

**INTERAGENCY AGREEMENT
NO. DTFA01-96-Z-02035
BETWEEN
THE FEDERAL AVIATION ADMINISTRATION (FAA)
AND
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
AERONAUTICAL SAFETY AND HUMAN FACTORS**

ARTICLE I - PURPOSE

This agreement between the FAA and NASA establishes a cooperative effort to conduct research and development investigations in the area of aeronautical human factors and safety.

ARTICLE II - LEGAL AUTHORITY

Interagency Agreement DTFA01-96-Z-02035 is entered into pursuant to the authority of Section 322(c)(1) of the Department of Transportation Act.

ARTICLE III - STATEMENT OF WORK

I. BACKGROUND

Human Factors related aviation incidents and accidents remain subjects of great public concern. Despite the aerospace industry's success at developing ever more sophisticated and reliable technology, the proportion of human error-related incidents and accidents remains remarkably constant. This fact, combined with the requirement to increase productivity, resulted in considerable attention to Human Factors research and application programs over the last several years. Valuable programs in aviation Human Factors have been underway for many years at the Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA), and Department of Defense (DOD), as well as in academic and industry sectors. However, sufficient coordination, adequate funding, or long-term, high level management support in most government and industry organizations did not exist.

The National Plan for Civil Aviation Human Factors, published in March 1995, outlines a coherent national agenda focusing on the following five research thrusts:

1. Human-Centered Automation - Research in this area addresses the identification and application of knowledge concerning the relative strengths and limitations of humans in an automated environment. It investigates the implications of computer-based technology in the design, evaluation and certification of controls, displays and advanced systems. Human-Centered Automation research investigates the role of the operator (active or passive) and

the cognitive and behavioral effects of using automation to assist humans in accomplishing their assigned tasks with increased safety and efficiency.

2. Selection and Training - National Air Space (NAS) efficiency and effectiveness is enhanced through research to: (1) understand the relationship between human abilities and aviation task performance; (2) enhance the measures and methods for the prediction of future job/task performance; (3) develop a scientific basis for the design of training programs, devices, and aids; (4) define criteria for assessing future training requirements; (5) and to identify new ways by which to select aviation system personnel. The recipients of research findings on selection and training are flight crews, air traffic controllers, Airways Facilities systems management personnel; airport security; and others in the aviation community who contribute to safety and efficiency.

3. Human Performance Assessment - Research under this thrust targets measurement and improved understanding of human performance capabilities and limitations in aviation. Cognitive and interpersonal skills of individuals, characteristics of teams, and organizational factors directly shape the safety and efficiency of aviation operations. This research will provide ways to improve safety and productivity through better equipment design, training, and system performance.

4. Information Management and Display - Research conducted under this thrust seeks improved safety and performance by addressing the presentation and transfer of information among components in the NAS, including controller workstations, flight deck, operational and airway facilities, and all the interfaces which link these functions together.

5. Bioaeronautics - Here, the emphasis will be on the bioengineering, biomedicine, and biochemistry associated with performance and safety. Research will focus on enhancing personal performance and safety by maximizing crew and passenger health and physiological integrity. Also addressed will be safety equipment and procedure design, cabin egress, rescue, and in-flight medical care.

The aviation community is both the initiator and the recipient of this Plan. As initiator, the aviation community causes federal agencies and their contractor/academic support organizations to respond to aviation needs by allocating budgets, supporting research, and transferring results. As the recipient, the aviation community benefits from the user-centered products of this Plan. The Plan identifies near-term and long-term needs, assesses the progress of research, and implements the research results through the technical transfer process. The publication of this Plan represents one of several necessary steps to establish and maintain a coordinated national human factors program for civil aviation. Continued emphasis on research activities over the long-term as well as sustained management support for program implementation and technology transfer are needed. This plan describes these sustaining activities which involve an iterative process for both initiators and recipients. If properly implemented and adequately

supported, the National Plan for Civil Aviation Human Factors will lead to significant improvements in overall system safety, efficiency, and capacity for the benefit of the ultimate customer -- the flying public.

The FAA and NASA, by this Agreement, agree to pursue a cooperative joint Human Factors research program directed toward the goals and objectives of the National Plan for Civil Aviation Human Factors. This joint NASA/FAA research program shall involve active participation in research activities by personnel of NASA organizational elements and by personnel of the FAA Office of the Chief Scientific & Technical Advisor for Human Factors or designated representatives. Participation of FAA personnel shall vary from general monitoring of progress to active participation in experiments, depending upon the numbers and expertise of the staff. Research will address the five Thrusts of the National Plan as outlines above. Some tasks will address several Thrusts. Specific tasks are enumerated below

II. SPECIFIC TASKS

The following tasks are incorporated into this agreement for immediate FY96 execution. Detailed objectives and schedules shall be developed as part of individual experiment plans in each Task area.

Task 1: Automated Performance Measuring System (APMS). FAA Technical Point of Contact is Mr. Ronald R. Simmons, telephone number 202-267-7058. NASA/Ames Project Manager is Dr. Irv Statler, telephone number (415) 604-5729.

NASA shall accomplish the following:

A. Deliverable Product 1-1: Digital Flight Database Prototype

Select and implement a secure, capacious, cost-effective, accessible and fast database system to support all of the APMS functions. Develop a concept of total-system integration, and provide a user-friendly interface for rapid and transparent data access. Identify, develop, and test statistical sampling, aggregation, and compression designs to minimize storage requirements without compromising trend analysis or retrospective search for data not previously identified as "important". Explore the potential of, and approach to, linking APMS flight data with other information, such as ASRS incident reports and databases assembled by NASDAC. This work will be carried out by NASA personnel in the Flight Management and Human Factors Division with support from personnel of Battelle Memorial Institute.

B. Deliverable Product 1-2: Automated Exceedance Verification and Diagnostic Software

Develop and demonstrate a knowledge-based software tool with a user-friendly interface that will assist analysts of "special events" by:

- (1) validating candidate exceedances identified by COTS software,
- (2) positing possible explanatory factors,
- (3) tentatively assessing event severity,
- (4) identifying similar past events in the database, and
- (5) flagging like-events in the future.

This work will be carried out largely by personnel of the Computer Sciences Division with extensive experience in building successful knowledge-based systems for various aerospace applications.

C. Deliverable Product 1-3: Operationally-oriented Statistical Analyses and Presentation System Prototype

A team of airline-operations people, flight-recorder people, and APMS people will be formed to study the state of the art, the needs of the users, and the risk/reward potential for advanced automated statistical analyses of flight-recorded data. The following initiatives will result: (1) Development of a suite of descriptive statistics for operationally meaningful overview of air-carrier fleet operations from the perspective of each of the potential users; (2) Development of software to generate the desired statistics and supporting graphics, equipped with a user-friendly interface; (3) Test with each of the airline partners in response to their specific user-needs; (4) Development of the APMS concept for integrated analyses of total system performance including engine-health monitoring, AQP/training evaluation, and sub-system health as well as crew performance.

This work will be carried out by a team composed of NASA personnel from both the Flight Management and Human Factors Division and the Computer Sciences Division together with personnel of Battelle Memorial Institute, other sub-contractors, and our airline partners.

D. Deliverable Product 1-4: Demonstration of Integrated, Customized APMS Prototype at each Partner-Airline Site

Negotiate agreements with two additional US air carriers. Conduct a user-needs study with each. Prepare a report of the user-needs study for each partner. Recommend to the APMS Team a customized response to each of the three airline partners based on their user-needs study. Establish detailed procedures for acquiring and handling data from each of the APMS partners. Acquire data, and enter them into the APMS database. This work will be performed by APMS team members at the site of each airline partner if so requested. The APMS suite of tools will be demonstrated on site at each partner airline using operational data and enable hands-on testing by potential users. An acceptable product will be designed.

Task 2: CRM Training Evaluation

FAA Technical Point of Contact is Dr. Eleana Edens, telephone number 202-267-7867.

NASA shall accomplish the following:

- A. Deliverable Product 2-1: Technical reports to document the scientific effort
- B. Deliverable Product 2-2: Documentation required to implement and evaluate the interventions developed, such as computer software, syllabi, worksheets, pamphlets, and audio and video tapes.

Task 3: Air-Ground Communication and Data Link Interface Design. FAA Technical Point of Contact is Dr. Tom McCloy, telephone number 202-267-7167.

NASA shall accomplish the following:

- A. Deliverable Product 3-1: Identification of potential loss of clearance information and crew procedures for data link communications.
- B. Deliverable Product 3-2: An assessment of data link timing and procedural constraints in different airspace types (en route and terminal).
- C. Deliverable Product 3-3: An identification of the relevant research findings in the field of data link Human Factors that will correspond to human factors issues in the free flight domain.
- D. Deliverable Product 3-4: Evaluation of data link communications for air-to-air and air-to-ground communications for transgression of free flight zones and evaluation of avoidance maneuver displays.

Task 4: Team Decision-Making; Crew Communication; Crew Training Evaluation. FAA Technical Point of Contact is Dr. Tom McCloy, telephone number 202-267-7167.

NASA shall accomplish the following:

- A. Deliverable Product 4-1: Validated recommendations for training flight crews in strategies that minimize risk in aviation decision making
- B. Deliverable Product 4-2: Two instruments for assessing crew decision-making Performance in LOFT. One instrument should be used for research purposes, and the other instrument should be used by LOFT instructors and for crew self critique.
- C. Deliverable Product 4-3: Recommendations for an enhanced NPR system performance.

D. Deliverable Product 4-4: A guidelines document on procedure change process.

E. Deliverable Product 4-5: Recommendations for incorporating procedure changes into

Training procedures for check airmen and pilots

F. Deliverable Product 4-6: A technical report with training recommendations for effective LOFT debriefing techniques.

G. Deliverable Product 4-7: Interim report on “Inter-Rater Reliability Study”.

Task 5: Air Traffic Control Fatigue Research. FAA Technical Point of Contact is Mr. Larry Cole, telephone number 202-267-9853.

NASA shall accomplish the following:

A. Deliverable Product 5-1: Complete review of the March 7, 1995 proposal for FAA/NASA collaboration entitled “Managing Fatigue in ATC/AF Shift work Operations”. Expand the proposal and establish necessary milestones for the research activities.

B. Deliverable Product 5-2: Complete and document the review of the ASRS data base to identify and categorize ATC fatigue-related incidents.

C. Deliverable Product 5-3: Integrate the ASRS findings and CAMI analysis of the ATC operational error data base into a formal technical report.

D. Deliverable Product 5-4: Complete initial draft of the proposed ATC Education and Training Module (ETM). Include preliminary proposals for a systematic evaluation of the effectiveness of the ETM.

E. Deliverable Product 5-5: Complete draft of the NASA Technical Report on fatigue, sleep loss, and circadian disruption relevant to principles and guidelines of duty/rest schedules.

F. Deliverable Product 5-6: Complete the draft of the NASA Technical Report on Regional/135 Operations.

Task 6: Fatigue Countermeasure Training. FAA Technical Point of Contact is Mr. Ronald Simmons, telephone number 202-267-7058.

NASA shall accomplish the following:

Deliverable Product 6-1: Multi-media training material for commercial airline personnel which promotes awareness of the effects of human fatigue, and provides countermeasures that can be utilized to minimize the effects of fatigue on daily job performance.

III. REPORTS AND DOCUMENTATION STANDARDS

Research progress reports shall be issued quarterly for each task. These reports shall include an initial research plan with objectives and milestones; technical and funding utilization status reports, and scheduled semiannual reviews. To achieve the widest dissemination of research results and information to appropriate government organizations and the aviation community, the following guidelines have been established. Deviations from these guidelines must be mutually agreed upon by appropriate FAA and NASA personnel and commemorated in writing by modification to this Agreement.

- Formal technical reports shall be prepared in accordance with FAA Order 1700.8D (*Standards for Preparing, Printing, and Distributing Federal Aviation Administration Formal Technical Reports*), February 27, 1992, which implements DOT Order 1700.18B, March 8, 1976. Reports shall be in a numbered series as established by AAR-100.
- All material shall display the AAR-100 logo.
- Presentation material shall be provide in electronic format compatible with Power Point, Version. 4.0.
- Written material shall be compatible with Microsoft Word, Version 6.0 (IBM) or Word Perfect 5.1 (IBM).
- Material suitable for transfer to World Wide Web shall be compatible with Microsoft Word or, if applicable, HTML format.
- Proposed distribution shall be reported to avoid duplication.

ARTICLE IV - FAA POINTS OF CONTACT

FAA Contract Administration - The Contract Specialist is Mr. Rick White,

ASU-340A, Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591. Telephone number 202- 267-7801, or FAX number 202-267-5149. The Contracting Officer is Mr. Anthony Guida at the same address.

FAA Accounts Payable - ABA-222 - (Address above)

FAA Contracting Officer's Technical Representative (COTR) - Dr. Thomas McCloy, AAR-100, address above, telephone number 202-267-7125.

ARTICLE V - CHANGES, COMMENCEMENT, MODIFICATIONS AND INTERPRETATIONS

The duration of this agreement shall be one year from the effective date. It can be extended an additional two years by modification signed by the FAA Contracting Officer. Changes and/or modifications to this Agreement shall be in writing and signed by an FAA Contracting Officer and a NASA Contracting Officer (except for incremental funding modifications and extensions, which will be signed by the FAA Contracting Officer). The modification shall cite the Interagency Agreement number and shall set forth the exact nature of the change and/or modification. No oral statement by any person shall be interpreted as modifying or otherwise affecting the terms of this Agreement.

All requests for interpretations of this Agreement or modifications to it shall be submitted in writing to the FAA Contracting Officer.

ARTICLE VI - DISPUTES

The parties agree that in the event of a dispute between the FAA and NASA under this agreement, and to the extent that such a dispute concerns funding provided by the FAA to NASA, or law and or regulations specifically applicable to the FAA, the decision of the FAA contracting officer shall be final. The final decision on the handling of other contractual matters shall rest with the NASA contracting officer. Any disagreement between the FAA contracting officer and the NASA contracting officer as to the implementation of this agreement may be appealed to a committee consisting of the FAA Manager of Facilities and Technology Branch and NASA's Director, Aerospace Research Division, Headquarters NASA. The committee shall attempt to reach informal agreement to resolve the dispute. If successful resolution cannot be reached, the dispute shall be grounds for termination of this agreement under Article VIII, termination.

ARTICLE VII - TERMINATION

This Agreement may be terminated in whole or in part by mutual consent at any time, or unilaterally, provided a 90 day written notice is given to the other party. The termination shall be

in writing and signed by a warranted FAA Contracting Officer when the FAA is the withdrawing party; the FAA Contracting Officer shall be notified in writing if NASA is the withdrawing party.

Upon expiration or termination of this Agreement, NASA shall refund any portion of funds which have been advanced by the FAA, but not expended in connection with the work specified herein.

ARTICLE VIII - FUNDING AND PAYMENT

The FAA shall reimburse the NASA for supplies or services furnished under this agreement upon submission of a properly executed voucher. A detailed itemized schedule of expenditures shall be included for each task including equipment purchased, personnel labor hours, and contractor support. The voucher shall be submitted in an original and two copies to the accounts payable organization identified in ARTICLE IV above. A properly executed SF 1080 shall reference the Interagency Agreement number and the following FY96 appropriation data:

Task 1	\$602,000 - W/888.0/G210/8AA/2596/081-110
Task 2	\$112,000 - W/888.0/G210/8AA/2596/081-110
Task 3	\$602,000 - W/888.0/G210/8AA/2596/081-110
Task 4	\$335,000 - W/888.0/G210/8AA/2596/081-110
Task 5	\$172,000 - W/888.0/G210/8BA/2596/082-110
Task 6	<u>\$172,000</u> - W/888.0/G210/8AA/2596/081-110

Total: \$1,995,000

Funding for years two and three (options) shall be in the same amounts per task as in FY96.

The intent of the FAA and NASA is to share in the funding of the total program consistent with approved agency operating plans. The Total FAA funding for this Interagency Agreement is not to exceed \$1,995,000 in FY96. Any additional expenditure of FAA funds shall be authorized only by the FAA Contracting Officer.

ARTICLE IX - PROTECTION OF INFORMATION

The parties agree that they shall take appropriate measures to protect proprietary, privileged, or otherwise confidential information that may come into their possession as a result of this Agreement.

AGREED:

NASA
BY:

NAME:

TITLE:

DATE:

FEDERAL AVIATION ADMINISTRATION

BY:

NAME:

TITLE:

DATE: