



U. S. Department of
Federal Aviation Administration

Aeromedical Research Resume

Research Project Initiative Subtask for FY00

1. Title: Enhancing Personal Survival and Minimization of Personal Injury in Aircraft Crashes	2. Sponsoring Organization/Focal Point: AIR-1; Nancy C. Lane (AIR-3) AAM-1: J. Jordan	3. Originator Name, Organization R. Van Gowdy AAM-630 Civil Aeromedical Institute (405) 954-5510						
		4. Origination Date March 1, 1999 Start Date: October 1, 1999						
5. Parent RPI Number: <div style="text-align: center;">2</div>	6. Subtask Number: AM-B-00-PRS-92	7. Completion Date: September 30, 2002						
8. Parent MNS: Aeromedical Research (159)	9. RPD Manager Name, Organization, Phone: <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Dennis V. Canfield, Ph.D.</td> <td style="width: 50%;">R. Van Gowdy</td> </tr> <tr> <td>AAM-600, FAA CAMI</td> <td>AAM-630, FAA-CAMI</td> </tr> <tr> <td>(405) 954-6252</td> <td>(405) 954-5510</td> </tr> </table>		Dennis V. Canfield, Ph.D.	R. Van Gowdy	AAM-600, FAA CAMI	AAM-630, FAA-CAMI	(405) 954-6252	(405) 954-5510
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10. Research Objective(s): Research and development of improvements to aircraft seats, restraints, and interior systems which protect the occupant from injury or death within the survivable crash envelope defined in the Federal Aviation Regulations for each type of aircraft.								
11. Technical Summary: <p>Dynamic impact sled tests will be conducted with aircraft seat/restraint systems using anthropomorphic test dummies as surrogate occupants. The R&D test projects will be performed to measure and analyze the performance of the seat/restraint system in protecting the occupant during simulated crash conditions.</p> <p>Computer simulation software will be developed for use in the analysis of issues and factors related to aircraft crash protection and survival. The determination of parameter values necessary for such models to work properly will be the focus of this work. This research will also feature validation exercises to assess the accuracy and utility of these models.</p> <p>The results of the dynamic tests and the associated research will be utilized in improvements to aircraft seat systems, as well as the development and enforcement of FAA regulatory requirements and policies.</p> <p>Continued technical support and consultations will be provided to agency organizations responsible for enforcement of regulations and development of new policies or standards.</p>								

12. Resources Requirements:	<u>FY00</u>	<u>FY01</u>	<u>FY02</u>
FAA Staff Years	9	9	9
13. Description of Work:			
<p>(1) Brief Background Improvements in occupant protection from crash injuries are mandated by FAR Amendments 23-36, 25-64, and 29-29. Applications for new Type Certificates in each category of aircraft must meet these new regulations. At many locations within new aircraft, traditional practices for seat installation cannot fulfill the requirements for occupant protection. The expertise, knowledge, and products generated from the applied research described in this initiative are critical to the evolution of seats, installation practices, and performance assessment as these new seat/restraint/interior systems enter the civil fleet. These regulations are objective in nature, and specific policies related to unique designs will require research support and consultation coordinated with the various prime directorates responsible for enforcing the regulations.</p>			
(2) Statement of Work			
<p>The following research programs will be conducted during the time frame of the project. Some of these programs were initiated prior to FY99. The priority of importance is not in the order of listing, and the scope of resources and time applied to each topic are subject to change based on the requirements of the requesters for this research.</p>			
<ul style="list-style-type: none"> a) Dynamic impact test programs to develop crashworthy seats and improved restraint systems will continue with manufacturers. Key topics in the design of seats for the FY00 period include the evaluation of test procedures and computer modeling to enhance the understanding of occupant protection as well as provide design tools for the development of new systems. Another key topic in the design of seats includes the evaluation of test procedures to measure Head Injury Criteria by means other than full scale sled impact tests. If satisfactory alternative compliance test procedures can be developed, it could enhance the research/design of aircraft interiors as well as significantly reduce the regulatory burden of new seat/interiors certifications. b) The Anthropomorphic Test Dummy (ATD) used in aircraft crashworthiness studies is an instrument. As with any instrument, there must be equipment and procedures to perform calibration checks. Calibration procedures and standards will be investigated and developed. c) Research has been recommended to evaluate the means of providing occupant protection for side facing seats. There are a number of new aircraft with proposed side facing seats. Dynamic impact testing will be conducted to measure the potential protection problems and evaluate current and proposed designs. d) Assessment of the performance of child restraint devices allowed on aircraft will be conducted by means of sled tests. Prior research has been for transport airplane passenger seats. The focus of research during the FY-00-02 period will be focused on the performance of child restraints designed to meet new standards issued by NHTSA in 1999. Work will also be directed towards establishing an aviation standard for child restraints. e) Since there is an increasing number of impact test facilities performing certification tests with aircraft seats, there is a need to ensure that the analytical techniques being used to produce critical certification data are consistent and reliable. As an example, the methods, equipment, and procedures being applied to photometric data are new to the aviation industry. Research procedures will be developed and coordinated with the independent test laboratories to establish acceptable means of acquiring as well as processing film/video image data. This task is highly recommended by the SAE AS8049 seat committee and is supported by the regional certification offices as well as the National Resource Specialist for Crashdynamics (ANM-112). f) Due to the unique expertise and test data base maintained in the section, support of regulatory activities will require significant time and resources. Assistance in training, consultation on specific certification issues, and support of new regulatory and/or policy definition will continue to be a major effort. Many of these will be unanticipated requests, and will require priority research actions over the life of the project. Several of these requests will involve international travel, consultation, and provision of training. 			
14. Intended End Products / Deliverables:			
<p>The products resulting from this research and testing activities will be published in the open literature, Office of Aviation Medicine Reports, and SAE technical papers and committee reports. Presentations of research findings will be provided at meetings sponsored by groups such as the SAE. Results from research conducted in support of regulatory and policy activities will be included in Advisory Circulars, policy statements, and certification directives.</p>			

15. Schedule/Milestones:

A quarterly update is coordinated with the research sponsor to reflect current priorities.

	FY00	FY01	FY02
Calibration procedures and standards for Anthropomorphic Test Dummies (ATDs) used for aircraft crashworthiness studies.	Q1		
Yearly Update to "Impact Test Procedures Training Course". (Update of new policies and procedures as they are implemented)	Q1	Q1	Q1
Report: "Photometric Analysis of ATD Kinematics from Aircraft Seat Tests"	Q2		
Final Report: "Suitability of Alternative Aircraft Crashworthiness Compliance Techniques".		Q2	
Interim Report: "Evaluation of the Impact Protection Offered by Side Facing Seats in Aircraft".	Q2		
Final report and recommendations regarding test procedures and injury criteria for side facing seats		Q2	
Interim Report: "A Comparison of Crashworthiness Response Measurements Made by Different Testing Organizations".	Q3		
Progress Report: Computer Simulation Occupant Models, - Resources, Capabilities, and Potential Applications Related to Research and Certification.		Q3	Q2
Initial Report: "Computer Simulation of Occupant Kinematics and Biomechanical Responses"			Q3

16. Procurement Strategy/Acquisition Approach/Technology Transfer:

Major procurement items anticipated in FY-00 follow standard acquisition guidelines.

Instrumentation equip	\$75,000	Child Restraints	\$10,000
Occupant modeling resources	\$125,000	Airplane seat test specimens	\$20,000
Shop fabrication equipment	\$20,000		

17. Justification/History:

This research is responsive to the needs of the primary sponsor (Aircraft Certification Service). Additionally, this research is consistent with the FY 1996 Research, Engineering, and Development (RE&D) Plan, and directly supports the Bioaeronautics portion of the 1995 National Plan for Civil Aviation Human Factors Research.

18. Issues:

Not Applicable

19. Transition Strategy:

Not Applicable

20. Impact of Funding Deferral:

The research described is necessary to resolve regulatory issues associated with implementation of the FAA's amended crashworthiness requirements for new aircraft. Deferral of this work imperils implementation of these regulations and the associated societal benefits. Additionally, deferral of this research may prevent the adoption of less expensive techniques for industry to comply with FAA regulations.

21. R&D Teaming Arrangements:

All research is conducted in coordination with the FAA Technical Center's crashworthiness test program. A limited amount of work is done directly for the Technical Center. Coordination is achieved and close oversight is maintained by the National Resource Specialist for Crash Dynamics. Additionally, the Cabin Safety Research Plan defines a division of labor between CAMI, the Technical Center, and Canadian and European representatives. Extensive collaborative development is also undertaken with all US and several foreign seat and restraint system manufacturers.

22. Special Facility Requirements:

The unique laboratory and test fixture fabrication facilities within the Protection and Survival Laboratory of the Aeromedical Research Division of CAMI are necessary and sufficient to conduct this research.

23. Approvals (Signature Authority):

		Performing Organization	
	Name	William E. Collins, Ph.D.	
Nancy C. Lane, AIR-3	Date	Director, FAA Civil Aeromedical Institute, AAM-3	
Jon L. Jordan, M.D., AAM-1	Date	Date:	