



U.S. Department of Transportation
Federal Aviation Administration

Aeromedical Research Resume

Research Project Initiative Subtask for FY00

<p>1. Title: Forensic Toxicology Research in Support of Aircraft Accident Analyses</p>	<p>2. Sponsoring Organization/Focal Point: AAI-1: D. Thomas AAM-1: Dr. Jon Jordan</p>	<p>3. Originator Name, Organization Dennis V. Canfield, Ph.D. AAM-610, Civil Aeromedical Institute (405) 954-6252</p>
		<p>4. Origination Date: March 3, 1999 Start Date: Oct. 1, 2000</p>
<p>5. Parent RPI Number: 532</p>	<p>6. Subtask Number: AM-B-00-TOX-202</p>	<p>7. Completion Date: September 30, 2002</p>
<p>8. Parent MNS: Aeromedical Research (159)</p>	<p>9. RPI Manager Name, Organization, Phone: Dennis V. Canfield, Ph.D. AAM-600, FAA, CAMI (405) 954-6252</p>	
<p>10. Research Objective(s):</p> <ol style="list-style-type: none"> 1. To reduce accidents and major incidents due to drugs and alcohol by ascertaining the impact of drugs and alcohol on human performance. 2. Help reduce the cases of medical incapacitation of pilots by identifying medical conditions which are found in fatal aviation accidents and determine the effectiveness of present medical certification standards and to notify the FAA and NTSB of possible incapacitating medical conditions not reported in the pilots medical, that may have caused an accident. 3. To provide regulatory authorities and the public with up-to-date information on the effects of drugs on pilot and crew performance and the effectiveness of present and proposed medical certification standards. 		
<p>11. Technical Summary: In compliance with PUBLIC LAW 100-591 [H.R. 4686] (November 3, 1988) and NTSB safety recommendation A-84-93, specimens will be collected at aviation accidents/incidents; those specimens will be identified and analyzed for drugs and alcohol. Reliable toxicology data from these tests will be stored in a computerized, searchable form and provided to investigative and regulatory authorities for use in determining the cause of aviation accidents, evaluation of regulatory statues, and to determine trends in the use of alcohol and drugs for the annual report to congress. Information collected will be reported to regulatory authorities and the public. This information will identify drugs and medical conditions that need additional study of their effects on human performance. New procedures will be developed to assist in the identification of commonly prescribed drugs at therapeutic and sub-therapeutic levels. State-of-the-art DNA-RNA technology will be applied to identify specimen source and possible confounding components. Information gathered in this research will be used to monitor compliance of pilots with the FAA medical certification regulations. These data will help determine the extent to which drugs and medical conditions are contributing to fatal aviation accidents.</p> <p>Data derived from collaborative research with NIOSH on infectious diseases in people working in an enclosed aircraft environment will help determine the risks associated with this type of work as per the congressionally mandated FAA-NIOSH interagency plan to evaluate aircraft cabin environmental conditions.</p>		

12. Resources Requirements:FY00FY01FY02**FAA Staff Years**

14

14

14

13. Description of Work:**(1) Brief Background**

The Forensic Toxicology Research Team (FTRT) has been collecting extensive chemical use data and will continue to collect data on drugs and alcohol in fatal aircraft accidents. Software developments by the FTRT have made it possible to rapidly analyze the available data for requesters. CAMI testing capability permits direct in-house assessment of chemical presence, permitting a wide spectrum of qualitative and quantitative toxicological data collection. The laboratory has a fully functional DNA testing laboratory capable of identifying victims of aircraft accidents and identifying infectious diseases present in blood samples. The FAA has entered into an agreement with the NTSB to conduct drug testing on surface accidents at the FAA Forensic Toxicology and Accident Research Laboratory. The FAA receives compensation from the NTSB for the cost of drug testing surface accidents.

(2) Statement of Work

The following operational hypotheses will be evaluated:

- I. The most prevalent therapeutic and abused drugs in the USA will be routinely detectable by FTRT procedures.
- II. The prevalence of drug abuse in pilots of fatal aircraft accidents is at least three times that of the pilots in nonfatal aircraft accidents.

Specimens received from nearly all fatal aviation accidents will be tested for the presence of drugs and alcohol. Analyses and interpretations will be channeled through the Office of Accident Investigation to the National Transportation Safety Board. Selected evaluations of the impact of drug effects on performance will be investigated in response to research sponsors. New Procedures will be developed to assist in the identification of commonly prescribed drugs. To better understand how aircraft occupants become incapacitated or die in fires, methods must be developed to analyze CN in whole blood, as well as carbon monoxide (CO) in plasma or whole blood. New DNA procedures will be developed to assist in the identification of pilot remains, postmortem ethanol, and infectious diseases. Special quality control programs [external: CAP; internal Forensic Toxicology Research Team, Biochemistry Research Team] will be maintained to assure data correctness and integrity. The new altitude chambers will be used to determine the interaction of hypoxia on the distribution of drugs in biological specimens. Blood will be taken from human subjects at different altitudes after taking common over the counter antihistamines and tests will be performed to determine the distribution of drugs at different altitudes.

14. Intended End Products / Deliverables:

Reduce accidents and major incidents due to medical incapacitation of crew by 15% relative to baseline levels noted in the Office of Aviation Medicine Medical Incapacitation Database. Approximately 600 forensic toxicology reports from fatal aviation accidents will be provided annually to the research sponsors. Information collected from this research will yield OAM Technical Reports and scientific research papers which will provide valuable information on the causes of aviation accidents, the interpretation of toxicology reports, the incidence of drug and alcohol use in aviation accidents, and new methods of analysis for the identification and quantitation of drugs. New DNA procedures that prevent misidentification and misinterpretation of specimen analyses will be shared with all federal state forensic toxicology and law enforcement officials. An annual report to Congress will be made in compliance with PUBLIC LAW 100-591 [H.R. 4686] (November 3, 1988) regarding the use of drugs and alcohol in fatal aviation accidents. Risk factors for contracting an infectious disease in an enclosed aircraft environment will be provided to the general public, congress, and the FAA for evaluating potential risks to aircraft crew and passengers.

15. Schedule/Milestones:	FY00	FY01	FY02
1. Accept all post-fatality and select non-fatality specimens for analysis as requested by sponsor.	Continuous	Continuous	Continuous
2. Collaborative study to determine risk factors associated with ionizing radiation to crew members in aviation	Continuous	Continuous	Continuous
3. Toxicological/analytical aspects of cyanide and carbon monoxide in aviation accident fatalities.	Q2		
4. Collaborative study on the effects of new antihistamines and hypoxia.		Q4	
5. Expand DNA technology to type STR loci.		Q1	
6. DNA-based feasibility study for determining the incidence of infectious disease.			Q1
7. Collect DNA data on the incidence of infectious diseases.			Q4
8. Evaluate alternative chemical methods of determining postmortem ethanol production.	Q1		
9. Develop chemical method for the determination of postmortem ethanol production.		Q4	
10. Implement new chemical method for determination of postmortem ethanol production.			Q4
11. Develop method for the identification of pilots who use crack cocaine.	Q2		
12. Implement method for the identification of pilots who use crack cocaine.		Q1	
13. Develop analytical procedure to differentiate between true opiate ingestion and artifactual morphine production (i.e., develop markers for "Poppy Seed Ingestion").		Q1	

16. Procurement Strategy/Acquisition Approach/Technology Transfer:

Procurements anticipated in FY-00 follow standard acquisition strategies.

Analytical Equipment Upgrades: 150K
 Data Automation Upgrades: 50K

17. Justification/History:

Medical certification of pilots restricts or prohibits the use of most pharmaceuticals and compliance must be assessed. The NTSB Safety Recommendation A-84-93, requested the FAA establish at CAMI 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. This project is in compliance with PUBLIC LAW 100-591 [H.R. 4686]; November 3, 1988. This project is consistent with the FAA Research, Engineering, and Development (RE&D) Plan, and directly supports the Bioaeronautics portion of the National Plan for Civil Aviation Human Factors.

18. Issues:

Select performance testing that requires human subject testing will incorporate separate protocols reviewed by the CAMI Institutional Review Board (IRB).

19. Transition Strategy:

Not applicable.

20. Impact of Funding Deferral:

Identifying drugs and alcohol which may have caused an aviation accident would be impossible. Testing of specimens for the Office of Accident Investigation and National Transportation Safety Board would be impossible. This would cause an increase in multimillion dollar liability claims against the government which could not be defended; currently, the research data generated by this project results in an annual saving to the FAA of millions of dollars per year. The annual report to congress regarding drug and alcohol use found in fatal aviation accidents would be impossible. It would be impossible to comply with PUBLIC LAW 100-591 [H.R. 4686]; November 3, 1988, and the FAA would not be able to support the intent of NTSB Safety Recommendation A-894-93.

21. R&D Teaming Arrangements:

Coordination will be carried out with the Office of Accident Investigation (AAI), the Office of the Chief Counsel (AGC), and the National Transportation Safety Board (NTSB). AAI represents the primary sponsor, and the AGC and the NTSB, primary users, for this research. The Toxicology and Accident Research Laboratory has been asked by the National Safety Council to help in the development of safety standards which will reduce transportation accidents.

22. Special Facility Requirements:

A state-of-the-art forensic toxicology laboratory and nucleic acid analytical capability at CAMI must be maintained to ensure technically correct and legally defensible toxicological assessments. Attention to chain-of-custody requirements further necessitates that the facility have special locks and passwords, photo surveillance, and motion detectors.

23. Approvals (Signature Authority):

Approvals (Signature Authority)		Performing Organization	
David F. Thomas, AAI-1	<i>Date</i>	Name:	William E. Collins, Ph.D.
Nancy C. Lane, AIR-3	<i>Date</i>	Title:	Director, FAA Civil Aeromedical Institute, AAM-3
Jon L. Jordan, M.D., AAM-1	<i>Date</i>	Date:	