



Federal Aviation
Administration

FAA **PAVEAIR**

FAA PAVEAIR Workshop



Milestones for 2012

- FAAPAVEAIR 2.0 released on June 1, 2012.
- Second User's Group meeting held on Wednesday September 12, 2012 in Salt Lake City, Utah.

New for 2012

- Updated help file
- Added News and Change Log pages
- FAA PAVEAIR User Forum
- Improved Interfaces
 - Inventory, Work, and Inventory data entry
 - Additional Validation
- Enhanced Logic
 - Adding a new pavement section automatically creates a “New construction” work item and a “Q&A” inspection item.
 - Pavement age is calculated based on the last Major M&R

New for 2012

- Improved Modules
 - Maintenance & Rehabilitation (M&R)
 - Prediction Modeling
 - Pavement Condition
 - Inventory
- Improve Database Import
 - Support for MicroPAVER e65 files
- New Functionality
 - Life Cycle Cost Analysis (LCCA)
 - Leverages the AirCost application

M&R New Improvements

- A user can only view his or her own M&R
- An M&R can only be built on the owner's databases
- Delete/edit/new functions
- Selects M&R scope by Branch Use/Surface Type
- Allows users to configure budgets for each year
- More detailed M&R results are displayed
- User configured M&R tables can be used for all M&R model for this user
- User configured M&R tables can be copied to another table
- Family curves will be used for M&R calculation

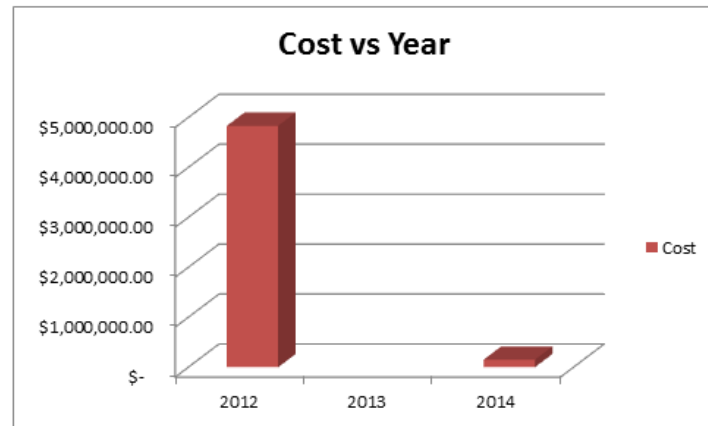
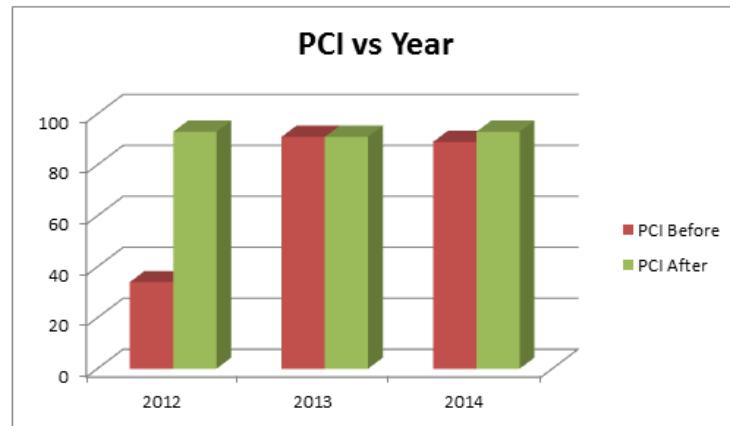
M&R New Improvements

- Database
 - Creates a dedicated database to support M&R calculation and data storage
- Calculation
 - Two mathematical algorithms were improved to calculate M&R
- Performance
 - Faster Calculations

M&R Improvements – Export Data

- Data is exportable to Microsoft Excel for further analysis and charting

Branch Minimum Condition Summary



Year	Network	Branch	PCI Before	Cost	PCI After
2012	Mansfield -	TAXIWAY	34	\$ 4,832,778.87	93
2013	Mansfield -	TAXIWAY	91		91
2014	Mansfield -	TAXIWAY	89	\$ 150,575.24	93

Prediction Modeling Improvements

- Multi-database support
 - Builds prediction modeling on multiple inventories
- Builds several sample curves on large scaled inventories
 - Large Airport/Major runway
 - Runway/Concrete pavement
 - Above sample curves can be used for registered users as family curves

PCI Inspections – Rapid Data Entry

Select Sample
Unit



Samples for Inspection Date 5/24/2002

	Sample Number	Sample Type	Sample Size	Size Unit	Comment	No Distress		
Select	05	R	465	m ²		<input type="checkbox"/>	Edit	Delete
Select	14	R	465	m ²		<input type="checkbox"/>	Edit	Delete
Select	12	R	465	m ²		<input type="checkbox"/>	Edit	Delete
Select	02	R	386	m ²		<input type="checkbox"/>	Edit	Delete
Select	10	R	567	m ²		<input type="checkbox"/>	Edit	Delete
		Random ▼		m ² ▼			Add New	

Distresses for Sample Number 12

ASTM Code	Severity	Comment	Quantity	Quantity Unit		
8 Long. & Trans. Cracking	M		36.59	m	Edit	Delete
8 Long. & Trans. Cracking	M		45.73	m	Edit	Delete
1 Alligator Cracking	M		3.72	m ²	Edit	Delete
1 Alligator Cracking ▼	High ▼			m ² ▼	Add New	



Type: ASTM Number + <TAB> + (H, M, L) + <TAB> + TAB <ENTER>

Inventory & Work Module Improvements

- Improved User Interface (UI)
- Additional Logic and Validation
- Show all Work for a Section (Table)
- Adding a Section; Creates an “Initial Construction” Work Record and “New Construction” Inspection Record
- Adding “Major M&R” work creates a “Construction/Major M&R” Inspection Record

Work Module – New User Interface

FAA PAVEAIR



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Exit Member Area Logout faa

FAA PAVEAIR : Member Area

Network

Branch

Section

Date	Work
01/13/1974	New Construction - PCC (Major M
01/13/1974	Base Course - Aggregate (Layer
01/13/1974	Initial Construction
01/13/2001	Overlay - AC Structural (Major M

Work Details

Date 1/13/1974

Project

Phase

Work Base Course - Aggregate (Layer Cons

Work Type BA-AG

Quantity

Quantity Unit m²

Cost

Material Type Gravel and Crushed Stone

Material Code 211

Thickness 177.80

Thickness Unit mm

Comment P-154

Major M&R ☐

Work Completed ☒

Back Calculated ☐

Submit

Cancel

Current database: Mansfield

TW N

TW J

	Major M&R	Work Completed		
	True	True	Edit	Delete
	False	True	Edit	Delete
	True	True	Edit	Delete
	True	True	Edit	Delete

Add New Record

Life Cycle Cost Analysis (LCCA)

- Identify the most cost-effective pavement management strategies
- AirCost - Airfield Asphalt Pavement Technology Program (AAPTP) Integrated with FAA PAVEAIR
- LCCA data stored in FAA PAVEAIR database

Life Cycle Cost Analysis (LCCA)



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

[FAA PAVEAIR : Member Area : LCCA](#)

Current database: **Mansfield**

Select Airport/ Project

Springfield Regional Airport ▼

[Add New](#)

[Delete](#)

Airport Information

[Project Detail](#)

[LCCA Parameters](#)

[Pay Item & Unit Cost](#)

[Create Alternatives](#)

[Execute LCCA](#)

Airport Name Springfield Regional Airport

Location(City, State) Springfield

Airport Authority Name Springfield Airport Authority

Airport Consultant Name Airport Consultants, Inc.

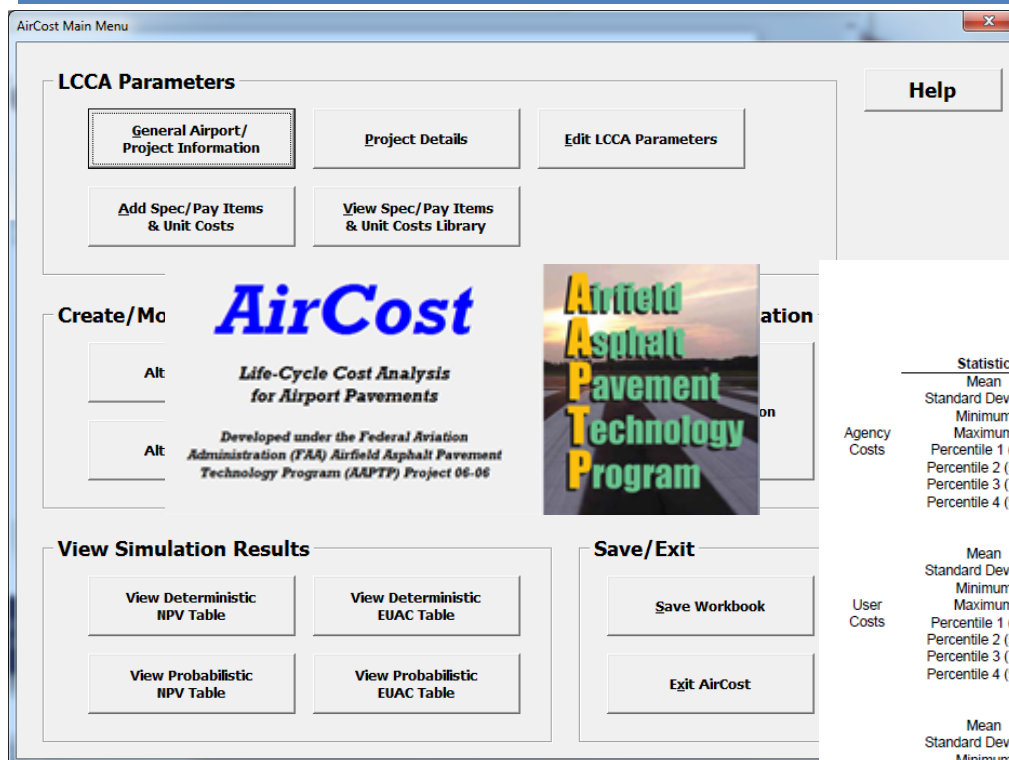
Project AIP Number

Project Description Rehab of South End (3800 ft) of Existing Asphalt Runway

LCCA Date 1/1/2011

[Edit](#)

Life Cycle Cost Analysis (LCCA)



PROBABILISTIC NPV RESULTS

		Total NPV (in \$1,000's)			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
Agency Costs	Statistic				
	Mean	\$1,124			
	Standard Deviation	\$99			
	Minimum	\$833			
	Maximum	\$1,515			
	Percentile 1 (5%)	\$973			
User Costs	Percentile 2 (50%)	\$1,124			
	Percentile 3 (75%)	\$1,186			
	Percentile 4 (95%)	\$1,293			
	Mean	\$1,049			
	Standard Deviation	\$185			
	Minimum	\$894			
Total Costs	Maximum	\$1,642			
	Percentile 1 (5%)	\$923			
	Percentile 2 (50%)	\$975			
	Percentile 3 (75%)	\$1,008			
	Percentile 4 (95%)	\$1,486			
	Mean	\$2,173			
Convergence	Standard Deviation	\$260			
	Minimum	\$1,737			
	Maximum	\$3,011			
	Percentile 1 (5%)	\$1,933			
	Percentile 2 (50%)	\$2,095			
	Percentile 3 (75%)	\$2,165			
Iterations	Percentile 4 (95%)	\$2,785			
	Convergence Reached?	1000			
Iterations	Iterations with repeated events?	166			

Other Updates

- Form input
 - Intensive error checking on user input
 - Allows multiple lines of data entry

WorkCode	Name	WorkUnit	Application Interval	Life Increase	Cost
NONE	No Global MR	ft ²	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
OL-AT	Overlay - AC Thin (Global)	ft ²	<input type="text" value="10"/>	<input type="text" value="8"/>	<input type="text" value="0.4"/>
SS-CT	Surface Seal - Coal Tar	ft ²	<input type="text" value="5"/>	<input type="text" value="2"/>	<input type="text" value="0.05"/>
SS-FS	Surface Seal - Fog Seal	ft ²	<input type="text" value="5"/>	<input type="text" value="2"/>	<input type="text" value="0.05"/>
SS-RE	Surface Seal - Rejuvenating	ft ²	<input type="text" value="5"/>	<input type="text" value="3"/>	<input type="text" value="0.05"/>
ST-SB	Surface Treatment - Single Bitum.	ft ²	<input type="text" value="5"/>	<input type="text" value="3"/>	<input type="text" value="0.1"/>
ST-SS	Surface Treatment - Slurry Seal	ft ²	<input type="text" value="5"/>	<input type="text" value="3"/>	<input type="text" value="0.1"/>
ST-ST	Surface Treatment - Sand Tar	ft ²	<input type="text" value="5"/>	<input type="text" value="2"/>	<input type="text" value="0.1"/>
ST-CS	Surface Treatment - Cape Seal	ft ²	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0.6"/>
ST-MS	Surface Treatment - Micro Surface	ft ²	<input type="text" value="6"/>	<input type="text" value="4"/>	<input type="text" value="0.6"/>

Future Developments

- Field Data Acquisition
 - Import inspection data from field devices
- Pavement Distress Guide
- Offline Inspection Module
- Traffic Module
- Climate Module
- Integration of FAA applications

Unit 1

What is a Pavement Management System?



What is a Pavement Management Program?

- Defined in FAA Advisory Circular 150/5380-6B Appendix A
 - Specifies the procedures to be followed to assure that proper preventative and remedial pavement maintenance is performed
- Public Law 103-305, section 107, amended Title 49, Section 47105 of the United States Code
 - To be eligible for federal funding, an airport agency must implement an effective pavement maintenance management program

Pavement Management Programs Must Include:

- Pavement Inventory
 - Location, type of pavement, dimensions, construction date
- Inspection Schedule
 - Detailed inspection must be performed at least once a year
 - Drive-by inspection must be performed a minimum of once per month
- Record Keeping
 - Inspection date, location, distress types, maintenance scheduled or performed
- Information Retrieval
- Program Funding

What is an Airport Pavement Management System?

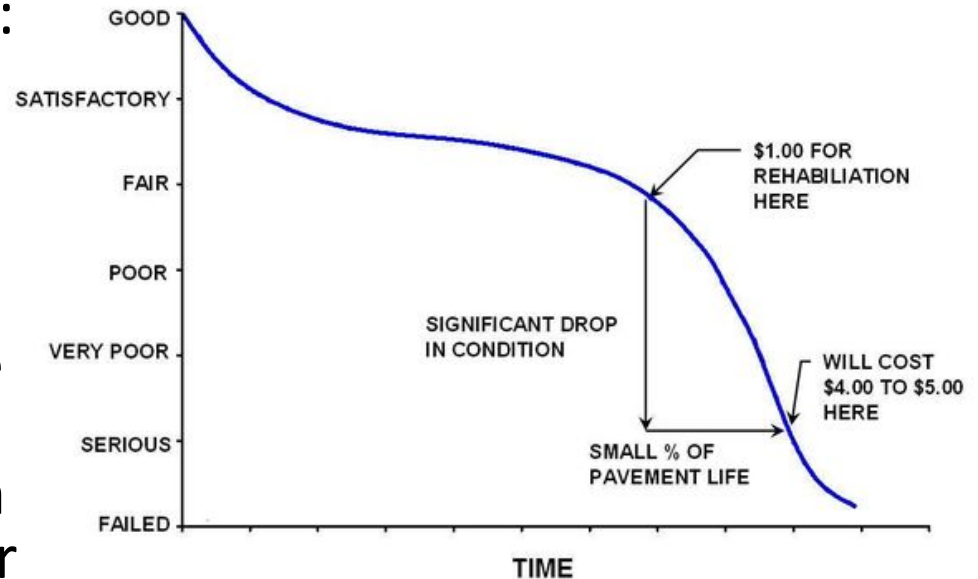
- Discussed in FAA Advisory Circular 150/5380-7A
 - A system which identifies optimum strategies to maintain pavements at an adequate level of serviceability
 - Includes systematic procedures for scheduling maintenance and rehabilitation activities
 - Optimizes benefits while minimizing cost

Benefits of an Airport Pavement Management System

Provides	Identifies
Objective and consistent evaluation of pavement conditions	Budget requirements necessary to maintain pavements at various levels of serviceability
Systematic and documentable engineering basis for determining maintenance and rehabilitation needs	Impact on the pavement network as a result of performing no major repairs
Documentation on the present and future condition of the pavements in a network	Life-cycle costs for various maintenance and rehabilitation alternatives

Pavement Life Cycle Curve

- First several years of life: low deterioration
- At a certain point in time: deterioration accelerates
- Preventive maintenance early in pavement life is more cost effective than major maintenance later in life
- Determine the optimum time to effectively apply funds



Typical Pavement Life Cycle Curve

History of FAA PAVEAIR

PAVER PMS

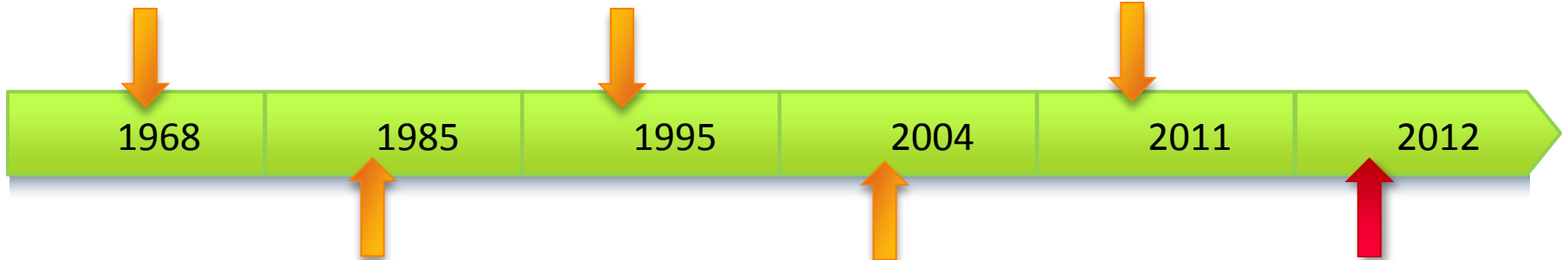
In 1968, CERL begins development of a mainframe PMS for the DOD. The first version is completed in 1972.

Public Law 103-305

Requires an airport agency to show that it has an effective PMS in place to be eligible for federal funding.

FAA PAVEAIR

February 2011, FAA releases a public beta of FAA PAVEAIR, a public web-based Airport Pavement Management System (APMS)



MicroPAVER

In 1985, the FAA funds CERL to develop a microcomputer version of PAVER, named MicroPAVER. The first version is released in 1987.

APMS Systems in Use

By 2004, 84% of state aviation agencies in the US use an APMS.

FAA PAVEAIR

June 2012, FAA releases FAA PAVEAIR 2.0.

* CERL (U.S. Army Construction Engineering Research Laboratory)

Student Lab 1a

Connect to the Workshop Lab Network

- Purpose
 - Connect to the Workshop Lab Network
- FAA PAVEAIR Workshop Wireless Network
 - SID: FAAPAVEAIR
 - Key: FAAPAVEAIR
- FAA PAVEAIR Workshop Site
 - <http://faapaveair>

Please let your instructor know if you are having difficulties connecting to the Workshop network.

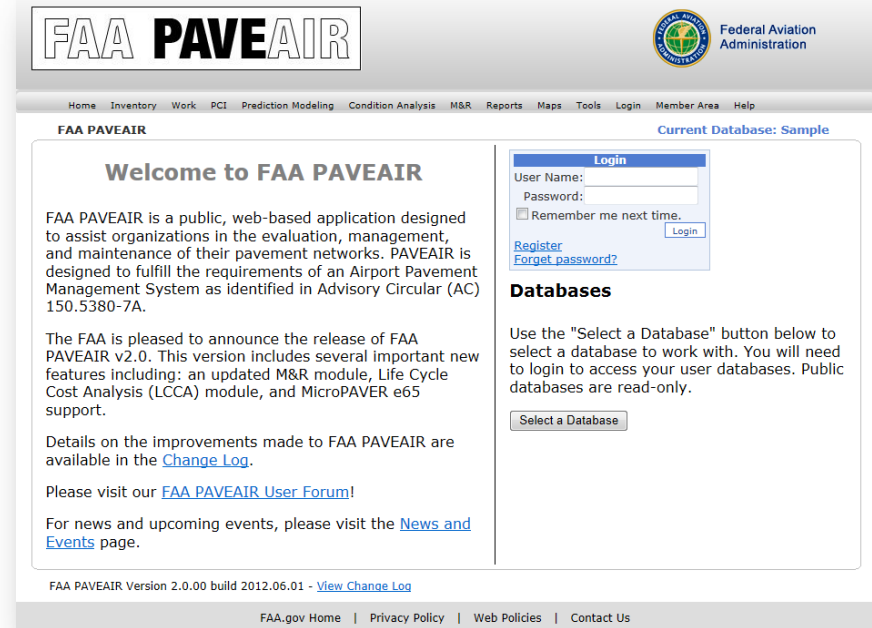
Unit 2

FAA PAVEAIR Basics



About FAA PAVEAIR

- Airport Pavement Management System
 - Publicly available and free to use (source code available)
 - Data can be made “public” or “private”
 - Includes similar functionality found in MicroPAVER version 5.3
- Web-based
 - Access through the Internet, company Intranet, or a stand-alone PC
- Regional Settings
 - English / Metric



Primary Functions

- Inventory
 - Manage Pavement Inventories
- Work
 - Record Pavement Work Histories
- PCI / Update Inspections
 - Calculate PCI / SCI / FOD
 - Record Condition Surveys
- Prediction Modeling
 - Predict future pavement conditions
 - Plot PCI vs. Age
- Condition Analysis
 - Provides projections about the viability of pavements
- Maintenance and Repair Planning
- Reports / Maps
 - Generate reports
 - Mapping support with shapefiles
- Compatibility
 - Import data from MicroPAVER (e60 files)
 - Export data to XML

The screenshot displays the FAA PAVEAIR web application interface. At the top, there is a header with the 'FAA PAVEAIR' logo on the left and the 'Federal Aviation Administration' logo on the right. Below the header is a navigation bar with links: Home, Inventory, Work, PCI, Prediction Modeling, Condition Analysis, M&R, Reports, Maps, Tools, Login, Member Area, and Help. The main content area is titled 'FAA PAVEAIR' and 'Current Database: Sample'. It features a 'Welcome to FAA PAVEAIR' section with a description of the application's purpose and a 'Login' section with fields for 'User Name', 'Password', and a 'Remember me next time' checkbox. There are also links for 'Register' and 'Forgot password?'. A 'Databases' section explains the need to select a database and provides a 'Select a Database' button. At the bottom, there is a footer with the version information 'FAA PAVEAIR Version 2.0.00 build 2012.06.01 - View Change Log' and a navigation bar with links: FAA.gov Home, Privacy Policy, Web Policies, and Contact Us.

Versions

- Three supported configurations
 - FAA Hosted version (<http://faapaveair.faa.gov>)
 - Intranet Version
 - Locally Installed version
- National Airport Pavement Test Facility
 - <http://www.airporttech.tc.faa.gov>
 - Additional information
 - Setup files
 - Source code

User Accounts / Databases

- Registered Users
 - Create Database
 - Multiple databases supported
 - New database or import from MicroPAVER
 - Choose to make data “Public” or “Private”
 - Manage Database
 - Delete database
 - Change between “Public” and “Private”
 - Assign permissions to other registered users

Student Lab 2a

Create a User Account and Pavement Database

- Purpose
 - Create a user account
 - Create a new blank database
 - Set English / Metric unit preferences

Instructor Demonstration 2a

Importing MicroPAVER Data

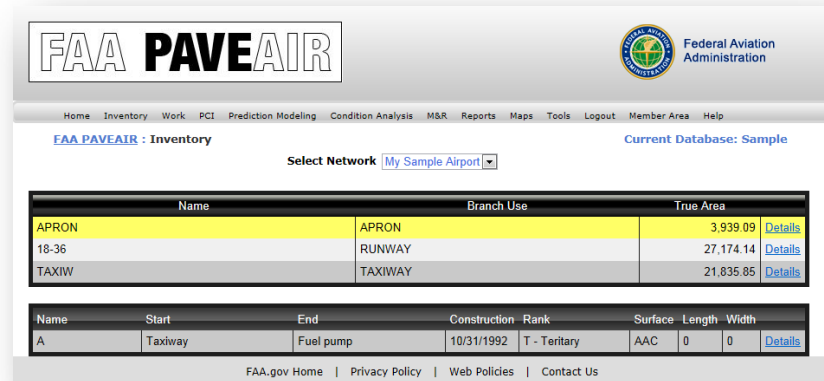
- Importing MicroPAVER Data
 - Create an e60 file in MicroPAVER
 - Paver Database Tools
 - Create a new FAA PAVEAIR database
 - Choose to import database from a MicroPAVER e60 file

Pavement Hierarchy

- Pavement Network
 - High-level grouping of an organization's pavements for the purposes of maintenance and repair planning
 - Examples: Ohio State University Airport, JFK Airport
- Pavement Branch
 - Identifiable area of a pavement network having a distinct function
 - Examples: Runway 9L, Taxiway D, Apron
- Pavement Section
 - Subdivision of a branch with uniform construction, maintenance, usage, condition, traffic volume, and load intensity conditions
 - Example: Section A (Runway 32 end to 3,013' west)

Pavement Inventory

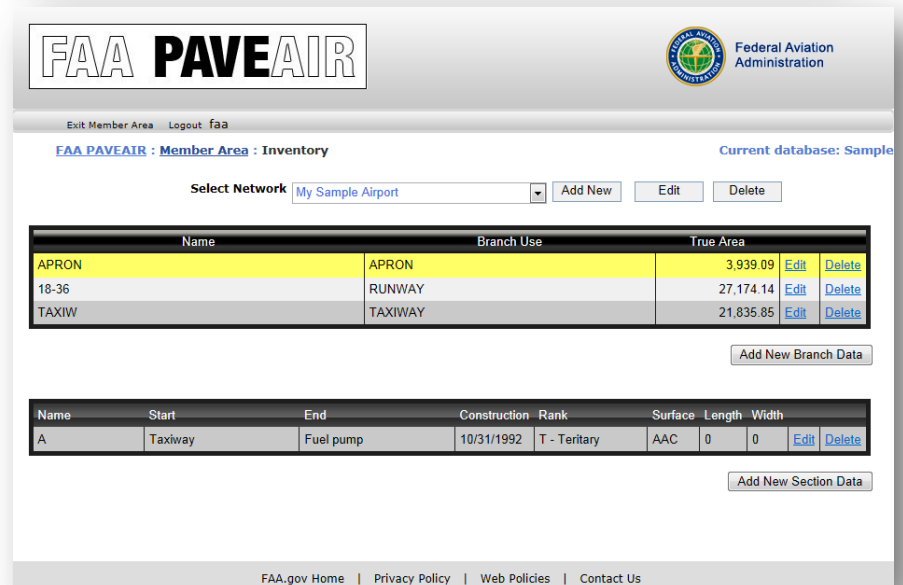
- View Pavement Inventories
 - “Inventory”
- Manage Pavement Inventories
 - Member Area “Inventory Update”



The screenshot shows the FAA PAVEAIR web application interface. At the top, there is a header with the FAA PAVEAIR logo and the Federal Aviation Administration logo. Below the header, a navigation bar contains links: Home, Inventory, Work, PCI, Prediction Modeling, Condition Analysis, M&R, Reports, Maps, Tools, Logout, Member Area, and Help. The main content area is titled "FAA PAVEAIR : Inventory" and includes a "Select Network" dropdown menu set to "My Sample Airport" and a "Current Database: Sample" label. The primary data is presented in a table with three columns: Name, Branch Use, and True Area. The table lists three items: APRON (3,939.09), 18-36 (27,174.14), and TAXIWAY (21,835.85). Each item has a "Details" link. Below this table is another table with columns: Name, Start, End, Construction, Rank, Surface, Length, and Width. It lists a single item: A (Taxiway, Fuel pump, 10/31/1992, T - Teritary, AAC, 0, 0), with an "Details" link. At the bottom, there are links for FAA.gov Home, Privacy Policy, Web Policies, and Contact Us.

Name	Branch Use	True Area
APRON	APRON	3,939.09
18-36	RUNWAY	27,174.14
TAXIWAY	TAXIWAY	21,835.85

Name	Start	End	Construction	Rank	Surface	Length	Width
A	Taxiway	Fuel pump	10/31/1992	T - Teritary	AAC	0	0



The screenshot shows the FAA PAVEAIR web application interface from the Member Area. The header and navigation bar are identical to the previous screenshot. The main content area is titled "FAA PAVEAIR : Member Area : Inventory" and includes a "Select Network" dropdown menu set to "My Sample Airport", and "Add New", "Edit", and "Delete" buttons. The primary data is presented in a table with three columns: Name, Branch Use, and True Area. The table lists three items: APRON (3,939.09), 18-36 (27,174.14), and TAXIWAY (21,835.85). Each item has "Edit" and "Delete" links. Below this table is a button labeled "Add New Branch Data". At the bottom of the table is another table with columns: Name, Start, End, Construction, Rank, Surface, Length, and Width. It lists a single item: A (Taxiway, Fuel pump, 10/31/1992, T - Teritary, AAC, 0, 0), with "Edit" and "Delete" links. Below this table is a button labeled "Add New Section Data". At the bottom, there are links for FAA.gov Home, Privacy Policy, Web Policies, and Contact Us.

Name	Branch Use	True Area
APRON	APRON	3,939.09
18-36	RUNWAY	27,174.14
TAXIWAY	TAXIWAY	21,835.85

Name	Start	End	Construction	Rank	Surface	Length	Width
A	Taxiway	Fuel pump	10/31/1992	T - Teritary	AAC	0	0

Student Lab 2b

Pavement Inventory

- Purpose
 - Add Pavement Inventories
 - Update Pavement Inventories

Pavement Work History

- View Work History
 - “Work”
- Manage Work History
 - Member Area “Work Update” module
- Accurate Work History is essential

The screenshot shows the 'FAA PAVEAIR : Work' interface. At the top, there's a navigation bar with links: Home, Inventory, Work, PCI, Prediction Modeling, Condition Analysis, M&R, Reports, Maps, Tools, Logout, Member Area, Help. The main header includes the FAA PAVEAIR logo and the Federal Aviation Administration logo. Below the header, there's a form for selecting a network, branch, and section. The 'Current Database: Sample' is indicated. The main table lists work history records with columns: Date, Work, Work Type, Material Type, Comment, Major M&R, and Work Completed. The table contains several rows of data, including 'Initial Construction', 'Overlay - AC Thin (Major MR)', 'Surface Treatment - Slurry Seal', 'Crack Sealing - AC (Localized MR)', 'Overlay - AC Thin (Major MR)', 'Coat - Tack (Layer Construct)', and 'AC Leveling - layer construction (Major MR)'. Each row has a 'Select' link in the 'Work Completed' column.

Date	Work	Work Type	Material Type	Comment	Major M&R	Work Completed
01/01/1970	Initial Construction	INITIAL			True	True Select
11/18/1986	Overlay - AC Thin (Major MR)	OL-AT	Asphalt Concrete		True	True Select
10/31/1992	Surface Treatment - Slurry Seal	ST-SS	Slurry Seal		False	True Select
01/01/2003	Crack Sealing - AC (Localized MR)	CS-AC			False	True Select
01/01/2005	Overlay - AC Thin (Major MR)	OL-AT	AC	ODOT 404	True	True Select
01/01/2005	Coat - Tack (Layer Construct)	CO-TA	Tack Coat		True	True Select
01/01/2005	AC Leveling - layer construction (Major MR)	AC-LV		ODOT 403	True	True Select

The screenshot shows the 'FAA PAVEAIR : Member Area : Work' interface. At the top, there's a navigation bar with links: Exit Member Area, Logout, faa. The main header includes the FAA PAVEAIR logo and the Federal Aviation Administration logo. Below the header, there's a form for selecting a network, branch, and section. The 'Current database: Sample' is indicated. The main table lists work history records with columns: Date, Work, Work Type, Material Type, Comment, Major M&R, and Work Completed. The table contains several rows of data, including 'Initial Construction', 'Overlay - AC Thin (Major MR)', 'Surface Treatment - Slurry Seal', 'Crack Sealing - AC (Localized MR)', 'Overlay - AC Thin (Major MR)', 'Coat - Tack (Layer Construct)', and 'AC Leveling - layer construction (Major MR)'. Each row has 'Edit' and 'Delete' links in the 'Work Completed' column. An 'Add New Record' button is located at the bottom right.

Date	Work	Work Type	Material Type	Comment	Major M&R	Work Completed
01/01/1970	Initial Construction	INITIAL			True	True Edit Delete
11/18/1986	Overlay - AC Thin (Major MR)	OL-AT	Asphalt Concrete		True	True Edit Delete
10/31/1992	Surface Treatment - Slurry Seal	ST-SS	Slurry Seal		False	True Edit Delete
01/01/2003	Crack Sealing - AC (Localized MR)	CS-AC			False	True Edit Delete
01/01/2005	Overlay - AC Thin (Major MR)	OL-AT	AC	ODOT 404	True	True Edit Delete
01/01/2005	Coat - Tack (Layer Construct)	CO-TA	Tack Coat		True	True Edit Delete
01/01/2005	AC Leveling - layer construction (Major MR)	AC-LV		ODOT 403	True	True Edit Delete

Student Lab 2c

Pavement Work History

- Purpose
 - Add Pavement Work History
 - Update Pavement Work History

Unit 3

Assessing Pavement Condition



Pavement Condition Surveys

Inspection Process

- ASTM D 5340-10 and ASTM D 6433-09
 - Provides step-by-step process for identifying distresses, filling out survey forms, and calculating section PCI
- Create Sample Units
 - Divide pavement sections into Sample Units for Inspection
- Determine the Number of Sample Units
 - Calculate the minimum number of sample units that must be inspected
- Record Distresses
 - Condition Survey Forms
- Enter Inspection Data
 - Enter inspection data into FAA PAVEAIR's Update Inspection module

Updated ASTM Standards

ASTM D5340-10 and ASTM D6433-09 identify new distresses and their deduct curves. FAA PAVEAIR has been updated to reflect these changes.

ASTM D6433-09 - Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys

Surface Type	Old Distress	New Distress
Asphalt	19. Weathering / Raveling	19. Raveling
		20. Weathering

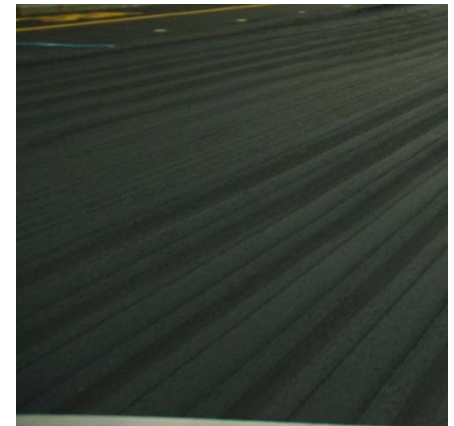
ASTM D5340-10 - Standard Test Method for Airport Pavement Condition Index Surveys

Surface Type	Old Distress	New Distress
Asphalt	12. Weathering / Raveling	12. Raveling
		17. Weathering
Surface Type	Old Distress	New Distress
Concrete	10. Scaling / Map Crack / Cracking	10. Scaling / Map Crack / Cracking
		16. Alkali Silica Reaction (ASR)

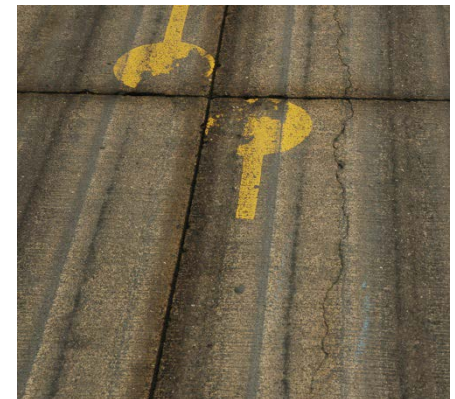
Types of Distresses

Distress Codes (AC)
1. Alligator Cracking
2. Bleeding
3. Block Cracking
4. Corrugation
5. Depression
6. Jet Blast
7. Joint Reflection (PCC)
8. Long. & Trans. Cracking
9. Oil Spillage
10 Patching
11. Polished Aggregate
12. Raveling
13. Rutting
14. Shoving from PCC
15. Slippage Cracking
16. Swell
17. Weathering

Distress Codes (PCC)
1. Blow up
2. Corner Break
3. Long / Trans / Diagonal Crack
4. Durability "D" Crack
5. Joint Seal Damage
6. Patching (Small)
7. Patching (Large) and Utility Cut
8. Popouts
9. Pumping
10. Scaling / Map Crack / Crazeing
11. Settlement / Fault
12. Shattered Slab
13. Shrinkage Crack
14. Spalling-Joints
15. Spalling-Corner
16. Alkali Silica Reaction (ASR)



Rutting

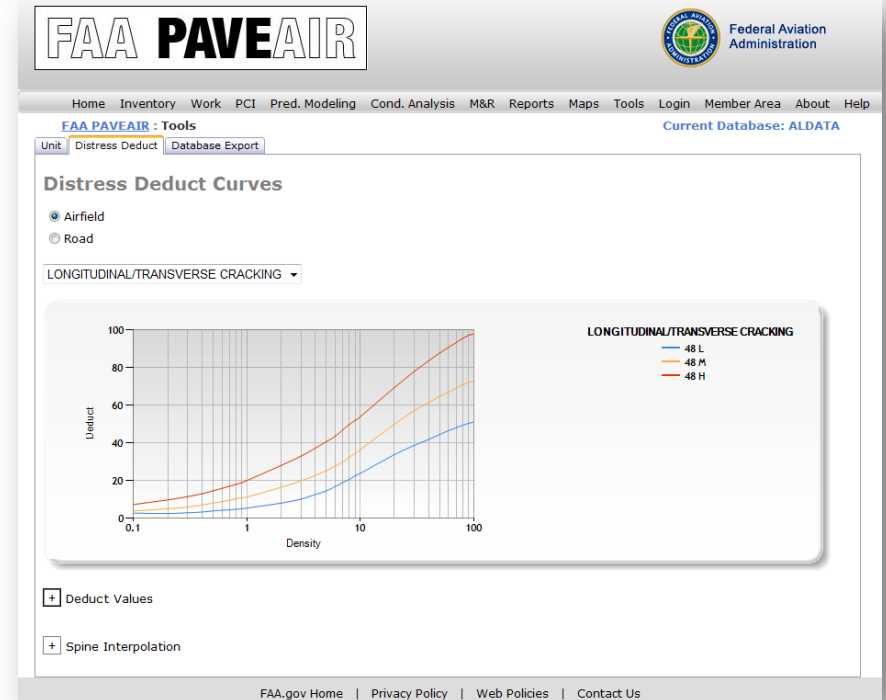


Longitudinal Cracking

Instructor Demonstration 3a

Distress Deduct Curves

- Distress Deduct Curves
 - View deduct curves for each distress
 - Deduct value details
 - Spine interpolation equation



Create Sample Units

- Divide pavement sections into sample units for inspection
 - Asphalt
 - Subdivide into sample units consisting of 5,000 ft² of contiguous area ($\pm 2,000$ ft²)
 - Concrete
 - Subdivide into sample units consisting of 20 contiguous slabs (± 8 slabs)

Determine Number of Sample Units

- Total Sampling
 - Total sampling is desirable for project analysis
 - May not be feasible for routing management due to manpower, funds, and time required
- Partial Sampling
 - Calculate the minimum number of random sample units n that must be surveyed to obtain a 95% confidence level

$$n = \frac{Ns^2}{\left(\left(\frac{e^2}{4}\right)(N - 1) + s^2\right)}$$

- e = acceptable error in estimating the section PCI; ± 5 PCI points
 s = standard deviation of the PCI from one sample unit to another; assumed to be 10 for AC pavements and 15 for PCC pavements
 N = total number of sample units in the section

Record Distresses



- Record distresses using the procedures documented in ASTM D5340-10 and ASTM D 6433-09
 - Divide pavements into sample units
 - Perform condition survey of sample units
 - Record distresses, severity, and quantity on survey data sheets
- Print survey data sheets from FAA PAVEAIR's Update Inspections Module
 - Distresses for Asphalt Pavements
 - Distresses for Concrete Pavements

[illegible]

Enter Inspection Data

Update Inspection

- Input / update inspection data from Condition Surveys
- PCI button
 - Calculates section condition (PCI)
 - Displays distress, deduct, and PCI details

Exit Member Area Logout: faa

Current database: Sample

Select Inventory

Network	My Sample Airp	My Sample Airport	
Branch	18-36	18-36	
Section	A	A	Runway end 18 Runway end 36

Condition Survey Data Sheets: [Asphalt Pavements](#) [Concrete Pavements](#)

Section 2 Summary

Branch	Use	Surface	True Area	Width	Length
RUNWAY	AAC		24154.79	19.81	1219.20

Inspection Date	Comment	New Construction		
10/19/2011		<input type="checkbox"/>	Edit	Delete
		<input type="checkbox"/>	Add New	

123456789

Samples for Inspection Date 10/19/2011

Sample Number	Sample Type	Sample Size	Size Unit	Comment	No Distress		
Select 02	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 05	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 06	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 12	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 16	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 20	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 25	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 26	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 31	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 35	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 39	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 40	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 45	R	453	m²		<input type="checkbox"/>	Edit	Delete
Select 48	R	453	m²		<input type="checkbox"/>	Edit	Delete
	Random		m²			Add New	

Distresses for Sample Number 02

ASTM Code	Severity	Comment	Quantity	Quantity Unit		
2 Bleeding			1.00	m²	Edit	Delete
7 Jt. Reflection (PCC)	M	kjdsnv	10.00	m²	Edit	Delete
1 Alligator Cracking	H		10.06	m²	Edit	Delete
1 Alligator Cracking	High			m²	Add New	

PCI

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Student Lab 3a

Condition Surveys

- Purpose
 - Add Pavement Condition Surveys
 - Update Pavement Condition Surveys

Pavement Condition Index (PCI)

- FAA PAVEAIR uses the procedures documented in ASTM D5340-10 to calculate PCI
- Developed by the US Army Corps of Engineers
- Quantify Airport Pavement Condition
- Numerical rating of the pavement condition

PCI	
100	Excellent
85	Very Good
70	Good
55	Fair
40	Poor
25	Very Poor
10	Failed
0	

PCI Calculation

Calculate the PCI of an Inspected Section

- Start by calculating the PCI of the surveyed sample units
 - Determine the maximum corrected deduct value (CDV) of the sample unit
 - Sample PCI = $(100 - \text{Max CDV})$
 - Determine the Area Weighted PCI of the Sample Units

Student Lab 3b

Corrected Deduct Values for Asphalt Pavements

- Purpose
 - Manually determine the maximum corrected deduct value (CDV) of a sample unit
 - Manually determine the PCI of a sample unit

Student Lab 3c

Corrected Deduct Values for Concrete Pavements

- Purpose
 - Manually determine the maximum corrected deduct value (CDV) of a sample unit
 - Manually determine the PCI of a sample unit

PCI Calculation

Area Weighted PCI of Random Sample Units

The area weighted PCI of your random sample units are calculated as:

$$\overline{PCI}_r = \frac{\sum_{i=1}^n (PCI_{ri} \times A_{ri})}{\sum_{i=1}^n A_{ri}}$$

\overline{PCI}_r = The area weighted PCI of the randomly surveyed sample units.

PCI_{ri} = PCI of random sample unit i.

A_{ri} = Area of random sample unit i.

n = Number of random sample units surveyed.

PCI Calculation

Area Weighted PCI of Additional Sample Units

The area weighted PCI of your additional sample units are calculated as:

$$\overline{PCI}_a = \frac{\sum_{i=1}^m (PCI_{ai} \times A_{ai})}{\sum_{i=1}^m A_{ai}}$$

\overline{PCI}_a = The area weighted PCI of the additional surveyed sample units.

PCI_{ai} = PCI of additional sample unit i.

A_{ai} = Area of additional sample unit i.

m = Number of additional sample units surveyed.

PCI Calculation

Area Weighted Section PCI

If all sample units are random, then:

$$PCI_S = \overline{PCI}_R$$

If there are additional sample units, then:

$$PCI_S = \frac{\overline{PCI}_R (A - \sum_{i=1}^m A_{ai}) + \overline{PCI}_a (\sum_{i=1}^m A_{ai})}{A}$$

\overline{PCI}_S = The area weighted PCI of the pavement section

Student Lab 3d

Pavement Condition Index

- Purpose
 - View PCI / SCI / FOD information in FAA PAVEAIR

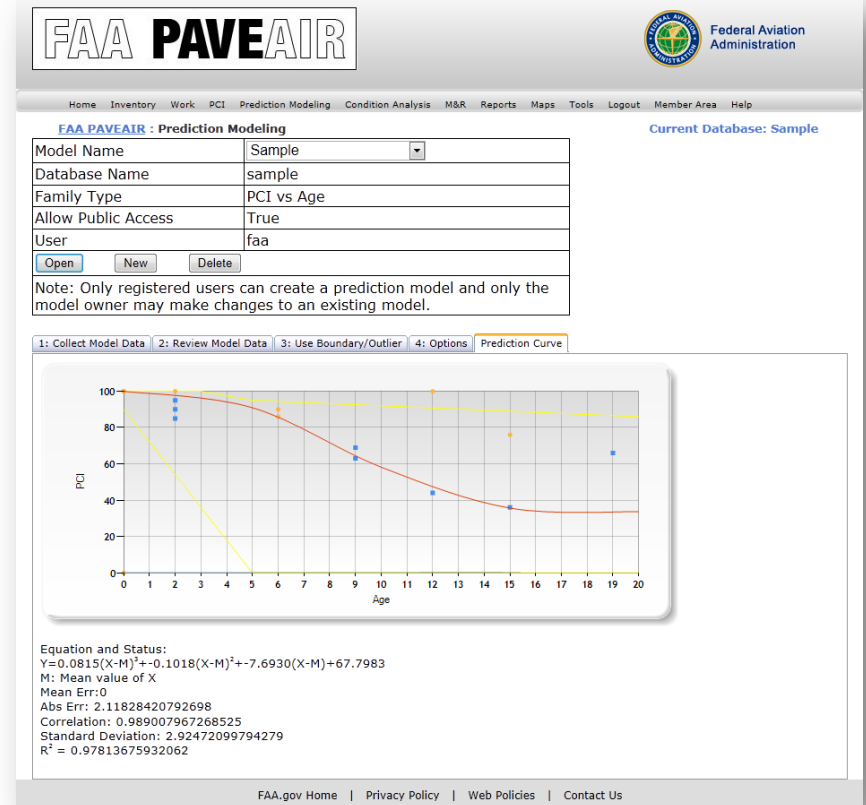
Unit 4

Predicting Pavement Performance



Prediction Modeling

- Collect Model Data
 - Group pavement sections of similar construction and with similar traffic patterns
- Review Model Data
- Use Boundary / Outlier
 - Filter out erroneous data points
- Options
- Prediction Curve
 - Plot predicted PCI vs. Age



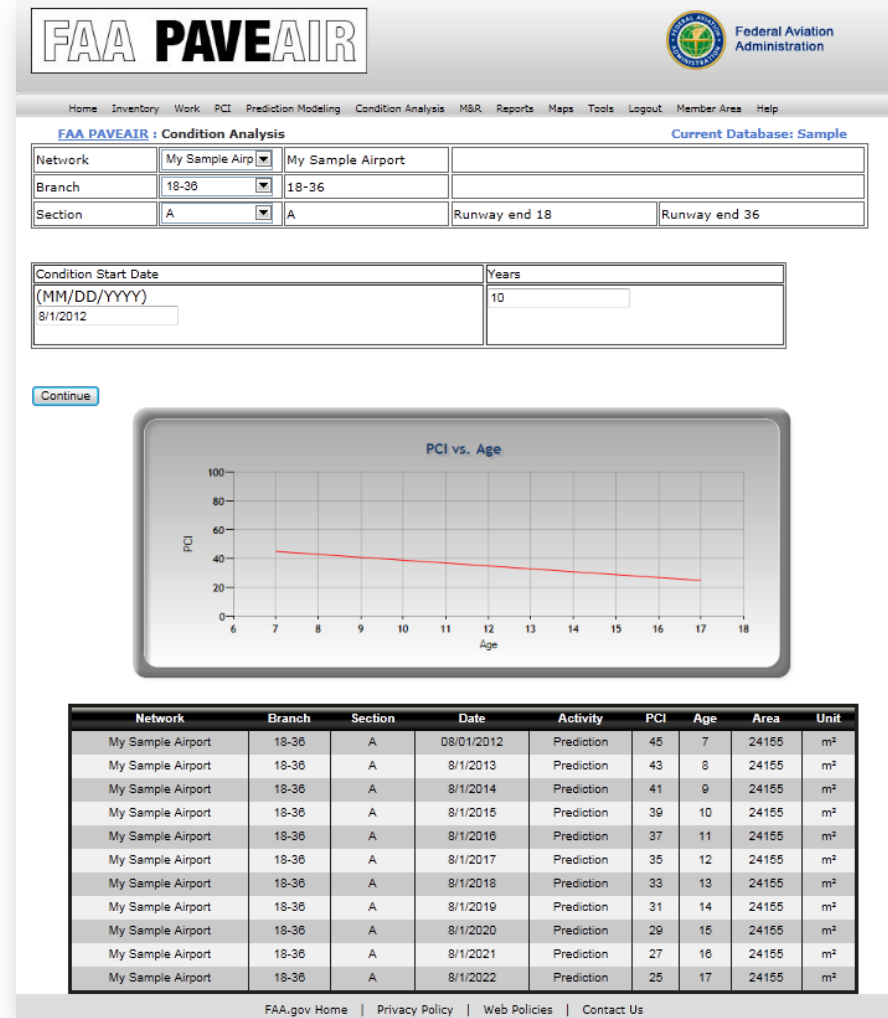
Instructor Demonstration 4a

Prediction Modeling

- Purpose
 - Create a Prediction Model
 - View PCI Prediction Curve

Condition Analysis

- Provides projections about the viability of pavements
- Analysis based upon:
 - Prior inspection data
 - Comparison of values between previous inspections
 - Projected conditions
- Graph PCI vs. Age



Student Lab 4a

Condition Analysis

- Purpose
 - Predict pavement performance for a section out to 10 years

Unit 5

Maintenance and Repair Planning



Maintenance and Repair Planning

- Scope
- Timing
- Plan Mode
 - Critical PCI Method
 - Minimum Condition
 - Consequence of Local Repair
- Policies
 - Apply Inflation Rate
 - Apply Policy in First Year
 - Global
- M&R Data
 - Applied Policy Consequence
 - Applied Policy Details
 - Inventory Info

The screenshot displays the FAA PAVEAIR web application. The header includes the FAA PAVEAIR logo and the Federal Aviation Administration logo. The navigation bar contains links: Home, MR Management, MR Tables, Consequence of Local Repair, Minimum Condition, Critical PCI, and Help. The main content area is titled 'Open Existing M&R' with a sub-header 'MR:7:Sample-Local:Sample'. Below this, there are input fields for 'MR Name' (Sample-Local), 'Database' (Sample), and 'MR Type' (ConsequenceOfLocalRepair). An 'Open' button is present. Below the input fields, there are tabs for 'Scope', 'Timing', 'Option', and 'Result'. The 'Scope' tab is active, showing a 'Save All Changes' section with a 'Save' button. Below this, there is a dropdown for 'Applied Policy Consequence' and a table of applied policy consequences.

Network	Branch	Section	StartCondition	Policy	EndCondition	Cost
My Sample Airport	APRON	A	66	LOCALIZED SAFETY FOR AIRFIELDS (DEFAULT)	66	0
My Sample Airport	18-36	A	89	LOCALIZED SAFETY FOR AIRFIELDS (DEFAULT)	90	91.45
My Sample Airport	18-36	B	90	LOCALIZED SAFETY FOR AIRFIELDS (DEFAULT)	90	0
My Sample Airport	TAXIW	A	36	LOCALIZED SAFETY FOR AIRFIELDS (DEFAULT)	46	16648.91

The footer contains links: FAA.gov Home | Privacy Policy | Web Policies | Contact Us.

Customizable M&R Settings

- Localized M&R
 - Policy
 - Work Type / Cost
 - Work Consequence
- Global M&R
 - Policy
- Major M&R
 - Minimum Condition
 - Branch Use Priority
 - Section Rank Priority
 - Major M&R Priority
- Cost by Condition
 - Cost by Condition
 - Budget

Open Existing M&R

MR Name	Database	MR Type
<input type="text" value="Sample-Local"/>	Sample	ConsequenceOfLocalRepair

Scope **Timing** Option Result

Localized

Policy < Critical	<input type="text" value="LOCALIZED SAFETY FOR AIRFIELDS (DEFAULT)"/>	<input type="button" value="Edit"/>	<input type="text" value="Default Cost by Work Type"/>	<input type="button" value="Edit"/>	Factor: <input type="text" value="1"/>
Policy > Critical	<input type="text" value="LOCALIZED SAFETY FOR AIRFIELDS (DEFAULT)"/>	<input type="button" value="Edit"/>	<input type="text" value="Default Cost by Work Type"/>	<input type="button" value="Edit"/>	Factor: <input type="text" value="1"/>
Policy Consequence	<input type="text" value="Localized Policy Consequence (Default)"/>	<input type="button" value="Edit"/>			

Edit Localized MR

[Localized Policy](#)
[Localized Work Type / Cost](#)
[Localized Work Consequence](#)

Edit Global MR

[Global Policy](#)

Edit Major MR

[Minimum Condition](#)
[Branch Use Priority](#)
[Section Rank Priority](#)
[Major MR priority](#)

Cost by Condition / Budget

[Cost by Condition](#)
[Budget](#)

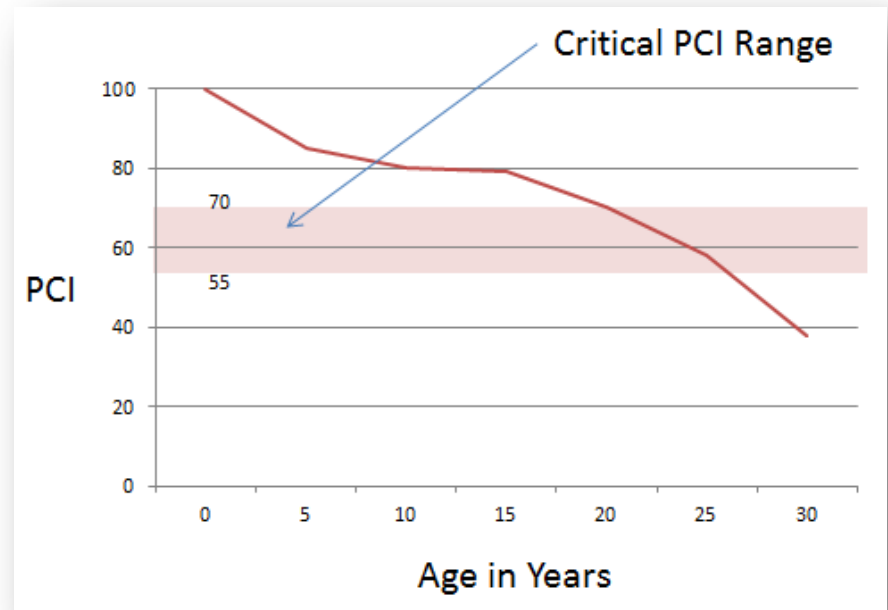
Instructor Demonstration 5a

Edit M&R Tables

- Purpose
 - To demonstrate how to customize your M&R plans.

Critical PCI Method

- Critical PCI
 - PCI value after which a pavement rapidly deteriorates
 - Usually between a PCI number of 70 and 55
- More economical to maintain pavements above rather than below the Critical PCI
 - The cost of applying localized preventive maintenance increases significantly



Instructor Demonstration 5b

Critical PCI

- Purpose
 - Create a 5 year M&R Plan with a \$500,000/Year budget and a 3% inflation rate
 - Determine the budget required to eliminate the backlog of maintenance over 5 years.
- Critical PCI Method
 - The PCI after which the pavement begins to rapidly deteriorate
 - Determine Budget Consequence or Determine Budget Requirements

Minimum Condition

- Minimum Condition
 - Only concerned with the Major M&R required to maintain a minimum PCI
 - Major M&R: Any overlay or other major work that results in a PCI of 100
 - Select the lowest pavement condition that is allowed for each pavement rank
 - Prioritize the Maintenance and Repair plan to reflect the choice of “Minimum Condition” as the variable for decision making in regard to future work

Instructor Demonstration 5c

Minimum Condition

- Purpose
 - Create a 5 year M&R plan to determine the budget required to maintain a minimum PCI condition.
- Minimum Condition
 - Set the lowest PCI condition allowed for per year

Consequence of Local Repair

- Consequence of Local Repair
 - Calculates the cost and resulting condition from the immediate implementation of local maintenance and repair.
 - M&R actions are based on current distresses and their severity.
 - Consider this plan mode for pavements above Critical PCI.

Instructor Demonstration 5d

Consequence of Local Repair

- Purpose
 - Calculate M&R using the “Consequence of Local Repair” plan mode
- Consequence of Local Repair
 - Cost and consequence of immediately applying local M&R
 - Plan is run for one year

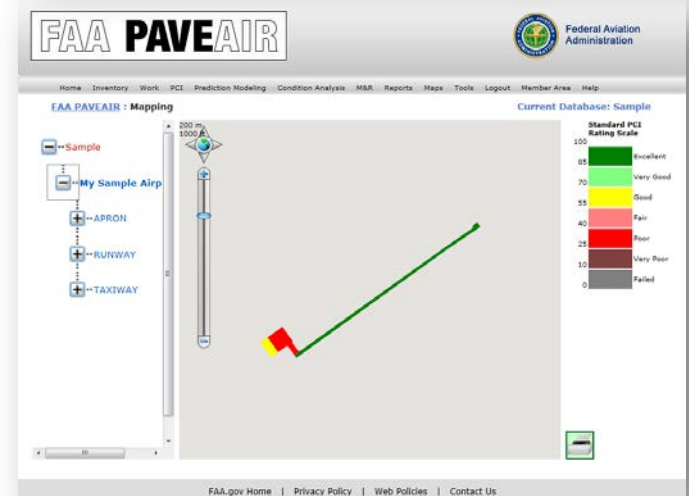
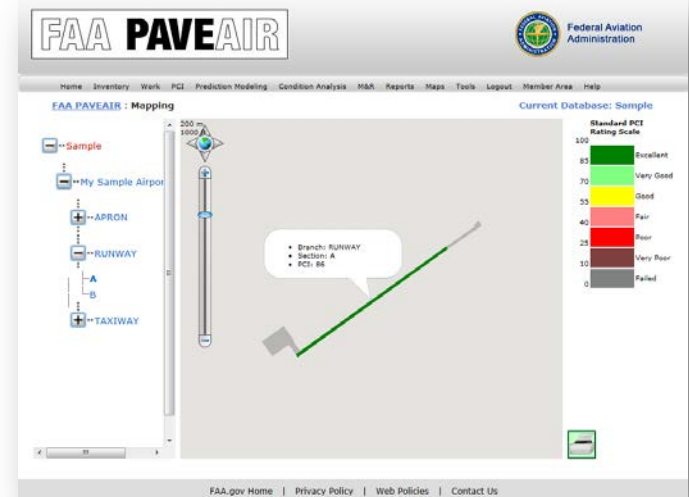
Unit 6

Additional Functions



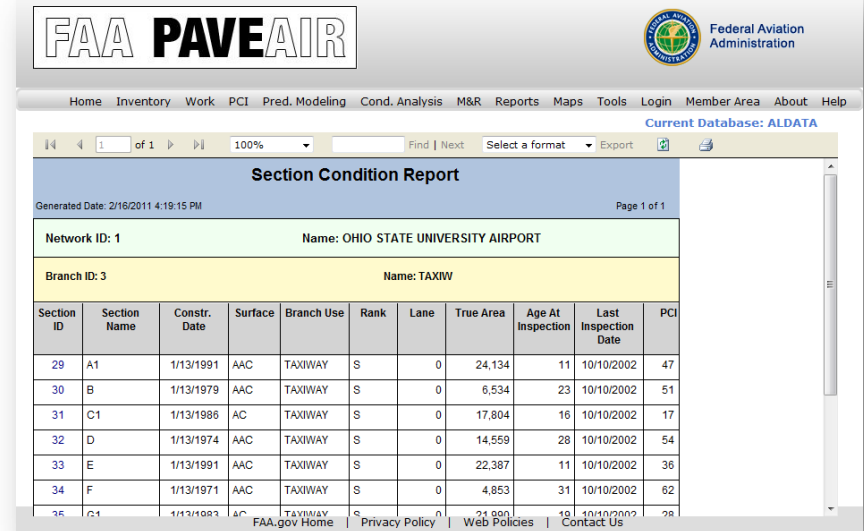
Mapping

- Add a shape file to the current database
 - Use the “Upload Shapefiles to Current DB” tool
- Import a shape file from MicroPAVER
 - Shapefiles are imported with MicroPAVER data
- Shape file assignment tool
 - Allows the assignment of pavement sections to shape file objects



Reporting

- Available Reports
 - Branch Listing Report
 - Work History Report
 - Branch Condition Report
 - Section Condition Report
 - Re-Inspection Report
- View, print, or export in Adobe PDF or Microsoft Excel format
- Condition Reports support additional mapping features



The screenshot displays the FAA PAVEAIR web application interface. The header includes the FAA PAVEAIR logo and the Federal Aviation Administration logo. The navigation menu contains links for Home, Inventory, Work, PCI, Pred. Modeling, Cond. Analysis, M&R, Reports, Maps, Tools, Login, Member Area, About, and Help. The current database is set to ALDATA. The report title is "Section Condition Report" and it was generated on 2/16/2011 at 4:19:15 PM. The report details for Network ID: 1 (OHIO STATE UNIVERSITY AIRPORT) and Branch ID: 3 (TAXIWAY) are shown. A table lists the section data with columns for Section ID, Section Name, Constr. Date, Surface, Branch Use, Rank, Lane, True Area, Age At Inspection, Last Inspection Date, and PCI.

Section ID	Section Name	Constr. Date	Surface	Branch Use	Rank	Lane	True Area	Age At Inspection	Last Inspection Date	PCI
29	A1	1/13/1991	AAC	TAXIWAY	S	0	24,134	11	10/10/2002	47
30	B	1/13/1979	AAC	TAXIWAY	S	0	6,534	23	10/10/2002	51
31	C1	1/13/1986	AC	TAXIWAY	S	0	17,804	16	10/10/2002	17
32	D	1/13/1974	AAC	TAXIWAY	S	0	14,559	28	10/10/2002	54
33	E	1/13/1991	AAC	TAXIWAY	S	0	22,387	11	10/10/2002	36
34	F	1/13/1971	AAC	TAXIWAY	S	0	4,853	31	10/10/2002	62
35	G1	1/13/1983	AC	TAXIWAY	S	0	21,900	19	10/10/2002	28

Student Lab 6a

Mapping and Reporting

- Purpose
 - To demonstrate the mapping abilities of FAA PAVEAIR
 - To familiarize the student with running the various reports

Life Cycle Cost Analysis

- Shares data with the AAPTTP AirCost LCCA application
- Economic Analysis
 - Evaluate the long-term economic efficiency between different pavement design strategies
- Procedures
 - Establish alternative pavement design strategies
 - Determine the performance period and activity timing
 - Estimate costs
 - Compute Net Present Value (NPV)
 - Analyze results
 - Re-evaluate pavement design strategies



Student Lab 6b

Life Cycle Cost Analysis

- Purpose
 - To demonstrate how to work with LCCA plans
 - Show how FAA PAVEAIR links with the AirCost application

Sharing Data

- Importing Data
 - MicroPAVER e60 or e65 files
 - Existing shapefiles will be imported
- Exporting Data
 - Tools: Database Export
 - Export to XML

The screenshot shows the 'FAA PAVEAIR' web interface. At the top, there's a header with the FAA logo and 'FAA PAVEAIR' text. Below the header, there are links for 'Exit Member Area' and 'Logout faa'. The main content area is titled 'FAA PAVEAIR : Member Area : Create Database'. On the right, it says 'Current database: Mansfield'. The form has several sections: 'Create Database' with a 'Database name:' field containing 'JFK'; 'Database Discription:' with a text area containing 'JFK Airport'; 'Database Options' with radio buttons for 'Public' (selected) and 'Private'; and 'Micro Paver data upload' with a 'Choose a micropaver .e60 file' section showing 'C:\JFK.E60' and a 'Browse...' button. At the bottom, there is a 'Create Database' button and a footer with links: 'FAA.gov Home | Privacy Policy | Web Policies | Contact Us'.

The screenshot shows the 'FAA PAVEAIR : Tools' web page. At the top, there's a header with the FAA logo and 'FAA PAVEAIR' text. Below the header, there are links for 'Exit Member Area' and 'Logout faa'. The main content area is titled 'FAA PAVEAIR : Tools'. On the right, it says 'Current Database: ALDATA'. The page has a navigation bar with 'Unit', 'Distress Deduct', and 'Database Export' (selected). The main content area is titled 'Export Current Database to XML' and contains a button labeled 'Export Current DB Data to XML'. At the bottom, there is a footer with links: 'FAA.gov Home | Privacy Policy | Web Policies | Contact Us'.

Questions and Answers

