NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY (AS-50)
Washington, D.C. 20594

December 14, 1994

HUMAN PERFORMANCE GROUP
OPERATIONS SUB-GROUP
SUB-GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

ADDENDUM

A. ACCIDENT: DCA-94-MA-076

Location: Aliquippa, Pennsylvania
Date: September 8, 1994
Time: 1904 Eastern Daylight Time
Airplane: Boeing 737-300, N513AU

B. OPERATIONS SUB-GROUP

Chairman: Malcolm Brenner, Ph.D.
National Transportation Safety Board (NTSB)
Washington, D.C. 20594

C. SUMMARY

On September 8, 1994, at 1904 Eastern Daylight time USAir flight 427, a Boeing 737-300, N513AU, crashed while maneuvering to land at Pittsburgh International Airport, Pittsburgh, Pennsylvania. The airplane was being operated on an instrument flight rules (IFR) flight plan under the provisions of Title 14, Code of Federal Regulation (CFR), Part 121, on a regularly scheduled flight from Chicago-O'Hare International Airport, Chicago, Illinois, to Pittsburgh. The airplane was destroyed by impact forces and fire near Aliquippa, Pennsylvania. All 132 persons on board the airplane were fatally injured.

D. DETAILS OF INVESTIGATION

Since the completion of the sub-group chairman's report on October 31, 1994, information has become available concerning identification and toxicological testing of remains for the two flightcrew members.

At the request of the NTSB and the Beaver County Pennsylvania Coroner, tests were conducted by the Armed Forces DNA Identification Laboratory that resulted in positive identifications of remains from both flightcrew members. A description of this DNA identification work, as prepared by the Armed Forces DNA Identification Laboratory, is attached to this report.

Muscle samples from both crewmembers were tested on a toxicological screen by the Civil Aeromedical Institute (CAMI) of the Federal Aviation Administration (FAA). Low levels of ethanol were detected for both crewmembers. In addition, a higher molecular weight alcohol was detected in the tissue of one of the crewmembers. As noted in the report, these findings are consistent with postmortem ethanol generation. No other drugs were detected in the drug testing protocol. A summary of the toxicological results is attached to this report.

Malcolm Brenner, Ph.D.
Senior Human Performance Investigator

DNA Identification Of Remains
US Air Flight 427
Pittsburgh, Pennsylvania
September 8, 1994

Identification of deceased military personnel during wartime incidents or peace time accidents has been a high priority of the Department of Defense (DoD) and the military services. The "dog tag" which is issued to each service member was a primary means of identification during World Wars I and II. However, "dog tags" today are considered mere personnel effects that confer little more than presumptive identification

The DoD has since moved to the use of positive means of identification - fingerprint and dental comparisons. Yet as reliable as these methods are, they have limitations. Although the military sends a ten-print fingerprint card to the Federal Bureau of Investigation on each service member, between 15-30% of those fingerprint cards are discarded as unclassifiable. Therefore, fingerprint comparison cannot be accomplished for a significant portion of the U.S. military population. Similarly, due to the success of water fluoridation programs, service members increasingly have fewer or even no dental restorations upon which to base a dental comparison.

Due the lethality of modern weaponry on the battlefield or high speed aircraft mishaps, crew member remains are often fragmented. A fragmented body may have no teeth or fingers, yet those remains must be identified.

Over the past ten years, major advances have taken place in the application of Deoxyribonucleic Acid (DNA) for forensic purposes. On-going efforts of the Office of the Armed Forces Medical Examiner (OAFME), Armed Forces Institute of Pathology (AFIP), to use these new technologies in the identification process led to the establishment of the Armed Forces DNA Identification Laboratory (AFDIL) to support the identification of casualties during Desert Storm operations in 1990-1991. It was in March 1991, that the first DNA identifications of causalities from the Kuwait Theater of operations were made.

Due to the successful use of DNA for Desert Storm operations, the DoD formally established the Department of Defense DNA Registry under the OAFME in December 1991. The Registry consists of the DNA Identification Laboratory (AFDIL) for casework analysis and the DNA Specimen Repository responsible for storing a DNA specimen from all service members.

Whether using nuclear or mitochondrial DNA technologies, confirming a DNA identification requires not only samples from the questioned remains but also a reference specimen to compare with. In some cases it is possible to use family members as reference sources such as a mother, father, wife, or children. However, problems arise when biological parents are not available, such as by adoption or death, or when the family will not provide the requested reference specimens. To preclude these difficulties, the DNA Specimen Repository began collections in June of 1992 from military service members and to date over 800,000 specimens have been collected. DNA specimens will be obtained from all current Active and Reserve Component service members by the year 2001. The DNA specimen received consist of a dried blood sample which is processed and stored at $-20^{\circ}C$. At the present time, the sample is stored until an individual becomes a casualty.

From its support of current OAFME casework that includes all fatal military aircraft mishaps to assisting in the identification of remains from World War II, Korea, and Southeast Asia, the AFDIL staff is challenged with the integration of DNA technologies to support on-going missions of the Department of Defense. Consistent with the mission of the AFIP for consultation, education and research, the AFDIL is also requested to support outside identification casework such as in the victims of the Branch Dividian conflagration at Waco, Texas and the US Air Flight 427 mishap at Pittsburgh, Pennsylvania.

On 12 September 1994, at the request of the National Transportation Safety Board and the Beaver County Pennsylvania Coroner, a team of forensic experts from the OAFME arrived to assist in the identification of accident victims. Due to the nature of the accident, extensive body fragmentation occurred. The degree of fragmentation was similar to that which is seen during a high speed military aircraft accident where extensive G-forces take place upon impact.

Briefings were conducted of representatives of the NTSB, US Air, and County Coroners from Beaver and Allegheny County, on the what would be required for the identification of passengers and crew members aboard Flight 427. In view of the extensive body fragmentation, efforts would be directed toward maximum use of fingerprint, dental, anthropological, and radiographic comparisons for identification. The use of DNA in this accident would be reserved for the more difficult cases where the standard identification criteria could not be used.

As the aircraft investigation proceeded, identification of the flight crew became imperative. Fragmented remains presumptively associated with the Captain and First Officer were recovered from the accident site and received at the mortuary facility on September 13th. Presumptive identification was based upon clothing and personal effects associated with the remains. After pathological and anthropological evaluation of the remains, samples were forwarded to the Armed Forces DNA Identification Laboratory, Rockville, MD, on September 14th.

The material received from the Captain (OW172) consisted of specimens from the upper left arm, lower lumbar spine muscle, and portion of unidentified muscle tissue; the remains of the First Officer (OW937) received consisted of specimens of thoracic spine muscle and muscle from the cervical spine area.

Nuclear DNA testing was completed September 20th on all specimens. DNA typing results were obtained on ten of eleven loci for specimens of OW937 and on eleven of eleven loci for specimens of OW172. These results verified the anthropological evaluation that each set of specimens represented one individual with no commingling present. This information was provided to the Beaver County Coroner with a request for obtaining family references (ie. biological mother and father or wife and children) to compare these results.

Contact with the next of kin was made by US Air representatives to locate the appropriate family members to obtain the requested reference specimens.

US Air personnel found the First Officer was not married and had no children, however, his mother was living but the father was deceased. Arrangements were made through her local physician to draw the necessary blood for use in the DNA testing. This blood specimen was received September 29th. As only a maternal reference was available in this case mitochondrial DNA testing was also conducted on the remains. Both nuclear and mitochondrial DNA testing was completed on October 4th. Although the mitochondrial DNA results were inconclusive, the nuclear DNA results across the ten loci for the mother and the questioned samples were the same. More importantly both the mitochondrial and nuclear DNA results excluded the second set of remains (OW172) as being those of the First Officer. Given that this case represents a closed population, the nuclear DNA testing results coupled with the presumptive and anthropological evaluation to support the identification as those of the First Officer.

Efforts were likewise made by US Air personnel to obtain reference specimens from the family of the Captain. However, as has been encountered in military mishaps, obtaining these specimens is not always possible.

Although the Captain of US Air Flight 427 was married, had children, and his mother and father were living, the family did not provide the requested reference specimens. Normally this would have made any identification of those remains impossible. However, also recovered on 13 September with the remains of OW172 was a portion of foot. This foot was printed by the Federal Bureau of Investigation and successfully matched with footprints from the Captain taken when he was a pilot with the U.S. Air Force. The U.S. Air Force is the only service that routinely foot prints its air crew members. As this foot was positively identified as that of the Captain, tissue was taken as the reference specimen for the DNA testing. The foot specimen produced DNA typing results for seven of the eleven loci tested and matched the questioned samples. The probability of finding a Caucasian with the identical nuclear DNA profile is approximately one in a million. Base on the DNA test results these remains OW172 were identified as those of the Captain.

With any aircraft mishap, an investigation board looks at factors that may have contributed to the mishap. In addition to mechanical and aircraft structure investigation, human factors analysis is a key element of this process. Many questions concerning flight crew performance to include toxicological studies must be addressed. However, to perform toxicological studies requires that specimens being tested must be identified. In view of the degree of body fragmentation which occurred in the US Air accident, it was imperative that positive identification of the flight crew remains be accomplished.

Although the Office of Armed Forces Medical Examiners Office has used DNA routinely for identification in fatal military aircraft accidents over the past two years, the US Air Flight 427 mishap is the first time it has been used to support identification efforts in a commercial aircraft mishap.

DNA is a powerful new tool that is now available for routine use in aircraft accident investigation. When coupled with existing identification methodologies to assist in the human factors analysis, it will play a major role in incidents such as the US Air Flight 427 accident.

THESE RECORDS MAY BE RELEASABLE UNDER THE FOIA REQUEST 15 DAYS AFTER SIGNATURE DATE UNLESS WE HEAR OTHERWISE FROM FAA OR NTSB COUNSEL.

U.S. Department of Transportation
Federal Aviation Administration

Mike Monroney Aeronautical Center
P.O. Box 25082
Oklahoma City, Oklahoma 73125

November 09, 1994

National Transportation Safety Board
2001 Route 46, Suite 203
Parsippany, NJ 07054

CAMI CASE #: 9400286002 NAME : [redacted]
DATE OF INCIDENT : 090894 DATE RECEIVED: 101894
LOCATION OF ACCIDENT: PITTSBURGH, PA
SPECIMENS RECEIVED : Muscle

FORENSIC TOXICOLOGY FATAL ACCIDENT REPORT

CARBON MONOXIDE:
Carbon monoxide analysis was not performed due to a lack of suitable specimen.

CYANIDE:
Cyanide analysis was not performed due to a lack of suitable specimen.

VOLATILES: The volatile concentrations were determined by headspace gas chromatography at a cutoff of 10 mg/dl. All positive ethanols were confirmed by Radiative Energy Attenuation.
--> 54.000 (mg/dl) Ethanol detected in Muscle
--> 8.000 (mg/dl) 2-Propanol detected in Muscle
Note: The delay in the collection and the analysis of specimens may have resulted in postmortem ethanol production.

DRUGS: Immunoassay and chromatography are used to screen for legal and illegal drugs which include amphetamine(0.010), opiates(0.010), marihuana(0.001), cocaine(0.020), phencylidine(0.002), benzodiazepines(0.030), barbiturates(0.060), antidepressants(0.100), antihistamines(0.020), meprobamate(0.100), methaqualone(0.100), and nicotine(0.050). The values in () are the threshold values in ug/ml used to report positive results. Values below this concentration are normally reported as negative.
GC/Mass Spec, or GC/FTIR, is used to confirm most positive results.
--> NO drugs detected in Muscle

[redacted] NOV 10 1994

Dennis V. Canfield, Ph.D.
Manager Toxicology and Accident
Research Laboratory

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U.S. Department of Transportation
Federal Aviation Administration

Mike Monroney
Aeronautical Center

P.O. Box 25082
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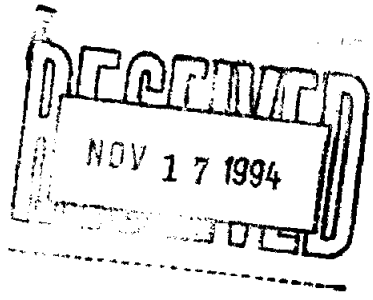
November 09, 1994



National Transportation Safety Board
2001 Route 46, Suite 203
Parsippany, NJ 07054

CAMI CASE #: 9400286001 NAME : [redacted]
DATE OF INCIDENT : 090894 DATE RECEIVED: 101894
LOCATION OF ACCIDENT: PITTSBURGH, PA
SPECIMENS RECEIVED : Muscle, Body Tissue

FORENSIC TOXICOLOGY FATAL ACCIDENT REPORT

CARBON MONOXIDE:
Carbon monoxide analysis was not performed due to a lack of suitable specimen.

CYANIDE:
Cyanide analysis was not performed due to a lack of suitable specimen.

VOLATILES: The volatile concentrations were determined by headspace gas chromatography at a cutoff of 10 mg/dl. All positive ethanols were confirmed by Radiative Energy Attenuation.
--> 34.000 (mg/dl) Ethanol detected in Muscle
Note: The delay in the collection and the analysis of specimens may have resulted in postmortem ethanol production.

DRUGS: Immunoassay and chromatography are used to screen for legal and illegal drugs which include amphetamine(0.010), opiates(0.010), marihuana(0.001), cocaine(0.020), phencylidine(0.002), benzodiazepines(0.030), barbiturates(0.060), antidepressants(0.100), antihistamines(0.020), meprobamate(0.100), methaqualone(0.100), and nicotine(0.050). The values in () are the threshold values in ug/ml used to report positive results. Values below this concentration are normally reported as negative.
GC/Mass Spec, or GC/FTIR, is used to confirm most positive results.
--> NO drugs detected in Muscle

[redacted] NOV 10 1994

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