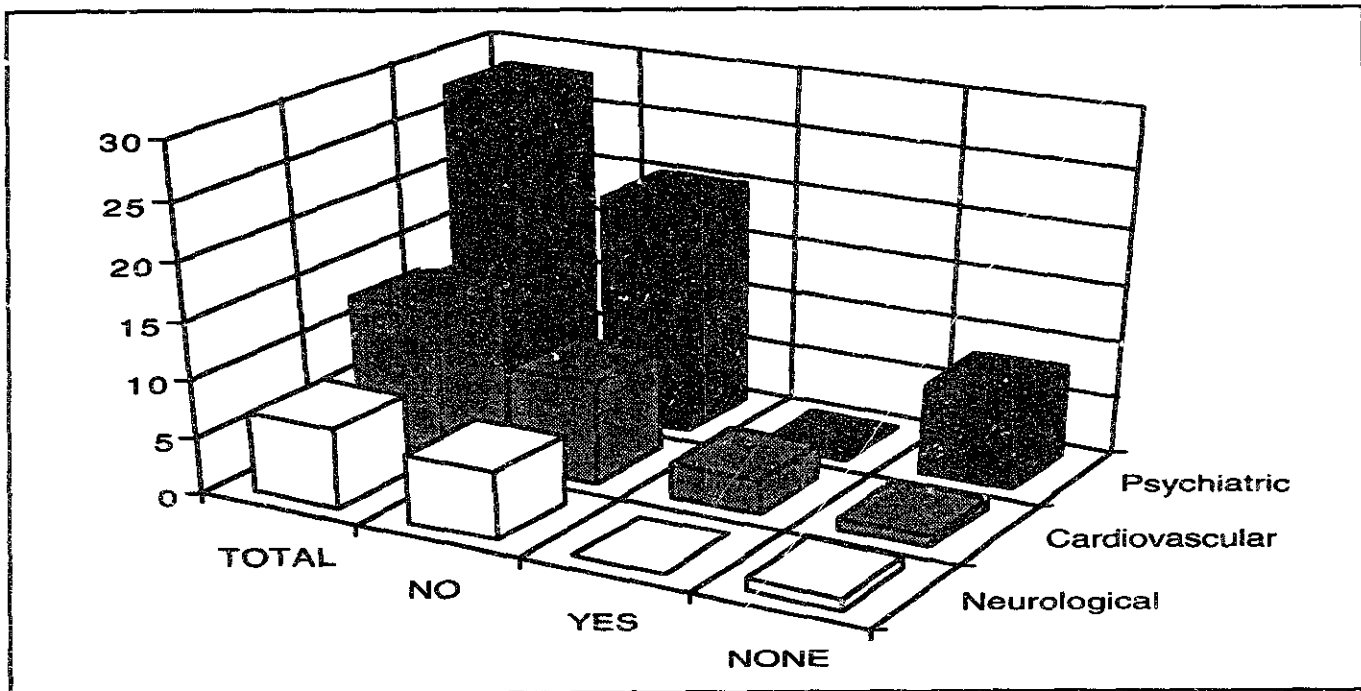
### RESULTS

The Toxicology and Accident Research Laboratory received specimens from 2192 pilots for postmortem toxicology analysis between 1987 to 1992. Drugs used in the treatment of potentially incapacitating medical conditions were found in 48 of the cases received during this time. Most of the pilots had not reported these drugs and medical conditions to their AME and the FAA. Drugs used in the treatment of cardiovascular diseases were found in 13 cases. Neurological medications were found in 7 of the cases. Medications used in the treatment of psychiatric conditions were found in 28 of the cases (Table 1).

**Table 1. Summary of cases found with drugs associated with potentially incapacitating medical conditions.**

REPORTED	Cardiovascular	Neurological	Psychiatric
TOTAL	13	7	28
NO	9	6	20
YES	3	0	0
NONE	1	1	8

**Figure 1. Graphical representation of information in Table 1.**



**Legend for Table 2:**

**Status**

- 0 = Not Reported
- 1 = Drug reported on medical
- 2 = No medical information available

**Medical Condition**

- PY = Psychiatric
- NR = Neurological
- CV = Cardiovascular

**Drugs:**

**Psychiatric**

- 29 = Imipramine
- 27 = Nordiazepam
- 21 = Diazepam
- 96 = Fluoxetine
- 113 = Trazodone
- 115 = Sertraline

**Neurological**

- 54 = Phenytoin
- 69 = Carbamazepine

**Cardiovascular**

- 5 = Quinidine
- 62 = Verapamil
- 13 = Lidocaine
- 72 = Propranolol
- 30 = Metoprolol
- 41 = Procainamid



Thirty five of the pilots who applied for medical certification did not report drugs that might be used for potentially incapacitating medical conditions. Six of these pilots had already lost their medical certification because of medical problems, which may or may not have been associated with the drug that was found in the specimens; in any case these 6 pilots were flying illegally.

There were only 3 cases out of the 48 cases studied in which the pilots reported the drug detected during laboratory analysis on their medical application. These cases were all for the treatment of cardiovascular conditions. In one case, the pilot reported using Quinaglute (Quinidine) and no medical certificate was issued as further information was needed to determine the severity of the illness. This pilot continued to fly without medical certification. In another case the pilot had reported using Calan (Verapamil) and had received a waiver for the use of this medication. This individual did suffer a heart-attack; however, the plane was safely landed by the passenger who was not a pilot. The other case was a pilot who reported taking Lopressor (Metoprolol) for the treatment of high blood pressure. In this case, a medical certification was issued. The National Transportation Safety Board determined that the probable cause "of this accident was: FAILURE TO MAINTAIN A SAFE AIRSPEED IN AN INADVERTENT STALL/SPIN."

There were 10 cases where the pilot did not report the use of cardiovascular medications. Quinidine was found in 4 of the pilots. Verapamil was found in 3 pilots. Propranolol was found in 1 pilot. Procainamide was found in 1 pilot. Lidocaine was found in 1 pilot, and the drug was most likely given during emergency treatment. However, this person had a prior myocardial infarction, angina pectoris, and other evidence of coronary heart disease, which he did not report on his medical application. He was denied medical certification after it was determined that he suffered from severe heart disease. He was flying without medical certification when he crashed.

As might be expected, none of the cases with psychiatric or neurological drugs reported the use of the drug or medical condition when they applied for medical certification. It was determined in 1 case that the pilot

was being treated by a private physician for seizures. This pilot flew his aircraft into a mountain on a clear sunny day. The pilot had a high blood level of phenytoin and a low urine level of phenytoin, which indicates the recent use of the drug. It was postulated that he sensed the onset of a seizure and tried to prevent the seizure by taking the drug. No mechanical or weather related problem could be found for this accident. The most likely cause of this accident was determined to be a seizure. In several cases, the pilot was found to have high levels of psychiatric drugs, high blood alcohol levels, and other drugs. A few of these cases were suspected suicides.

## CONCLUSION

In many of the cases studied, the detected drugs (or the associated illnesses) probably would have caused medical decertification of the pilot. And even though the identified cardiovascular drugs may have been given for conditions that were certifiable if the pilot had been appropriately examined by an aviation medical examiner, the majority of the cardiovascular drugs found in this study simply had not been brought to the attention of the certifying officials. The course of deception chosen by these pilots may indeed have been contributory to their specific fatal accidents; at the minimum, their deception was indicative of highly endangering, inappropriate behavior.

Some people have proposed that making it possible for pilots to obtain certification in all cases would result in more pilots reporting the medical conditions. However, it is interesting to note that even in those cases where the pilot may have been certified (cardiovascular medications), the pilots failed to report the drug and medical condition in 77% of the cases, 10 out of 13.

Although these 48 cases represent only approximately 2% of the pilot fatality case load examined at CAMI, the specifically enumerated drugs should help channel the index of suspicion of aviation medical examiners (AMEs) in the conduct of their pilot examinations. Additionally, if the rate of detection in fatal pilots could be projected to the approximate 700,000 civil aviation pilots, one could speculate that 14,000

pilots are flying while using unreported, potentially disqualifying medications, for unreported and also potentially disqualifying medical conditions. The actual number of positive cases for the types of drugs examined are most likely higher than the 2% reported in this study. Tests procedures since 1987 have improved dramatically and 22 (7%) of the cases analyzed in 1993 were found to contain the drugs reported in this study.

The application of a simple cognitive function test, which is capable of detecting pilot impairment from drugs or medical conditions, might be useful in assisting the AME in identifying those pilots who have lied on their medical application.



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