

RPA P7: SOFTWARE PROGRAM DEVELOPMENT & SUPPORT



Federal Aviation
Administration

Presented to: REDAC Subcommittee on Airports

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Date: March 21, 2018



RPA P7 Overview

Need

There is a need to develop and maintain user-friendly software programs that meet the current and future requirements of the FAA for airport design, construction, and maintenance and management tools. This RPA provides continuous support for airport Advisory Circulars, as well as the data management and data analysis needs of the Airport Technology branch.

Objectives

Goals:

- To upgrade FAA programs to current technologies.
- To meet FAA standards, and IT standards.
- To meet software industry standards.
- To develop tools that better serve FAA research needs.

Outputs:

- Software, websites, source code, and documentation.

Accomplishments

- FAA PAVEAIR 3.0.2 released in February 2, 2017.
- Created French/Spanish versions of PAVEAIR.
- Developed FAA Prediction Curve Library.
- Added Micro Paver e70 compatibility.
- Created BAKFAA/ProFAA file parsers
- Implemented Object-Oriented (OO) design in all programs.
- FAA PAVEAIR improvements.
- Branch Website improvements and database accessibility improvements.



FAA Pavement Software Programs

Name	Date of Adoption	Advisory Circular	Description
PAVEAIR	N/A	Recommended in 150/5380-7B	Web-based application for airport pavement management system, including PCI evaluations.
COMFAA 3.0	2011	150/5335-5C	Automatic PCN computation
FAARFIELD 1.4	2016	150/5320-6F	FAA Rigid and Flexible Interactive Elastic Layer Design. Mechanistic-Empirical thickness design. Uses NIKE3D for rigid and LEAF for flexible.
ProFAA	2009	150/5380-9	Longitudinal roughness profile analysis, roughness index computation, and aircraft ride simulation.
FEAFAA 2.0	NA		3D FEM program for rigid pavement response computation. Up to 9 slabs. Used to improve and extend FAA-NIKE3D.
BAKFAA	2003	Recommended in 150/5370-11A	FAA back-calculation of elastic layer properties using LEAF. Also computation of elastic layered system responses and used for LEAF development.
LEAF	2003	NA	Layered Elastic Analysis FAA. Windows DLL layered elastic computational engine written in Visual Basic. Can be compiled to a DLL and used as a component of other programs. (BAKFAA)
ICAO-ACR	2018	NA	Program extension to compute Aircraft Classification Rating (ACR) according to proposed new ICAO ACR-PCR standard. Can be compiled to a .NET DLL and used as a component of other programs.



FAA Requirements

- FAA Information Security and Privacy Program Policy.
- Privacy Policy
- Accessibility – Section 508 Compliance
- FAA Template and Branding
- Editorial Style Guide
- Federal Source Code Policy

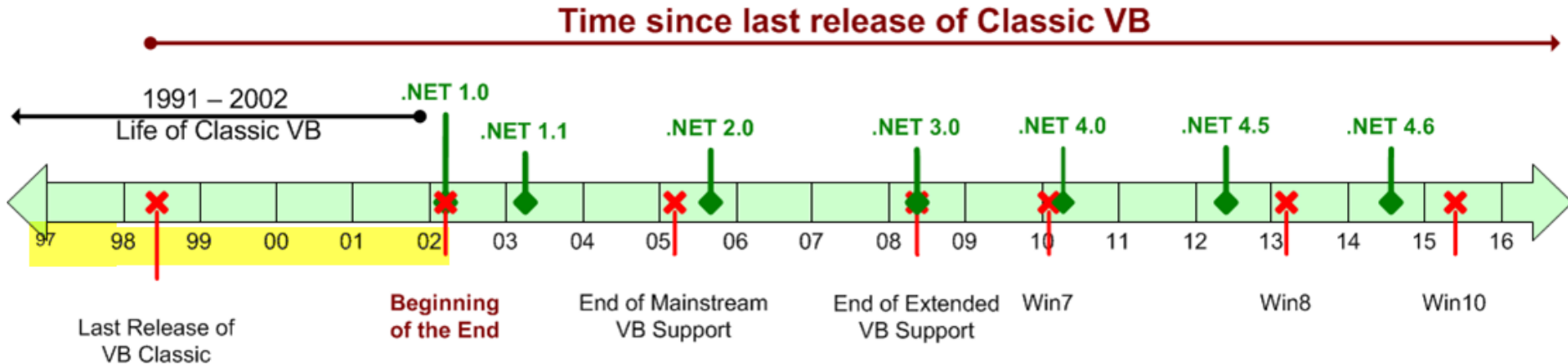


Software Environments, Operating Systems



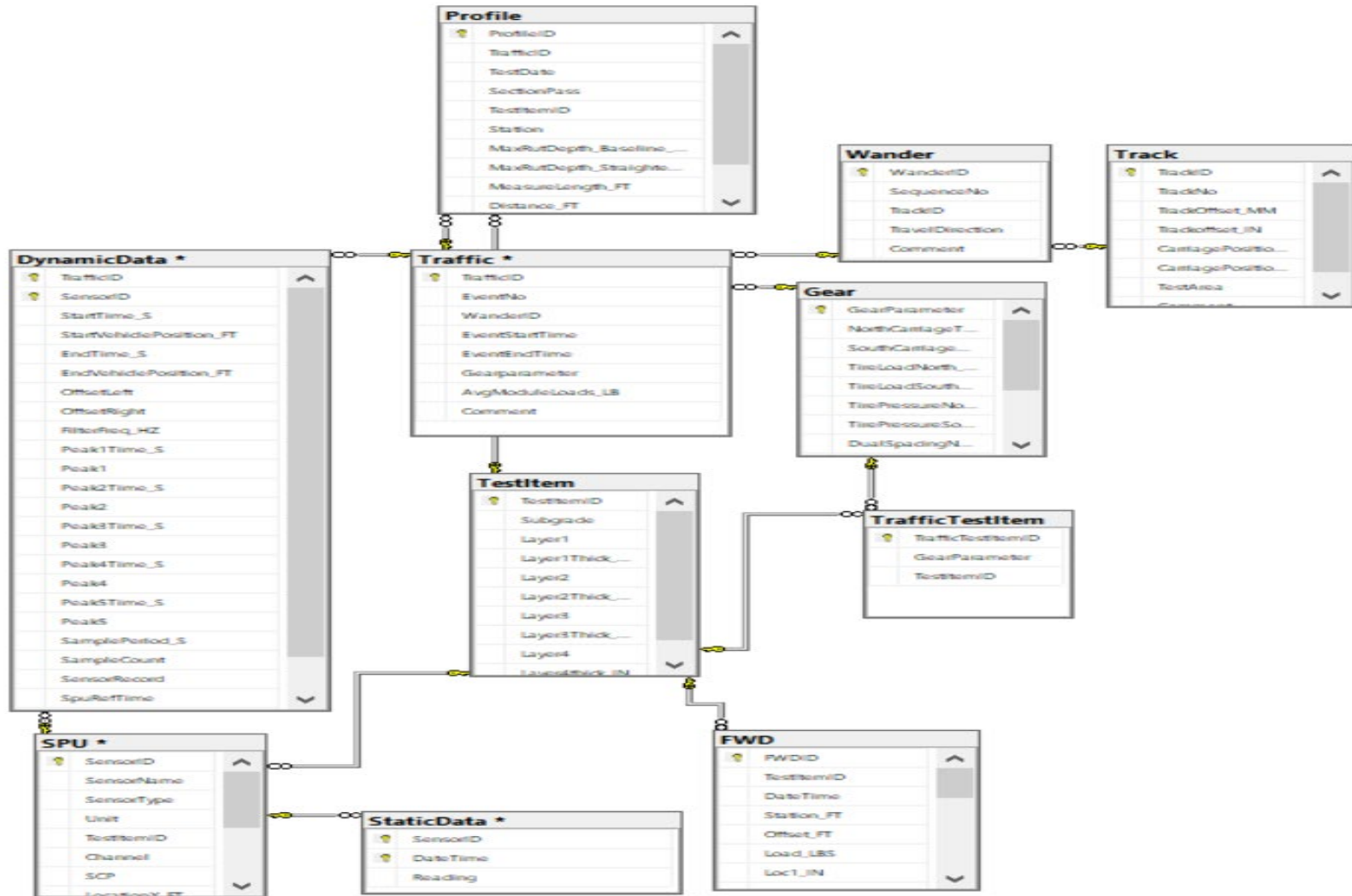
The Windows family tree

Visual Basic Timeline

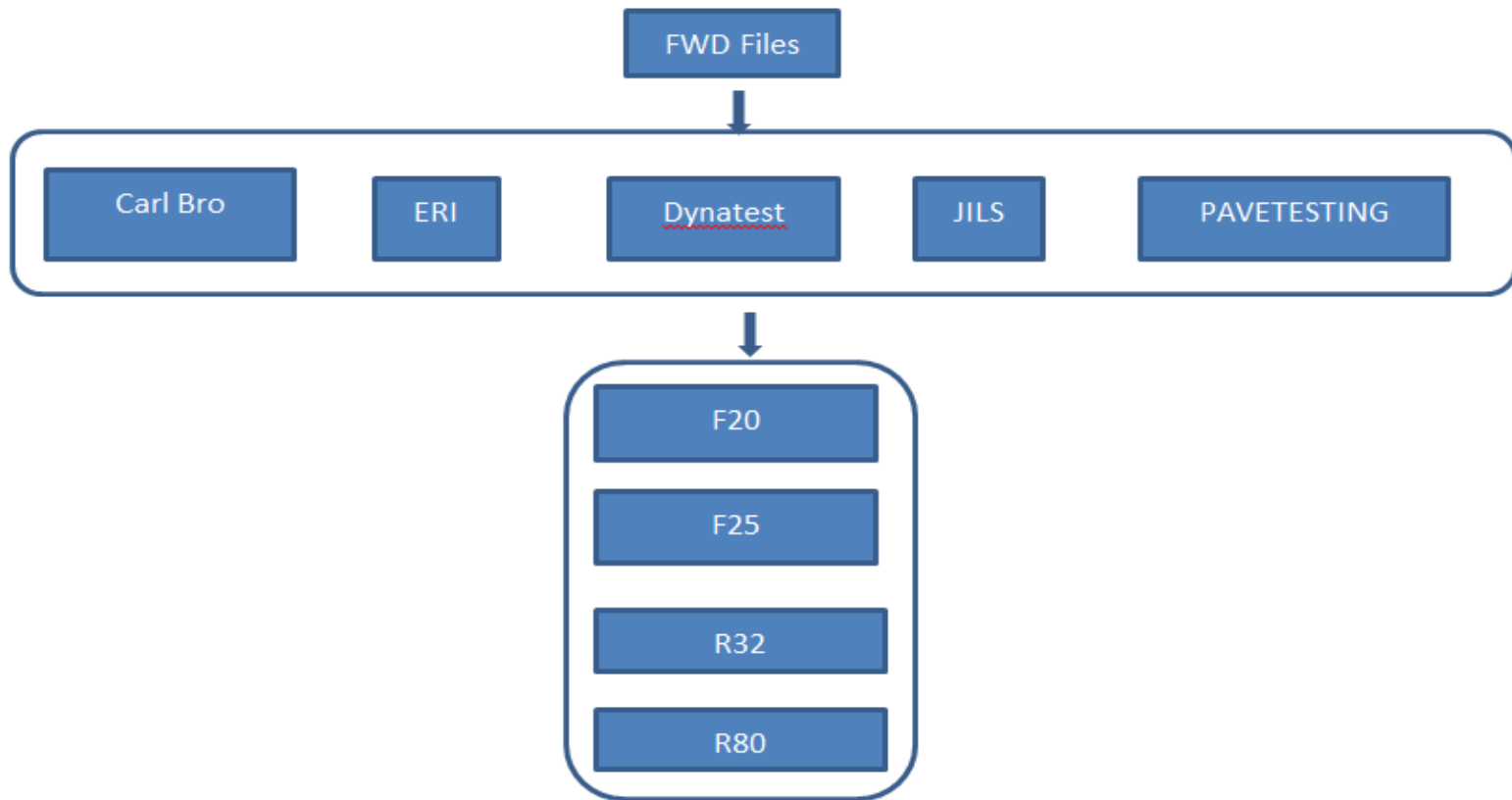


- *"Computers in the future may weigh no more than 1.5 tons."*
 - Popular Mechanics, forecasting the relentless march of science, 1949
- *"There is no reason anyone would want a computer in their home."*
 - Ken Olson, president, chairman and founder of Digital Equipment Corp., 1977
- *"640K ought to be enough for anybody."*
 - Bill Gates on computer memory, 1981

CC5 Database Tables and Relationship



FWD File Parsing



Pavement M&R Cost - Road

PCI	Stopgap	Preventive	Major	Unit
0	\$0.60	\$1.52	\$5.56	ft ²
10	\$0.39	\$1.32	\$5.56	ft ²
20	\$0.29	\$0.73	\$5.56	ft ²
30	\$0.21	\$0.58	\$5.56	ft ²
40	\$0.19	\$0.35	\$5.56	ft ²
50	\$0.14	\$0.21	\$2.19	ft ²
60	\$0.11	\$0.11	\$1.88	ft ²
70	\$0.09	\$0.05	\$1.70	ft ²
80	\$0.06	\$0.02	\$1.31	ft ²
90	\$0.01	\$0.01	\$1.27	ft ²
100	\$0.00	\$0.00	\$0.00	ft ²



M&R Cost - Airfield

PCI	Stopgap	Preventive	Major	Unit
0	\$1.24	\$0.57	\$8.39	ft ²
10	\$0.45	\$0.47	\$8.39	ft ²
20	\$0.14	\$0.42	\$8.39	ft ²
30	\$0.05	\$0.23	\$8.39	ft ²
40	\$0.03	\$0.14	\$8.39	ft ²
50	\$0.02	\$0.08	\$1.78	ft ²
60	\$0.02	\$0.04	\$1.66	ft ²
70	\$0.01	\$0.02	\$1.60	ft ²
80	\$0.00	\$0.01	\$1.27	ft ²
90	\$0.00	\$0.01	\$1.26	ft ²
100	\$0.00	\$0.00	\$0.00	ft ²



Multiple Databases in Prediction Model

FAA PAVEAIR : Prediction Modeling

Current Database: TAP_STANDARD

Model Name	TAP_Constrain_Test ▼
Family Type	PCI vs Age ▼
Allow Public Access	True
User	tparsons
<input type="button" value="Open"/> <input type="button" value="New"/> <input type="button" value="Delete"/>	
Note: Only registered users can create a prediction model and only the model owner can make changes to an existing model.	

1: Database Select 2: Collect Model Data 3: Review Model Data 4: Use Boundary/Outlier 5: Options 6: Prediction Curve 7: Model Assignment

Available Databases		TAP_Constrain_Test Databases
A321200 AA_CEGZ_150607 AAA AAF_Tamang AAS AAS100Trial abc1 abc897 ABIA AbrahamRenjuTest abv ACY Aeropuerto_Ernesto_Cortissoz Aeropuerto_Tarija_UFC aeropuerto1 AFU_17FE0287 AFU1 air Airplan	<input type="button" value=""/> >> <input type="button" value=""/> << <input type="button" value="Save Model Database(s)"/>	TAP_JAN_20171013B TAP_STANDARD



French

[Accueil](#) [Inventaire](#) [Travail](#) [PCI](#) [Modèle prédictif](#) [Analyse d'état](#) [Entretien et réfection \(E et R\)](#) [Rapports](#) [Cartes](#) [Outils](#) [Connexion](#) [Zone membres](#) [Aide](#)

FAA PAVEAIR

Base de données activeTAP_STANDARD

Bienvenue à FAA PAVEAIR

FAA PAVEAIR est une application Web publique conçue pour aider les organisations dans l'évaluation, la gestion et l'entretien de leurs réseaux de chaussées. PAVEAIR est conçu pour répondre aux exigences d'un système de gestion des chaussées d'aéroport tel

La FAA est heureuse d'annoncer la sortie de FAA PAVEAIR v3.0.2. Cette version inclut plusieurs nouvelles fonctionnalités importantes, telles que: des modèles de prédiction améliorés, un outil d'analyse de condition amélioré, l'utilisation de modèles de prédiction dans la planification d'analyse de condition et de M & R et le support de MicroPAVER e70.

Les questions concernant l'application ou les données peuvent être adressées à Qingge Jia, responsable du programme FAA PAVEAIR, à l'adresse suivante: qingge.jia@faa.gov.

Des détails sur les améliorations apportées à FAA PAVEAIR sont disponibles dans le [Journal des changements](#)

Pour les nouvelles et les événements à venir, s'il vous plaît visitez le [Nouvelles et Evénements](#) page.

Ouverture de session

Nom d'utilisateur

Mot de passe

☐ Se souvenir de moi la prochaine fois

[Ouverture de session](#)

[Enregistrer](#)

[Mot de passe oublié?](#)

Bases de données:

Utilisez le bouton "Sélectionner une base de données" ci-dessous pour sélectionner une base de données. Vous devrez vous connecter pour accéder à vos bases de données utilisateur. Les bases de données publiques sont en lecture seule.

[Sélectionner une base de données](#)



Spanish

Casa Inventario Trabajo PCI Modelado de Predicción Análisis de Condición M&R Informes Mapas Herramientas Cerrar sesión Área de Miembros Ayuda

FAA PAVEAIR : Condition Analysis

Red ▼ Demonstration Demonstration
 Rama ▼ APRON Apron
 Sección ▼ 01 01

Base de données actuelleTAP_STANDARD

Demonstration network for PAVEAIR seminar, May 2016, South Carolina

TWA Hangars

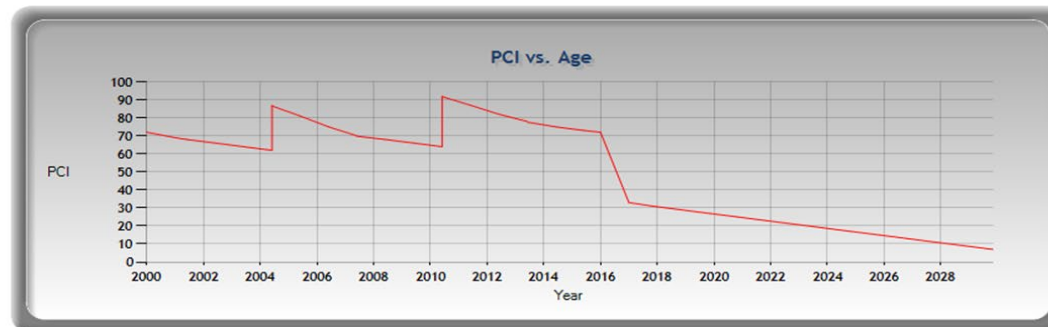
Estado Fecha de Inicio	Años
1/1/2000 (MM/DD/YYYY)	30

Continuar con el nivel de red

Continuar con nivel de rama

Continuar con el nivel de sección

- ☒ Usar curva asignada a la familia
- ☐ Usar la curva estándar degradada 2 puntos por año
- ☐ Usar la curva estándar degradada 3 puntos por año
- ☐ Usar la curva estándar degradada 4 puntos por año
- ☐ Usar la curva estándar degradada 5 puntos por año



Red	Rama	Sección	Fecha	Actividad	PCI	Años	Área	Unidad
Demonstration	APRON	01	01-01-2000	Interpolation	72	13	150000	ft²
Demonstration	APRON	01	01-01-2001	Interpolation	69	14	150000	ft²
Demonstration	APRON	01	06-01-2001	Inspection	68	15	150000	ft²



Prediction Modeling Library

FAA PAVEAIR : Prediction Modeling

Current Database: TAP_STANDARD

Model Name	-- Select Model --
Family Type	-- Select Model --
Allow Public Access	KGBD_TAP
User	KGBD_Test
	MDDallas
	PA40_ALL_AC
	PAVEAIR_AC_APR
	PAVEAIR_AC_RW
	PAVEAIR_AC_TW
	PAVEAIR_ALL_AC
	PAVEAIR_PCC_APR
	PAVEAIR_PCC_RW
	PAVEAIR_PCC_TW
	PAVEAIR_PRI_AC
	PAVEAIR_PRI_APR
	PAVEAIR_PRI_PCC
	PAVEAIR_PRI_TWY
	PAVEAIR_PRIM
	PAVEAIR_PRIM_RWY
	PAVEAIR_SEC
	PAVEAIR_SEC_AC

Open **New** **Delete**

Note: Only registered users can create new models. The model owner can make changes to an existing model.

1: Database Select

2: Collect Model Data

3: Review Model Data

4:

6: Prediction Curve

7: Model Assignment

FAA for...

Pilots
Mechanics
Other Aviation Professionals
Travelers
Educators & Students

Aeronautical Navigation Products

Airport Diagrams
Airport/Facility Directory (d-A)
National Flight Data Center (NFD)
Terminal Procedures (TERP)

Culture

Everything We Do

Stay Connected

Facebook
Twitter
YouTube
Subscribe

Regulations & Guidelines



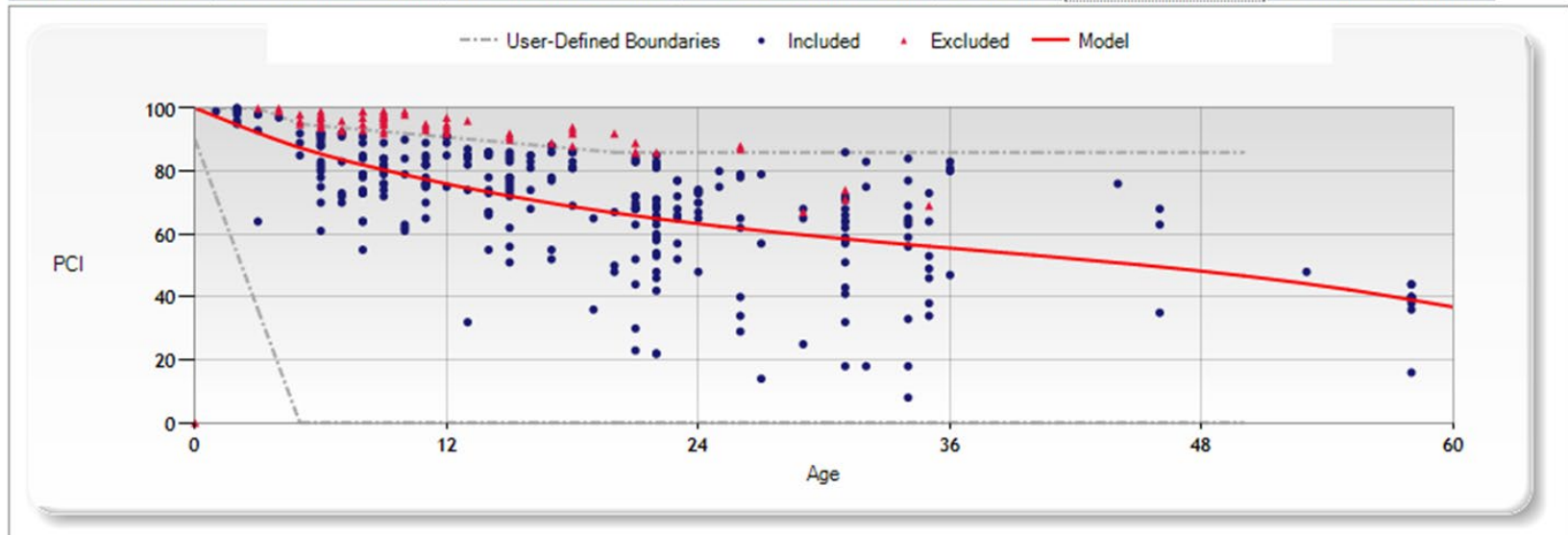
Prediction Model Library – AC, TW

FAA PAVEAIR : Prediction Modeling

Current Database: TAP_STANDARD

Model Name	PAVEAIR_AC_TW
Family Type	PCI vs Age
Allow Public Access	True
User	fclibrary
<input type="button" value="Open"/> <input type="button" value="New"/> <input type="button" value="Delete"/>	
Note: Only registered users can create a prediction model and only the model owner can make changes to an existing model.	

1: Database Select 2: Collect Model Data 3: Review Model Data 4: Use Boundary/Outlier 5: Options 6: Prediction Curve 7: Model Assignment



Traffic Model – PA40

Home Inventory Work PCI Prediction Modeling Condition Analysis M&R Reports Maps Tools Extended Life Logout Member Area Help

Current Database: GSO

Network:

GSO

Branch:

RW05L-23R

Start Date:

6/1/2014

The earliest date that data is available is 6/1/2014

End Date:

8/28/2016

The latest date that data is available is 8/28/2016

aircraft like 'a3%'

Filter

Show Help

☒ Both ☐ 23R ☐ 05L

Run Query

Aircraft	Arrivals	Departures
A306	69	69
A310	12	12
A319	66	63
A320	22	23

Data shown represents 503 days of data between 6/1/2014 and 8/28/2016 (61.3% complete between requested dates 6/1/2014 and 8/28/2016).



LCCA User Interface (UI)



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[Exit Member Area](#) [Logout](#)

FAA PAVEAIR : Member Area : LCCA

Current database: Ali

Select Airport/ Project [Add New](#) [Delete](#)

[Airport Information](#)

[Project Detail](#)

[LCCA Parameters](#)

[Pay Item & Unit Cost](#)

[Create Alternatives](#)

[Execute LCCA](#)

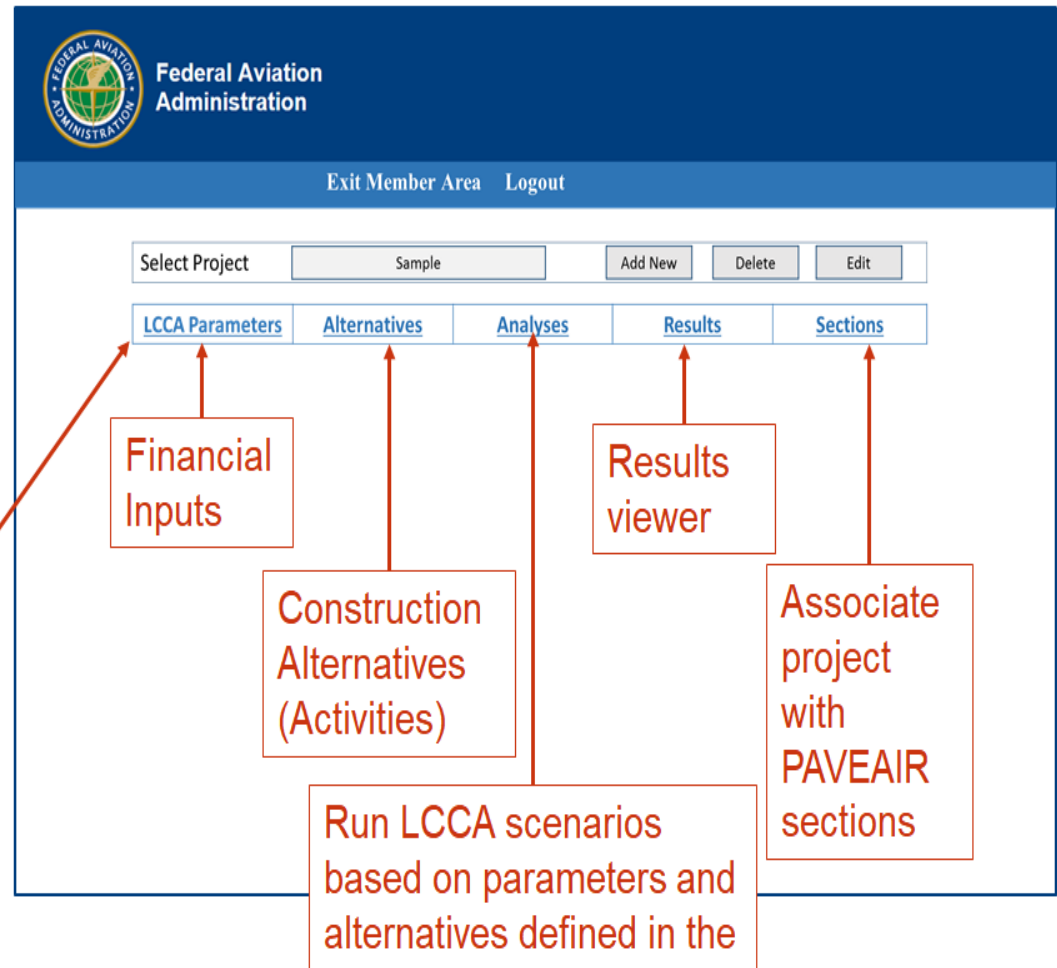
Facility Type:	Runway
Feature/Facility ID:	Runway 5/23
Event Type:	Rehabilitation
Description	Rehab of South End (3800 ft) of Existing Asphalt Runway
From STA:	0+00
To STA:	38+00
Pavement Area:	35955.00 Sq Yd
Shoulder Area:	6000.00 Sq Yd
Lighting:	
Striping:	
Grooved Pavement Area:	0.00 Sq Yd
Comments:	
Edit New Delete	



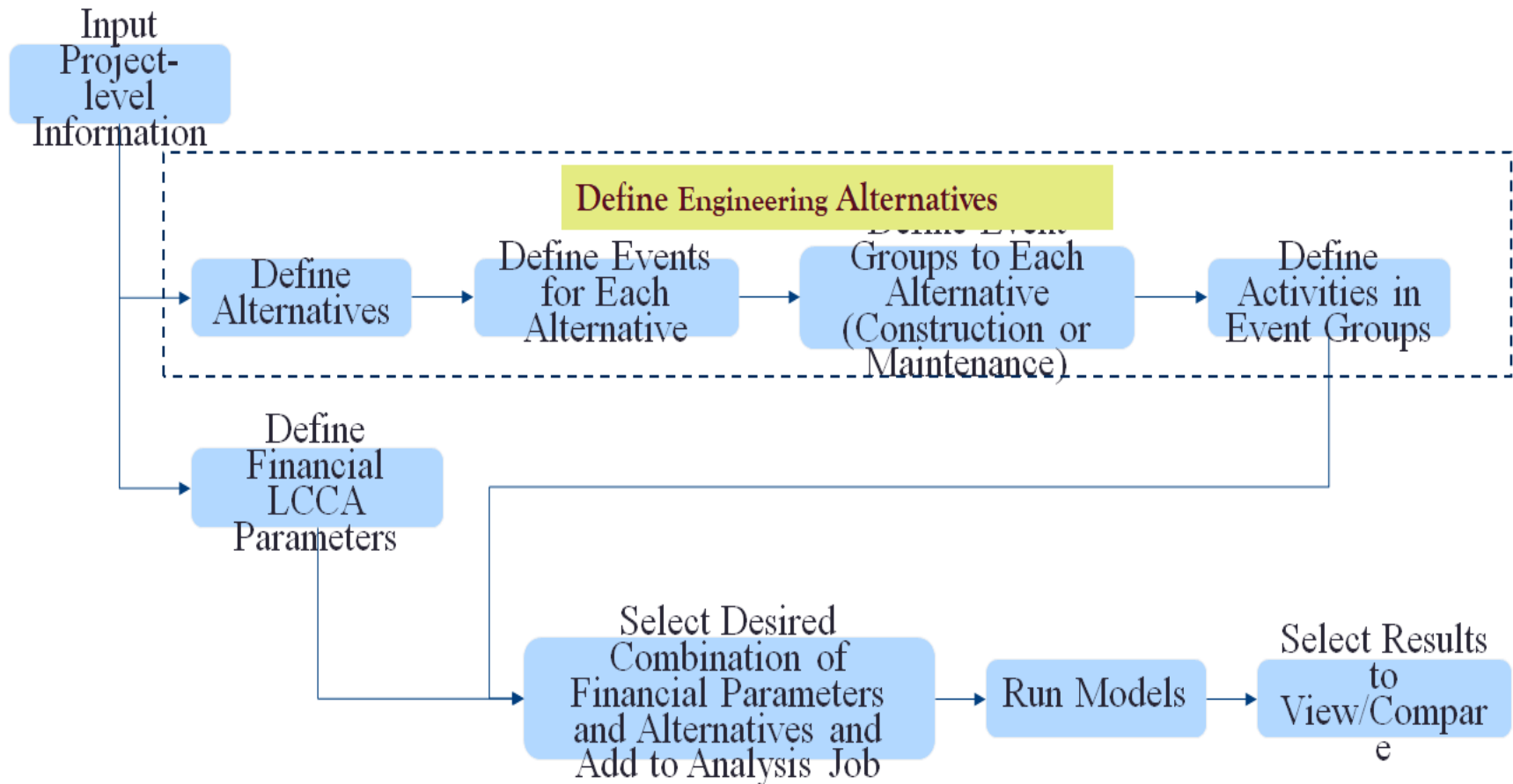
LCCA UI

- Drop down lists to open a project
- Add New and Edit to define or edit the general information of a project

Keep the tab-based interface concept, which is consistent with other parts of PAVEAIR (e.g., M&R and Prediction Modeling)



LCCA Workflow



LCCA Result



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[Exit Member Area](#) [Logout](#)

Select Project

[LCCA Parameters](#)

[Alternatives](#)

[Analyses](#)

[Results](#)

[Sections](#)

Cost Type	Statistic	LCCA No. 1 and Thin Overlay Method (\$)	LCCA No. 2 and Thin Overlay Method(\$)
User Costs	Standard Deviation	10,000	10,000
	Minimum	10,000	10,000
	Maximum	10,000	10,000
	Percentile 1 (5%)	10,000	10,000
	Percentile 2 (50%)	10,000	10,000
	Percentile 3 (75%)	10,000	10,000
	Percentile 4 (90%)	10,000	10,000
Total Costs	Mean	160,000	160,000
	Standard Deviation	5,500	5,500
	Minimum	160,000	160,000
	Maximum	160,000	160,000
	Percentile 1 (5%)	160,000	160,000
	Percentile 2 (50%)	160,000	160,000
	Percentile 3 (75%)	160,000	160,000
	Percentile 4 (90%)	160,000	160,000

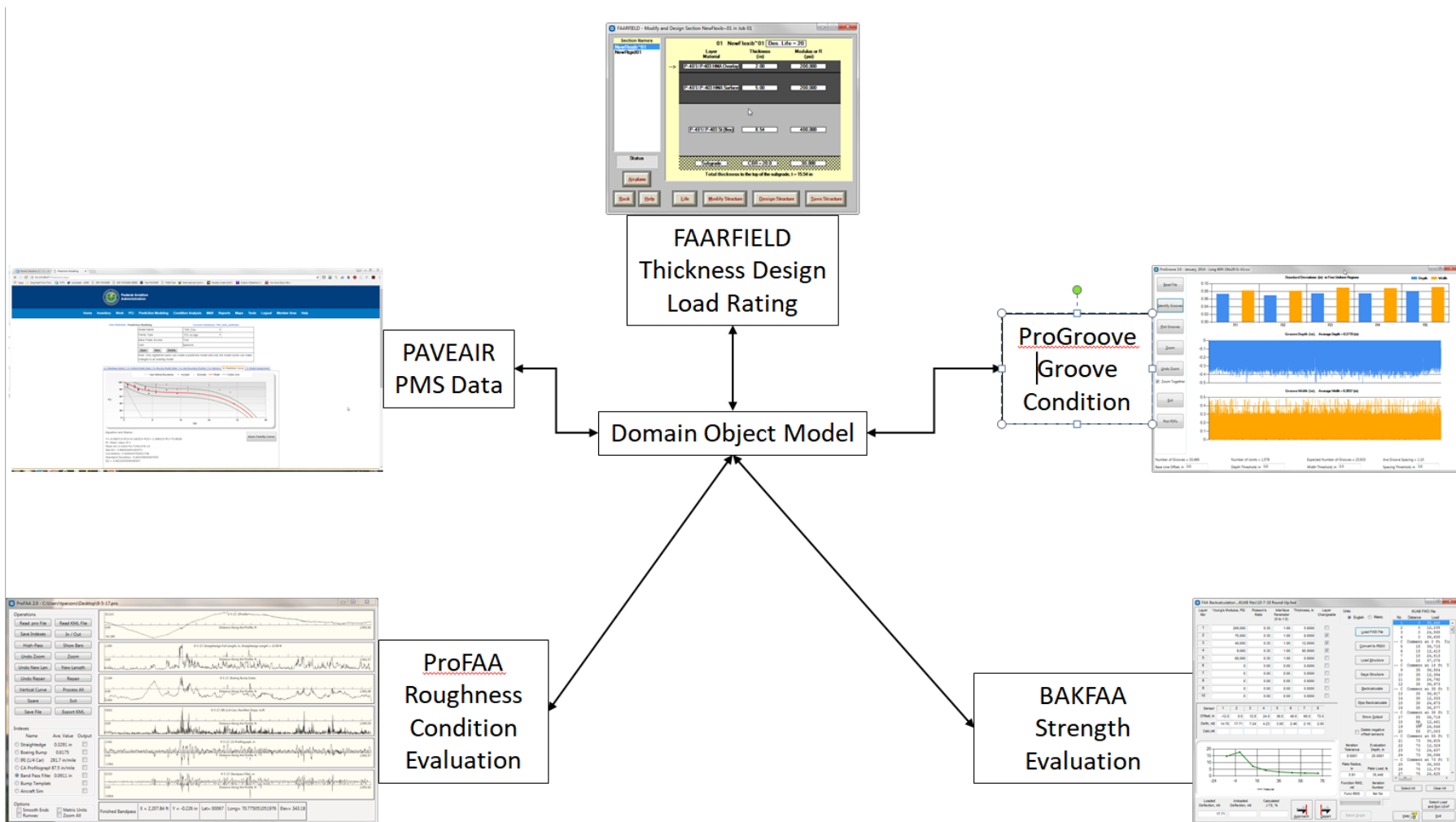


BAKFAA development

- **FWD file parsing**
- **Objected-Oriented Design**
- **UI improvements**



Software Integration

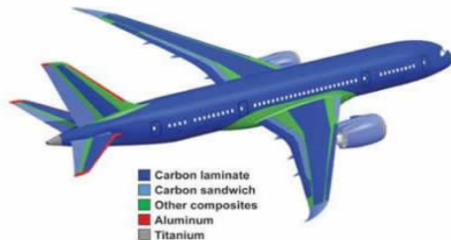


www.airporttech.tc.faa.gov

Browser window showing the FAA PAVEAIR website. The address bar displays <http://www.pjtdev-apt-ange260.com>. The browser interface includes tabs for 'FAA PAVEAIR', 'quinn-pc', and 'Airport R&D'. The website header features the Federal Aviation Administration logo and navigation links: FAA Home, About FAA, Jobs, News, A-Z Index, All Visitors, and Login. A secondary navigation bar includes links for Airport R&D, Airport Safety, Airport Pavement, Download, Databases, and Links, along with a search bar.

FAA Airport Technology Research & Development Branch Home Page

Airport Safety (ANG-E261)



Airport Pavement (ANG-E262)



About Us

The Airport Technology Research and Development Branch supports the [FAA's mission](#) by conducting the necessary research and development required to enhance the safety of operations at our nation's airports and to ensure the adequacy of engineering specifications and standards in all areas of the airport systems and, where necessary, develop data to support new standards.

With the implementation of new procedures from the NextGen research, the role of airports will be to accommodate the increased traffic safely. This is especially critical during aircraft operations in inclement weather. The increased traffic will necessitate efficient inspection and maintenance of our runways and taxiways. This will require development of technologies to heat airport pavements, reliable methods to assess the braking performance of aircraft, development of lighting and marking materials providing higher visibility, development of new lighting technologies, such as, holograms, developing methods to mitigate wildlife at or near the airport, and developing new and efficient techniques for aircraft rescue and fire fighting.

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