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FAA PAVEAIR – an Internet Airport Pavement Evaluation and Management Program

*LARKIN, Albert**

FAA William J. Hughes Technical Center

Airport Technology Research and Development Branch, AJP-6312

Atlantic City International Airport

Atlantic City, NJ 08405 USA

Tel: (609) 485-5552

Fax: (609) 485-4845

Email: albert.larkin@faa.gov

HAYHOE, Gordon F., Ph.D.

FAA William J. Hughes Technical Center

Airport Technology Research and Development Branch, AJP-6312

Atlantic City International Airport

Atlantic City, NJ 08405 USA

Tel: (609) 485-8555

Fax: (609) 485-4845

Email: gordon.hayhoe@faa.gov

JIA, Qingge

FAA William J. Hughes Technical Center

Airport Technology Research and Development Branch, AJP-6312

Atlantic City International Airport

Atlantic City, NJ 08405 USA

Tel: (609) 485-5427

Fax: (609) 485-4845

Email: Qingge.jia@faa.gov

* Corresponding Author: Albert Larkin

ABSTRACT

By the fall of 2010, the Federal Aviation Administration (FAA) is scheduled to complete a three year effort to create an internet-based airport pavement evaluation and management program. This program, titled FAA PAVEAIR, shall, using appropriate existing pavement evaluation databases, provide a pavement evaluation and management web-based application that will also function on stand-alone personal computers by running a local web server such as an Internet Information Server (IIS). The program shall have the equivalent functionality of MicroPAVER version 5.3. The FAA PAVEAIR program shall be specifically designed to function in Internet Explorer version 6.0 and above web browsers on the client side.

This version of FAA PAVEAIR and will be compatible with other FAA pavement software applications and continue to meet the expectations and demands of pavement management system users. FAA PAVEAIR will support simultaneous entry of inspection data into PAVEAIR by multiple users. The FAA envisions that an implementation of FAA PAVEAIR containing data for General Aviation and International Airports will ultimately reside on a server located at the William J. Hughes Technical Center in Atlantic City International Airport, New Jersey. This server will also contain FAA PAVEAIR data for FAA Airport Improvement Program (AIP) projects. This paper discusses the development and testing of FAA PAVEAIR as a nondestructive testing method for airport pavement evaluation and management. It is expected that FAA PAVEAIR will be distributed for implementation by any other interested agencies or users.

Keywords: pavement management system, pavement evaluation, nondestructive testing

INTRODUCTION

The FAA is continuing their efforts to develop and refine Nondestructive Testing (NDT) technologies to assess airport pavement condition. Nondestructive testing techniques have applications in many areas of FAA pavement-related specifications and standards. These areas include acceptance of new construction, measurement of material properties for thickness design, measurement of pavement response for design of overlays and for determining pavement structural condition, measurement of pavement functional condition, and maintenance of pavement management systems and databases. The FAA is researching the establishment of specifications for existing NDT devices, developing new devices, techniques, and methodologies, and evaluating the performance and applicability of new and innovative devices. Increasingly, this research includes the use of automated data acquisition, data processing, and display in FAA-developed software applications. Recent advances in computer hardware and software and data acquisition systems have significantly improved NDT effectiveness and value. For example, the FAA has developed back calculation software to collect and interpret data from Falling/Heavy Weight Deflectometer equipment. This software, titled BAKFAA, was developed by the FAA and has been available for several years. Results obtained from BAKFAA can provide information on the structural capacity of the pavement layers from measured deflection basins and assuming uniform layer thickness. In addition, the FAA has developed ProFAA, an airport pavement profile evaluation program. FAA pavement software applications – BAKFAA, FAARFIELD, COMFAA, and ProFAA are available to the public at no charge with access to the source code for local modification with the exception of FAARFIELD and ProFAA. The most recent FAA software program currently under development is the internet based computer program for use as an Airport Pavement Evaluation and Management application, FAA PAVEAIR. FAA PAVEAIR, will also be available at no cost to users with access to the source code. The background for the development of this program is discussed below.

FAA PAVEAIR

The FAA originally became involved in the development of a computer-based airport pavement evaluation program via collaboration with the US Army Corps of Engineers (USACOE). The original version of the USACOE pavement evaluation program was called PAVER. Development of PAVER dates back to the 1960's and was originally designed for use on a mainframe computer. The first version of PAVER and subsequent versions were also designed to evaluate airport, road, and parking lot pavements. A new version called MicroPAVER was then developed for use on personal computers. MicroPAVER included refinements such as dividing pavements into uniform sections to comply with existing FAA Advisory Circular guidelines, computing and storing pavement evaluation history as Pavement Condition Index (PCI) [1] as defined in ASTM D5340-04e1 Standard Test Method for Airport Pavement Condition Index surveys, and including deflectometer results for overlay design. The National Association of State Aviation Officials (NASAO) and the FAA agreed to partner to develop a system for sharing information to optimize available airport pavement funds. It was then agreed that the development of a web-based airport pavement program would be the optimum way to share this information. FAA Advisory Circular 150/5380-7A, Airport Pavement Management, requires the use of a Pavement Management System (PMS) [2]. FAA PAVEAIR will satisfy the requirements of this Advisory Circular and comply with the U.S. Government section 508 accessibility requirements to ensure that people with disabilities have the same access to electronic and information technology as people without disabilities.

*FAA PAVEAIR – an Internet Airport Pavement Evaluation and Management Program
(LARKIN, Albert; HAYHOE, Gordon F., Ph.D., JIA, Qingge)*

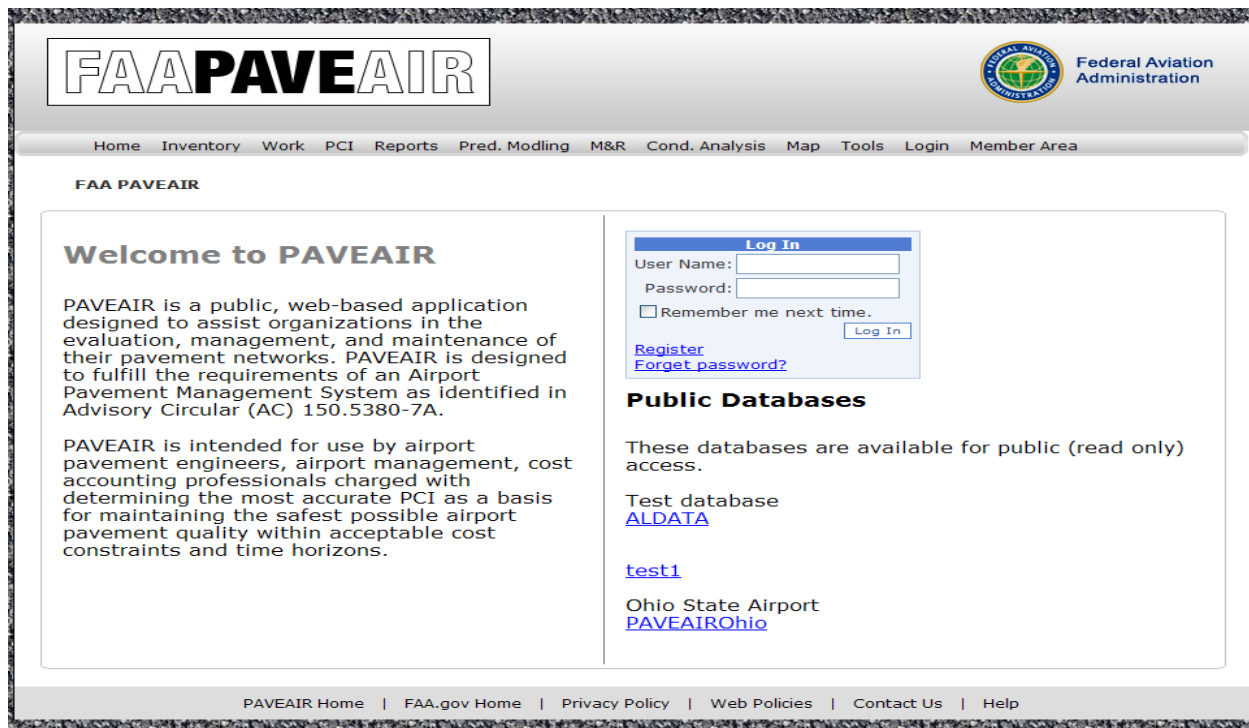


Figure 1 – FAA PAVEAIR Home Page

Figure 1 shows a screen capture of the FAA PAVEAIR home page. FAA PAVEAIR was originally devised to satisfy the requirements identified by NASAO and the FAA. Additional benefits of a web-based pavement evaluation and management program which were subsequently determined, include: a method to manage system-wide dissemination and analysis of FAA sponsored pavement projects, a tool to tie volumes of existing airport pavement data together for project/construction comparison, and as a means to join existing FAA airport pavement design and evaluation computer programs together for ease of operation. FAA PAVEAIR, in its' initial launch, will have the equivalent functionality of MicroPAVER version 5.3 and will be designed to operate in Microsoft® Internet Explorer® version 6.0 and above web browsers on the client side.

The primary MicroPAVER version 5.3 functionality includes: Inventory, Work, PCI, Reports, Prediction Modeling, Condition Analysis, and Maintenance and Rehabilitation (M&R) Plan. Secondary functions such as List Selector, Import/Export Tools are all supporting tools for the above main functionalities. The following definitions of primary functionalities as defined in references [3] and [4] by are as follows:

Inventory - Inventory is a user interface that allows users add, delete, and edit pavement information manually.

Work - Work is a user interface to let users to enter pavement work data for specific areas. Work data includes Required Work or History Work.

PCI - This function calculates the PCI value for an existing pavement inspection report and creates a new inspection data entry that calculates an estimated future PCI value of the pavement section.

*FAA PAVEAIR – an Internet Airport Pavement Evaluation and Management Program
(LARKIN, Albert; HAYHOE, Gordon F., Ph.D., JIA, Qingge)*

Standard Reports - Generates a variety of Reports for a given database. The list comprising Standard Reports includes; Section Condition Report, Branch Listing Report, Branch Condition Report, and Work History Report.

Prediction Modeling - this is a process that identifies and groups in-service pavements sharing similar construction features. These pavements also share common environmental and traffic loading attributes. Based on the evaluation of a smaller sample of similar pavement, the user can predict the future condition of a larger sample of like pavements.

Condition Analysis - this feature allows the user to quantify the state of the pavement based on the cause and rate of the pavement deterioration using pavement distresses with respect to time.

M&R Plan - is a tool used to coordinate pavement evaluation with planning, scheduling, budgeting and optimal pavement maintenance and repair (M&R) activities. The M&R plan combines existing and anticipated PCI values using inventory data and provides the ability to assess various M & R options with the resulting pavement life.

FAA PAVEAIR is being developed using Microsoft® Visual Studio 2008 and compiled to run using the most current Microsoft® Windows® operating system to support single-user and server-class personal computers. Installation of FAA PAVEAIR will be configured for use on a stand-alone personal computer, a private network, and the internet or an intranet. A user database will be created for each inventory (data owner), all work is performed on individual sections, and the database engine is Microsoft® SQL server. The FAA has acquired and will host a server at the WJHTC as a repository for civil airport projects funded by the Airport Improvement Program (AIP). As with other FAA pavement programs, the FAA PAVEAIR application will be made available for free download by users as a set of installation files, source code, and documentation for installation and operation. In addition, development of FAA PAVEAIR will be done in accordance with existing industry standards such as; American Society for Testing and Materials (ASTM), FAA Advisory Circulars, and Federal Department of Transportation (DOT) and FAA Information Systems Security (ISS) requirements.

During development of FAA PAVEAIR, the question of securing both the data owned and input by individual users and the data created by FAA PAVEAIR was identified as a possible cause for concern. The FAA has resolved the user authentication and authorization portion of this task through the development of registration functions, change password and reset password functions, and the development of a logon user interface for registered users.

An additional issue identified when developing the statement of work for FAA PAVEAIR was the extent to which data input and produced in FAA PAVEAIR would be accessible to the public. To date, this issue has not been resolved pending the determination of FAA policy for data that could be judged to be proprietary. One solution would be to provide users the option of choosing the level of accessibility granted to the public. This specified level of accessibility could be further refined within an organization to include read and write privileges. Figure 2 shows a screen capture of the FAA PAVEAIR registration page.

*FAA PAVEAIR – an Internet Airport Pavement Evaluation and Management Program
(LARKIN, Albert; HAYHOE, Gordon F., Ph.D., JIA, Qingge)*

The screenshot shows a web-based registration form for the FAA PAVEAIR system. The form is titled "User Information" and contains the following fields: First Name, Last Name, Title, Organization, Address Line 1, Address Line 2, City, State (a dropdown menu currently showing "ALABAMA"), Zip, Country, Phone#, Fax, Email, and Preferred Contact Method (a dropdown menu currently showing "Email"). A "Next" button is positioned at the bottom right of the form. The page header features the Federal Aviation Administration logo on the left and the text "Airport Pavement Database Management System" on the right. A navigation bar below the header contains links for Home, Inventory, Work, PCI, Reports, Pred. Modling, M&R, Cond. Analysis, Tools, Help, Login, and Member Only. The footer of the page includes the text "FAA.gov Home".

Figure2 - PAVEAIR Registration Form

Development and testing of FAA PAVEAIR has been ongoing for approximately two years at the time of writing and progress has been significant. Pending final testing, review, and acceptance, the status of FAA PAVEAIR at the time of this paper is as follows:

- Prototype User Interface and master page template is complete.
- The database structure has been defined and implemented.
- MicroPAVER data import procedure is completed.
- Logon and user profile modules are completed.
- Inventory and Work modules are completed.
- PCI module is complete.
- Prediction Modeling is complete.
- Condition Analysis is complete.
- Maintenance and Rehabilitation and Mapping Function are under development.
- FAA PAVEAIR Alpha testing is complete.
- FAA PAVEAIR Beta testing is complete.
- Bug fixes from Alpha and Beta testing is ongoing.
- First deployment is scheduled for September 2010.

FAA PAVEAIR is anticipated to be implemented (1) as an internet-based application for network-wide tracking of pavement projects where broad sharing of information is expected to occur, (2) as an internet-based application where restricted access within an organization is expected, such as in airport authorities and engineering services companies, and (3) as a stand-alone, single PC-based application for field work. Future enhancements are expected to include upgrading the mapping function for compliance with FAA Geographic Information System (GIS) requirements. In addition, the FAA will evaluate potential FAA PAVEAIR improvements by upgrading to Visual Studio 2010. The FAA will also conduct User's Group meetings for interested users to identify issues and collect program improvement recommendations. FAA PAVEAIR workshops will be provided at conferences and as requested by using organizations.

*FAA PAVEAIR – an Internet Airport Pavement Evaluation and Management Program
(LARKIN, Albert; HAYHOE, Gordon F., Ph.D., JIA, Qingge)*

Finally, FAA PAVEAIR is envisioned to be a central component in web enabling existing FAA pavement software applications such as: FAARFIELD, BAKFAA, COMFAA, and ProFAA. Figure 3 below illustrates the proposed configuration of linking the FAA pavement software programs.

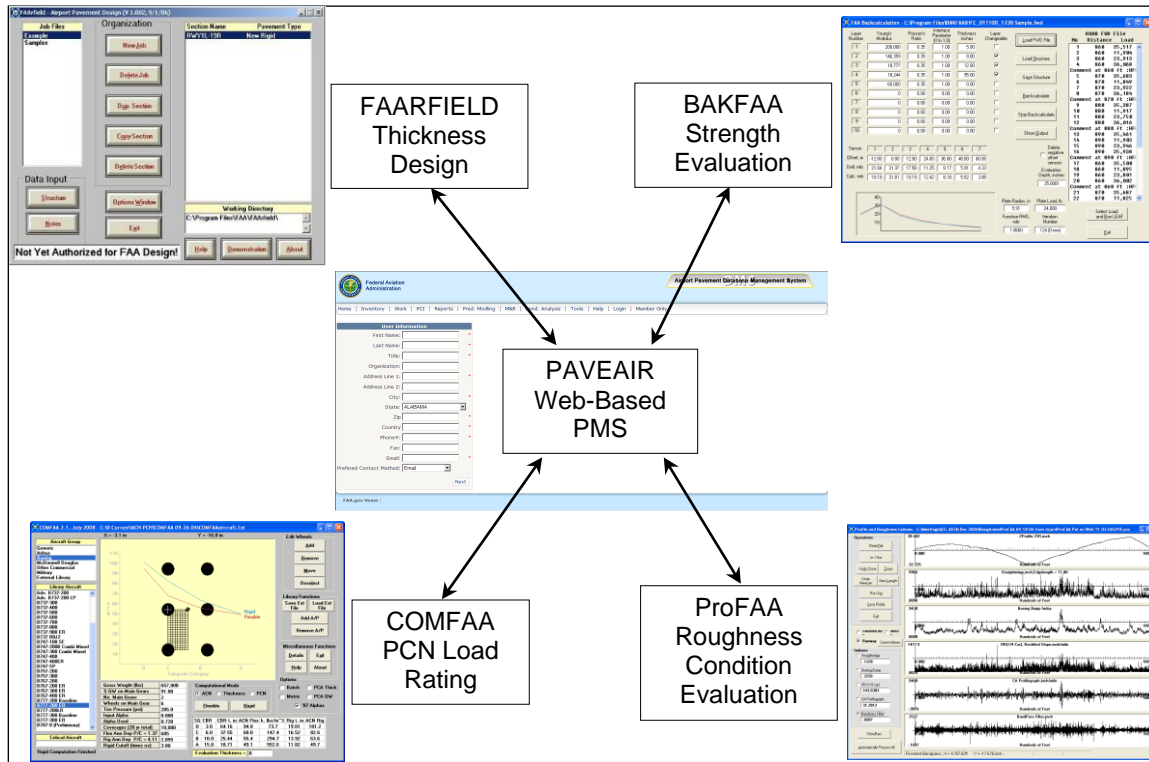


Figure 3 – Proposed Configuration of FAA Pavement Programs

CONCLUSION

The need for accurate and timely airport pavement evaluation and management has been established. The anticipated increase in air travel in the United States has made pavement management more critical as existing airport infrastructure is tasked with serving more flights. At issue is the ability of airport engineers to provide data to airport managers to maximize pavement use and optimize maintenance and repair funds. This paper described the development of the FAA PAVEAIR computer program to be used to evaluate and manage airport pavements.

This application will be developed using available existing standards for airport pavement maintenance and repair such as; applicable FAA Advisory Circulars, American Society for Testing and Materials (ASTM) standards, and Federal Information Technology requirements.

ACKNOWLEDGEMENTS

The work described in this paper was supported by the FAA Airport Technology Research and Development Branch, AJP-6312, United States of America (USA), Dr. Satish K. Agrawal, Manager. Acknowledgements are also due to SRA International for development and testing of FAA PAVEAIR. The contents of the paper reflect the views of the authors, who are responsible for the facts and accuracy of the data presented within. The contents do not necessarily reflect

the official views and policies of the FAA, USA. The paper does not constitute a standard, specification, or regulation.

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