

FAARFIELD 2.0

Presented to: REDAC Subcommittee on Airports

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Date: 26 August 2020

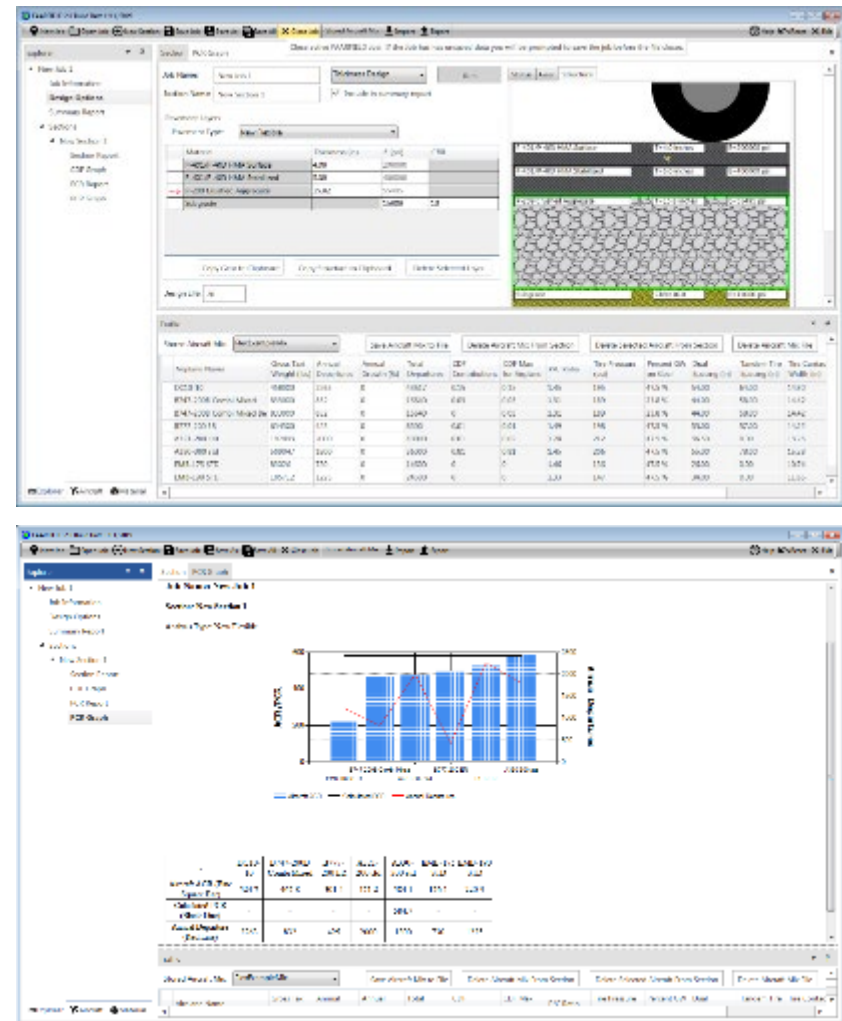


Federal Aviation
Administration

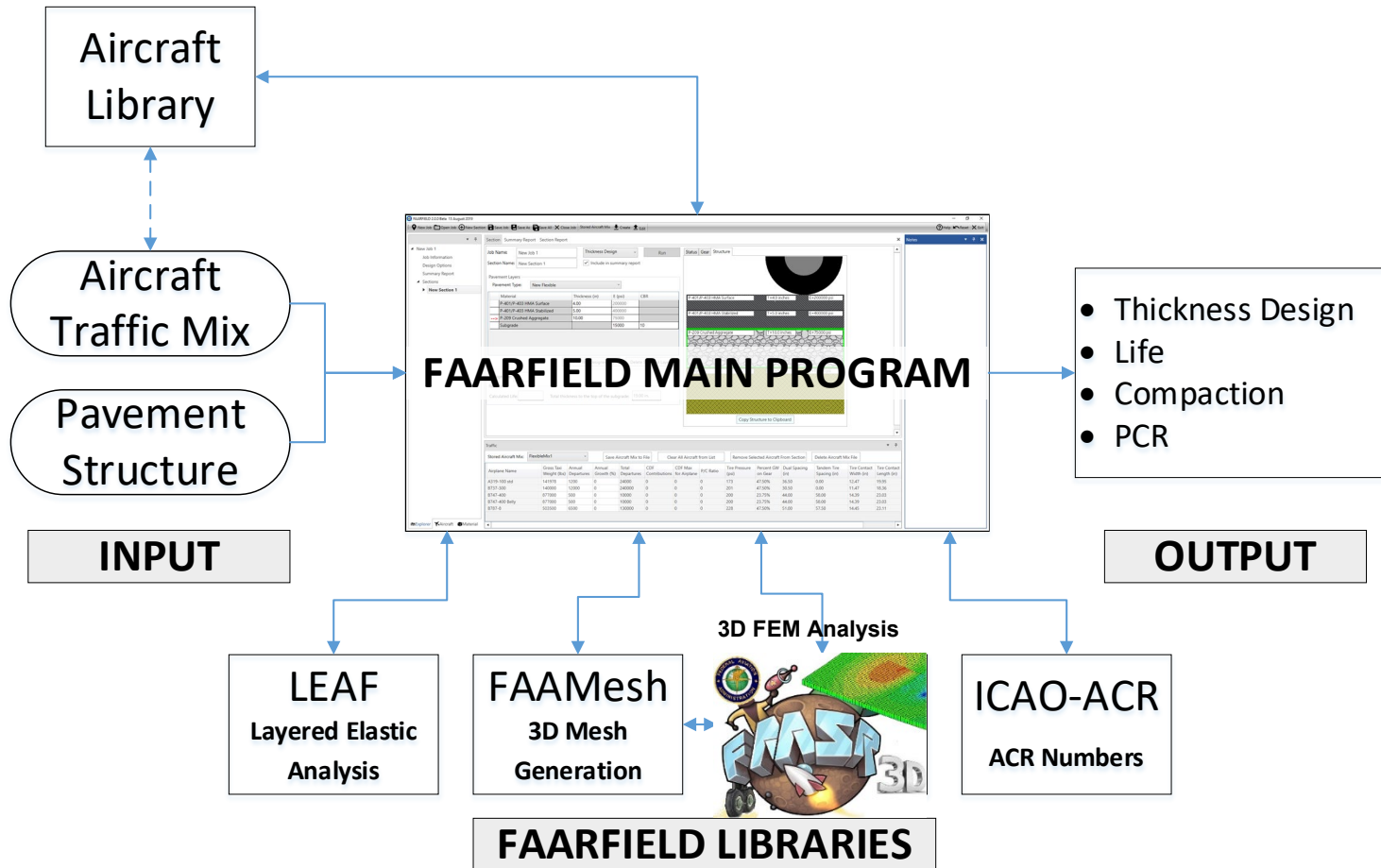


FAARFIELD 2.0 Beta

- **Full rewrite of AC 150/5320-6G.**
 - Industry review ended 8/1.
 - Comments under review.
 - Includes FAARFIELD 2.0.
- **Major update from version 1.4:**
 - Redesigned user interface with improved screen flow.
 - Updated 3DFEM models.
 - Support for ICAO ACR-PCR.
 - New vehicle editor.
 - Updated aircraft library.
- **No change to thickness design requirements at this time.**



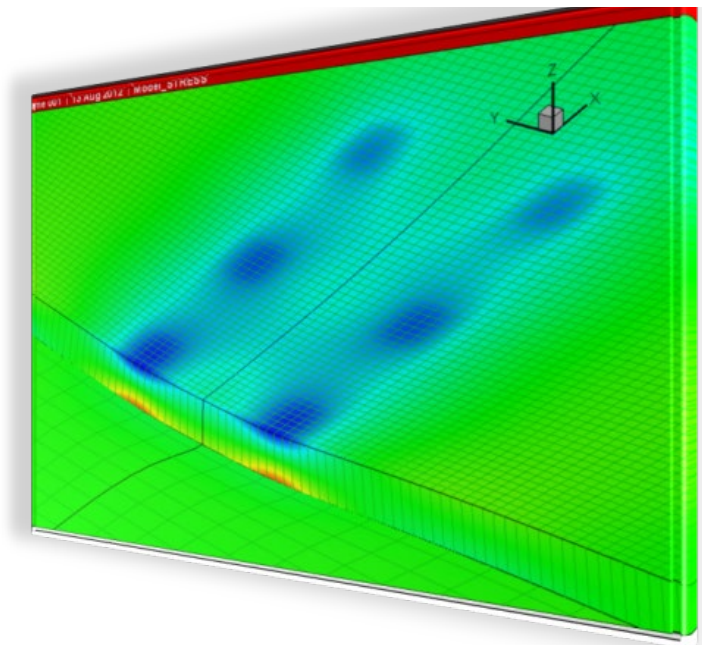
FAARFIELD 2.0 Organization



FAASR3D – FAA Structural Analysis in 3D



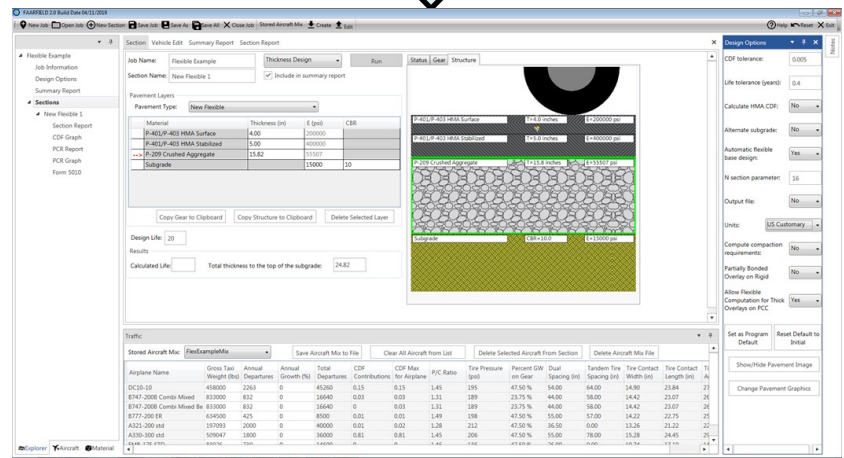
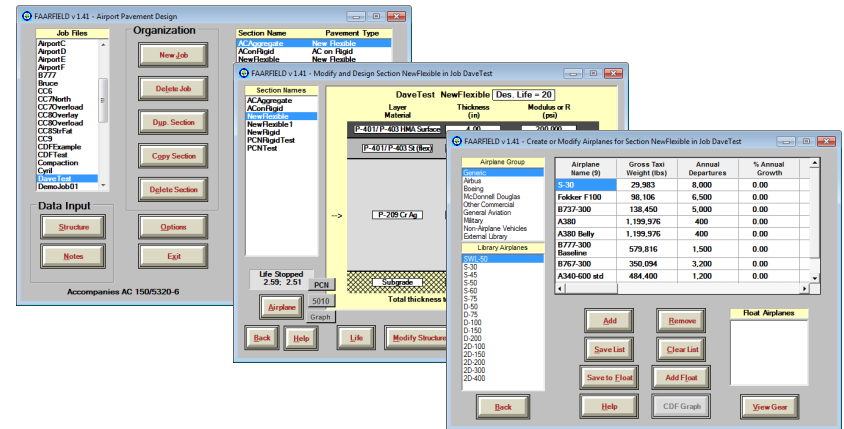
- **Visual Basic.NET library.**
- **Replaces obsolete NIKE3D Fortran program.**
 - Managed Code - compatible with Microsoft .NET memory management services.
 - Improves performance. Old code was subject to memory conflicts and crashing.
 - Freely distributable code.
- **Continued updates to improve speed & efficiency.**



GUI Modernization

Major improvements:

- Easier job and section entry.
- Explorer-based navigation.
- Improved screen re-sizing and appearance.
- Improved flow between screens.
- Ability to store traffic mixes.
- Rationalized data file structure.
- On-demand report generation.
- Remove program logic from GUI controls.
- Etc.



FAARFIELD 2.0 GUI Layout

EXPLORER

TOOLBAR

FUNCTION SELECTION

RUN

OPTIONS

HELP

PAVEMENT TYPE SELECTION

STRUCTURE TABLE

STRUCTURE IMAGE

MATERIAL LIBRARY TAB

TRAFFIC TABLE

AIRCRAFT LIBRARY TAB

FAARFIELD 2.0.0 Beta 22 January 2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit

Section

Job Name: New Job 1 Thickness Design Run Status Gear Structure

Section Name: New Section 1 Include in summary report

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	10.0	75000	
Subgrade		15000	10

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 19.00 in.

Copy Structure to Clipboard

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Traffic

Stored Aircraft Mix: FlexibleMix1 Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in)	Tandem Tire Spacing (in)	Tire Contact Width (in)	Tire Contact Length (in)
A319-100 std	141978	1200	0	24000	0	0	0	173	47.50%	36.5	0.0	12.5	19.9
B737-300	140000	12000	0	240000	0	0	0	201	47.50%	30.5	0.0	11.5	18.4
B747-400	877000	500	0	10000	0	0	0	200	23.75%	44.0	58.0	14.4	23.0
B747-400 Belly	877000	500	0	10000	0	0	0	200	23.75%	44.0	58.0	14.4	23.0
B787-8	503500	6500	0	130000	0	0	0	228	47.50%	51.0	57.5	14.4	23.1

Explorer Aircraft Material

Design Options Notes

Features of Modernized GUI

- **Multi-display interface.**
- **Highly configurable process flow.**
 - Consolidated data entry to single screen.
 - Open, resize, move, dock/undock, close screens independently.
 - Makes use of right-click context menus.
- **Resizable screens.**
- **Allows working with multiple jobs & sections.**
 - Switch between jobs/sections/pavement types with 1 click.
 - Cut and paste between jobs.
- **Standard Windows file management.**
 - Built-in Windows tools for saving/opening jobs.
 - Section and job names follow Windows standards.
- **Built-in standard pavement section library accessible from menu.**

Explorer Navigation

- **FAARFIELD 2.0** supports multiple jobs open at the same time.
- Use the Explorer to navigate between jobs, and display:
 - Sections
 - Section Reports
 - PCR Reports/Graphs
 - 5010 Reports
 - Summary Reports (All sections in a job)

The screenshot displays the FAARFIELD 2.0.0 Beta software interface. On the left, the Explorer panel shows a tree view with two jobs, 'Airport A' and 'Airport B', both highlighted with red boxes. Under 'Airport B', the 'Rigid Taxiway A' section is selected. The main area on the right shows the design details for 'Rigid Taxiway A'. It includes fields for 'Job Name' (Airport B), 'Section Name' (Rigid Taxiway A), and 'Pavement Type' (New Rigid). A table lists the pavement layers with their materials, thicknesses, and strengths. Below the table are buttons for 'Select As The Design Layer' and 'Delete Selected Layer'. The 'Design Life' is set to 20, and the 'Calculated Life' is shown as 25.00 in. At the bottom, there is a 'Traffic' section with a table of aircraft data.

Material	Thickness (in)	E (psi)	k (pci)	R (psi)
P-501 PCC Surface	14.0	4000000		650
P-401/P-403 HMA Stabilized	5.0	400000		
P-209 Crushed Aggregate	6.0	75000		
Subgrade		15000	172.4	

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C
DC10-10	458000	2263	0	45260	0	0	0
B747-200B Combi Mixed	833000	832	0	16640	0	0	0
B747-200B Combi Mixed Be	833000	832	0	16640	0	0	0
B777-200 ER	634500	425	0	8500	0	0	0

Four Functions in FAARFIELD 2.0

FAARFIELD 2.0.0 Beta 22 January 2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit

Section Section Report CDF Graph Form 5010

New Job 1

Job Information

Design Options

Summary Report

Sections

New Section 1

Section Report

CDF Graph

PCR Report

PCR Graph

Form 5010

Job Name: New Job 1

Section Name: New Section 1

Pavement Layers

Pavement Type: New Flexible

Material Thickness (in) E (psi) CBR

P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	18.3	65665	
Subgrade		15000	10

Select As The Design Layer Delete Sel

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 27.30 in.

Traffic

Stored Aircraft Mix: FlexExampleMix Save Aircraft Mix to File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CI
A320-100	150796	600	0	12000	0
A340-600 std	807333	1000	0	20000	0
A340-600 std Belly	807333	1000	0	20000	0
A380	1238998	300	0	6000	0
A380 Belly	1238998	300	0	6000	0
B737-800	174700	2000	0	40000	0
B777-300 ER	777000	1000	0	20000	0

Explorer Aircraft Material

- **THICKNESS DESIGN** – Compute required thickness per AC 150/5320-6.
- **LIFE** – Compute structural life for a given structure and traffic mix.
- **COMPACTION** – Compute subgrade compaction requirements per AC 150/5320-6 for a given structure and traffic mix. (Applies to completed designs.)
- **PCR** – Compute Pavement Classification Rating (PCR) for the structure and traffic mix.

FAARFIELD 2.0 Starting Screen

FAARFIELD 2.0.0 Beta 22 January 2020

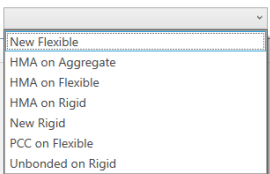
New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Help Reset Exit

Section

Job Name: New Job 1 Thickness Design Run Status Gear Structure

Section Name: New Section 1 ☒ Include in summary report

Pavement Layers

Pavement Type: 

Material E (psi)

To begin select a Pavement Type

Select a pavement type from drop-down list

Select As The Design Layer Delete Selected Layer

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 0.00 in.

Copy Structure to Clipboard

Traffic

Stored Aircraft Mix: Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in)	Tandem Tire Spacing (in)	Tire Contact Width (in)	Tire Contact Length (in)
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Explorer Aircraft Material

FAARFIELD 2.0 Design Example

FAARFIELD 2.0.0 Beta 22 January 2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Help Reset Exit

Section

Job Name: New Job 1 Thickness Design Run Status Gear Structure

Section Name: New Section 1 ☒ Include in summary report

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	10.0	75000	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life: 20

Results

Calculated Life: Total thickness to the top of the s

Traffic

Stored Aircraft Mix: Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in)	Tandem Tire Spacing (in)	Tire Contact Width (in)	Tire Contact Length (in)
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Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation of Thicknesses: Metric

Overlays on CCB: Yes

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Design Options Notes

In Options, select preferred unit system.

Pavement Structure

FAARFIELD 2.0.0 Beta 22 January 2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Help Reset Exit

Section

Job Name: New Job 1 Thickness Design Run Status Gear Structure

Section Name: New Section 1 ☒ Include in summary report

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	10.0	75000	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 19.00 in.

Copy Structure to Clipboard

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Design Options Notes

You can change the structure in the table, or by clicking directly on the image.

Aircraft Selection

Aircraft library has been completely reorganized and updated for the FAARFIELD 2.0 release!

FAARFIELD 2.0.0.g Beta 08/14/2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Batch Run Selection Select All DeSelect All Help Reset Exit

Aircraft Section Section Report PCR Report PCR Graph

Job Name: New Job 1 Thickness Design Run

Section Name: Add To Batch

Pavement Layer: New Flexible

Pavement Type: New Flexible

Material	Thickness (in.)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	10.0	52637	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 19.0 in.

Aircraft Group

Library Aircraft

Traffic

Stored Aircraft Mix: ExampleMix2 Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Tire Spacing (in.)	Tandem Tire Spacing (in.)	Tire Contact Width (in.)	Tire Length
A300-B4/C4 Std Bogie	365747	1200	0	24000	0	0	0	216	47.50%	36.5	55.0	12.6	20.7
A319-100 std	141978	1200	0	24000	0	0	0	173	47.50%	36.5	0.0	12.5	19.9
B727-200 Advanced Basic	185200	1200	0	24000	0	0	0	148	47.50%	34.0	0.0	15.4	24.6
B737-300	140000	1200	0	24000	0	0	0	201	47.50%	30.5	0.0	11.5	18.4
B747-400	877000	1200	0	24000	0	0	0	200	23.75%	44.0	58.0	14.4	23.0
B747-400 Belly	877000	1200	0	24000	0	0	0	200	23.75%	44.0	58.0	14.4	23.0
B767-200 ER	396000	1200	0	24000	0	0	0	190	47.50%	45.0	56.0	14.0	22.5
B777-200 ER	658000	1200	0	24000	0	0	0	205	47.50%	55.0	57.0	14.2	22.8

Y = 233 X = -129

Copy Gear to Clipboard

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Compute ACR for All Subgrade Categories: No

Show Advanced Options

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Traffic List

Aircraft Selection

Gear data displayed on screen
(mouse over wheel to display coordinates)

FAARFIELD 2.0.0.g Beta 08/14/2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Batch Run Selection Select All DeSelect All Help Reset Exit

Aircraft Section Section Report PCR Report PCR Graph

Job Name: New Job 1 Thickness Design Run

Section Name: New Section 1 Include in summary report Add To Batch

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in.)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	10.0	52637	
Subgrade		15000	10

Airplane: B777-200 ER

Y = -53

Wheel Coordinates
X = 188.5
Y = -57.0

X = 189

Copy Gear to Clipboard

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Compute ACR for All Subgrade Categories: No

Show Advanced Options

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Traffic

Stored Aircraft Mix: ExampleMix2 Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Tire Spacing (in.)	Tandem Tire Spacing (in.)	Tire Contact Width (in.)	Tire Contact Length (in.)
A300-B4/C4 Std Bogie	365747	1200	0	24000	0	0	0	216	47.50%	36.5	55.0	12.6	20.2
A319-100 std	141978	1200	0	24000	0	0	0	173	47.50%	36.5	0.0	12.5	19.9
B727-200 Advanced Basic	185200	1200	0	24000	0	0	0	148	47.50%	34.0	0.0	15.4	24.6
B737-300	140000	1200	0	24000	0	0	0	201	47.50%	30.5	0.0	11.5	18.4
B747-400	877000	1200	0	24000	0	0	0	200	23.75%	44.0	58.0	14.4	23.0
B747-400 Belly	877000	1200	0	24000	0	0	0	200	23.75%	44.0	58.0	14.4	23.0
B767-200 ER	396000	1200	0	24000	0	0	0	190	47.50%	45.0	56.0	14.0	22.5
B777-200 ER	658000	1200	0	24000	0	0	0	205	47.50%	55.0	57.0	14.2	22.8

FAARFIELD Aircraft Library

A300-B2

A300-B2K

A300-B4/C4 Std Bogie

A300-B4/C4 LGA Bogie

A300-600 Std Bogie

A300-600 LGA Bogie

A310-200

A310-300

A318-100 std

A318-100 opt

A319-100 std

A319-100 opt

A319neo

A320-200 std

A320-200 opt

A320-200 WW000 Bogie

A320neo

A321-100 std

Explorer Aircraft Material

Design Options Notes

Save aircraft mix to file
(replaces "float aircraft")

Run Thickness Design

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New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit

Material Section

General

User Defined

Subgrade

Aggregate

P-154 Uncrushed Aggregate

P-208 Crushed Aggregate

P-209 Crushed Aggregate

P-211 Lime Rock

P-219 Recycled Concrete Aggregate

P-401/P-403 HMA

P-401/P-403 HMA Surface

P-401/P-403 HMA Overlay

P-501 PCC

P-501 PCC Surface

P-501 PCC Overlay (unbonded)

P-501 PCC Overlay on Flexible

Stabilized

P-301 Soil Cement Base

P-304 Cement Treated Base

P-306 Lean Concrete

P-401/P-403 HMA Stabilized

Variable (flexible)

Variable (rigid)

Job Name: New Job 1 Thickness Design Run Status Gear Structure

Section Name: New Section 1 ☒ Include in summary report

Pavement Layers

Pavement Type:

Material	Thickness (in)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	10.0	75000	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 19.00 in.

Copy Structure to Clipboard

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Traffic

Stored Aircraft Mix: Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in)	Tandem Tire Spacing (in)	Tire Contact Width (in)	Tire Contact Length (in)
A320-100	150796	600	0	12000	0	0	0	200	47.50%	36.5	0.0	11.9	19.1
A340-600 std	807333	1000	0	20000	0	0	0	234	95.00%	55.0	78.0	25.6	40.9
A340-600 std Belly	807333	1000	0	20000	0	0	0	222	23.00%	46.3	77.9	12.9	20.6
A380	1238998	300	0	6000	0	0	0	218	19.00%	53.1	66.9	14.7	23.5
A380 Belly	1238998	300	0	6000	0	0	0	218	28.50%	0.0	0.0	14.7	23.5
B737-800	174700	2000	0	40000	0	0	0	204	47.50%	34.0	0.0	12.7	20.4
B777-300 ER	777000	1000	0	20000	0	0	0	221	47.50%	55.0	57.6	14.9	23.8

Explorer Aircraft Material

Design Options Notes

Design Complete

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New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Help Reset Exit

Material

General

User Defined

Subgrade

Aggregate

P-154 Uncrushed Aggregate

P-208 Crushed Aggregate

P-209 Crushed Aggregate

P-211 Lime Rock

P-219 Recycled Concrete Aggregate

P-401/P-403 HMA

P-401/P-403 HMA Surface

P-401/P-403 HMA Overlay

P-501 PCC

P-501 PCC Surface

P-501 PCC Overlay (unbonded)

P-501 PCC Overlay on Flexible

Stabilized

P-301 Soil Cement Base

P-304 Cement Treated Base

P-306 Lean Concrete

P-401/P-403 HMA Stabilized

Variable (flexible)

Variable (rigid)

Section

Job Name: New Job 1 Thickness Design Run

Section Name: New Section 1 Include in summary report

Pavement Layers

Pavement Type:

Material	Thickness (in)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	18.3	65665	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 27.30 in.

Status Gear Structure

Design Completed
Run Time: 4 seconds
Subgrade CDF = 1.00:

Run time status displays here.

Computed CDF and P/C ratio for each aircraft.

Traffic

Stored Aircraft Mix: Save Aircraft Mix File Clear All Aircraft From Section Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in)	Tandem Tire Spacing (in)	Tire Contact Width (in)	Tire Contact Length (in)
A320-100	150796	600	0	12000	0	0	1.27	200	47.50%	36.5	0.0	11.9	19.1
A340-600 std	807333	1000	0	20000	0.8	0.8	1.36	234	35.98%	55.0	78.0	15.7	25.2
A340-600 std Belly	807333	1000	0	20000	0	0	1.31	222	23.04%	46.3	77.9	12.9	20.7
A380	1238998	300	0	6000	0	0	1.36	218	19.00%	53.1	66.9	14.7	23.5
A380 Belly	1238998	300	0	6000	0	0	1.49	218	28.50%	0.0	0.0	14.7	23.5
B737-800	174700	2000	0	40000	0	0	1.29	204	47.50%	34.0	0.0	12.7	20.4
B777-300 ER	777000	1000	0	20000	0.19	0.19	1.39	221	47.50%	55.0	57.6	14.9	23.8

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Design Options Notes

Design Complete

FAARFIELD 2.0.0 Beta 22 January 2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Help Reset Exit

Material

General

User Defined

Subgrade

Aggregate

P-154 Uncrushed Aggregate

P-208 Crushed Aggregate

P-209 Crushed Aggregate

P-211 Lime Rock

P-219 Recycled Concrete Aggregate

P-401/P-403 HMA

P-401/P-403 HMA Surface

P-401/P-403 HMA Overlay

P-501 PCC

P-501 PCC Surface

P-501 PCC Overlay (unbonded)

P-501 PCC Overlay on Flexible

Stabilized

P-301 Soil Cement Base

P-304 Cement Treated Base

P-306 Lean Concrete

P-401/P-403 HMA Stabilized

Variable (flexible)

Variable (rigid)

Section

Job Name: New Job 1 Thickness Design Run

Section Name: New Section 1 ☒ Include in summary report

Pavement Layers

Pavement Type:

Material	Thickness (in)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
P-209 Crushed Aggregate	18.3	65665	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life: 20

Results

Calculated Life: Total thickness to the top of the subgrade: 27.30 in.

Status Gear Structure

Copy Structure to Clipboard

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Set as Program Default Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Traffic

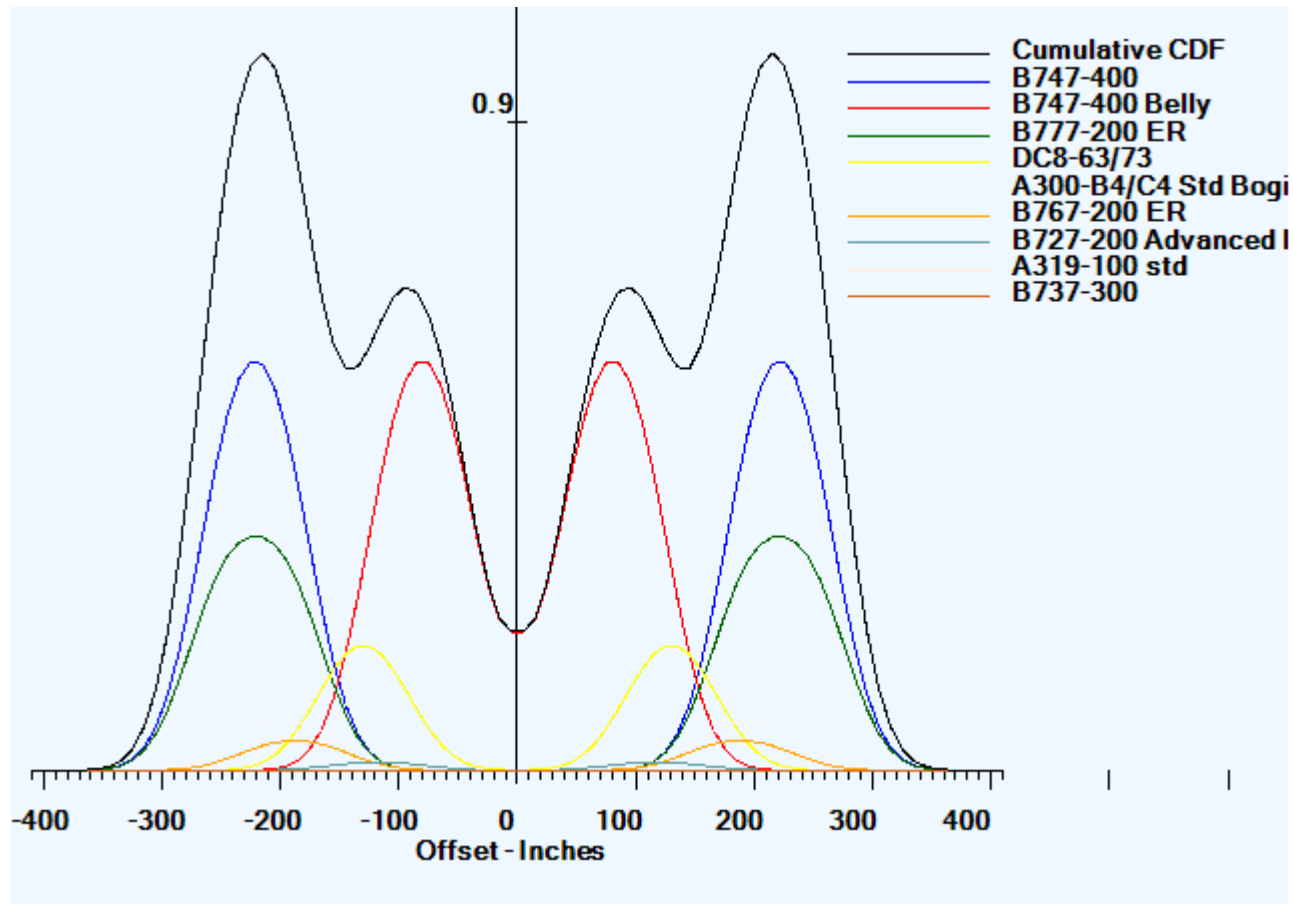
Stored Aircraft Mix: Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in)	Tandem Tire Spacing (in)	Tire Contact Width (in)	Tire Contact Length (in)
A320-100	150796	600	0	12000	0	0	1.27	200	47.50%	36.5	0.0	11.9	19.1
A340-600 std	807333	1000	0	20000	0.8	0.8	1.36	234	35.98%	55.0	78.0	15.7	25.2
A340-600 std Belly	807333	1000	0	20000	0	0	1.31	222	23.04%	46.3	77.9	12.9	20.7
A380	1238998	300	0	6000	0	0	1.36	218	19.00%	53.1	66.9	14.7	23.5
A380 Belly	1238998	300	0	6000	0	0	1.49	218	28.50%	0.0	0.0	14.7	23.5
B737-800	174700	2000	0	40000	0	0	1.29	204	47.50%	34.0	0.0	12.7	20.4
B777-300 ER	777000	1000	0	20000	0.19	0.19	1.39	221	47.50%	55.0	57.6	14.9	23.8

Explorer Aircraft Material

Design Options Notes

Cumulative Damage Factor (CDF)



User-Defined Aircraft Mode

Create, edit and save user-defined aircraft within the program.

FAARFIELD 2.0.0 Beta 22 January 2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit Help Reset Exit

Aircraft Section **Vehicle Edit**

FAARFIELD Aircraft Group

- Generic
- Airbus
- Boeing
- McDonnell Douglas
- Other Commercial
- General Aviation
- Military
- Non-Airplane Vehicles
- External Library

FAARFIELD Aircraft Library

- C-141A ICAO Flexible
- 2D-400 Ext1 (UDA)
- B737-900xt (UDA)
- B737-9ext (UDA)
- B767 ER Growth (UDA)
- Test3D (UDA)

User Defined Aircraft Info

Select Aircraft: B767 ER Growth (UDA)

Gross Taxi Weight (lbs): 413000

Percent Gross Weight On Whole Main Gear: 0.95

PCR Percent Gross Weight On Gear: 0.924

Tire Pressure (psi): 200

User Defined Gear

Design Options

Calculate HMA CDF: No

Automatic flexible base design: Yes

Output file: No

Units: US Customary

Allow Flexible Computation for Thick Overlays on PCC: Yes

Set as Program Default

Reset Default to Initial

Show/Hide Pavement Image

Change Pavement Graphics

Tires

X Coord. (in)	Y Coord. (in)
-224.3	28.0
-179.3	28.0
-224.3	-28.0
-179.3	-28.0

Evaluation Points

X Coord. (in)	Y Coord. (in)
-201.8	0.0
-201.8	-8.8
-201.8	-17.5
-197.3	-19.6
-192.8	-21.7
-188.3	-23.8

Delete Tire

Delete Eval. Point

Update Gear Image

Update User Defined Aircraft

Traffic

Stored Aircraft Mix: [Dropdown] Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in)	Tandem Tire Spacing (in)	Tire Contact Width (in)	Tire Contact Length (in)
A320-100	150796	600	0	12000	0	0	0	200	47.50%	36.5	0.0	11.9	19.1
A340-600 std	807333	1000	0	20000	0	0	0	234	35.98%	55.0	78.0	15.7	25.2
A340-600 std Belly	807333	1000	0	20000	0	0	0	222	23.04%	46.3	77.9	12.9	20.7
A380	1238998	300	0	6000	0	0	0	218	19.00%	53.1	66.9	14.7	23.5
A380 Belly	1238998	300	0	6000	0	0	0	218	28.50%	0.0	0.0	14.7	23.5
B737-800	174700	2000	0	40000	0	0	0	204	47.50%	34.0	0.0	12.7	20.4

Design Options Notes



User-Defined Aircraft

- **FAARFIELD treats UDA just like other library aircraft, except they have (UDA) appended to the aircraft name.**
- **UDA data are stored in files in:**
C:\Users\[user]\Documents\My FAARFIELD\User Defined Aircraft
- **UDA data are also saved to the job file – useful if a job is sent to another user.**

ICAO ACR/PCR

- **ICAO Aerodromes Pavement Expert Group (APEG).**
 - Task Force Participants included the major aircraft manufacturers, ACI World, ICAO APEG
 - Started in 2011
 - Designated ACR-PCR (Aircraft Classification Rating – Pavement Classification Rating) System
- **Same concepts as current ACN-PCN method, but:**
 - Fully layered elastic-based.
 - Uses uniform standard subgrade categories for flexible and rigid.
 - NO alpha factor, layer equivalency factors, top-of-base k, etc.
- **FAA developed program ICAO-ACR.**
 - Visual Basic class library computes rigid & flexible ACRs.
 - Replacement for legacy ICAO ACN computer programs.
 - Open source library – supports linking to any PCN program.

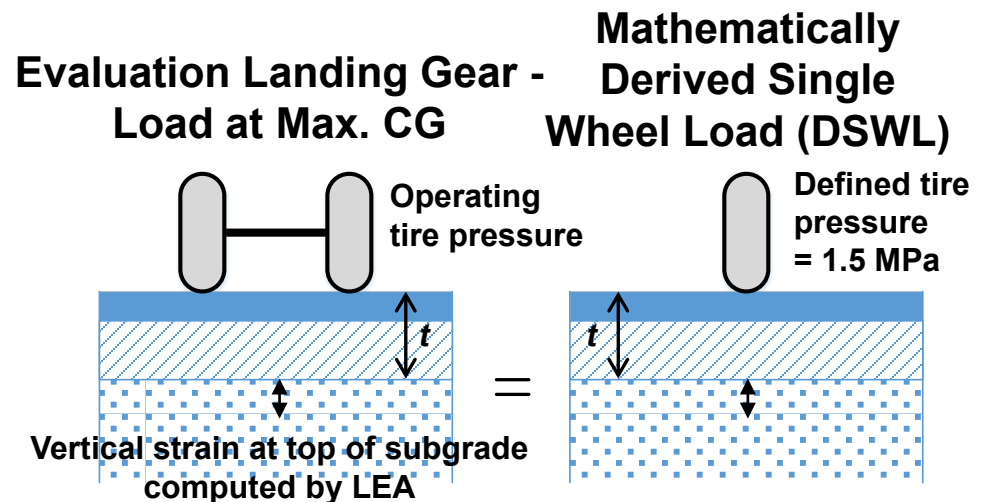
ACR/PCR Current Status

- **ICAO Air Navigation Committee (ANC) has recommend approval of the proposed amendment to Annex 14 on ACR-PCR.**
- **Proposal establishes four-year transition period from ACN-PCN to ACR-PCR:**
 - Effective date July 2020.
 - Full applicability November 2024(5?).
 - During transition, both systems will remain available.
- **FAA will update AC 150/5335-5.**
 - FAARFIELD 2.0 will calculate PCR.
 - COMFAA will no longer be updated.

ACR Methodology – Principles

Similar to ACN, except:

- All structures are layered elastic (rigid and flexible).
- Retains 4 standard subgrade categories, but defined by modulus (E) not CBR or k .
- Flexible ACR considers all wheels in the main landing gear.
- Standard tire pressure 1.5 MPa.
- Standard coverages increased to 36,500 for flexible ACR.
- DSWL expressed in 100's (not 1000's) of kg. ACR numerical values are approximately 10X higher than equivalent ACN.



The ACR numerical value is defined as two times the DSWL (expressed in hundreds of kilograms)

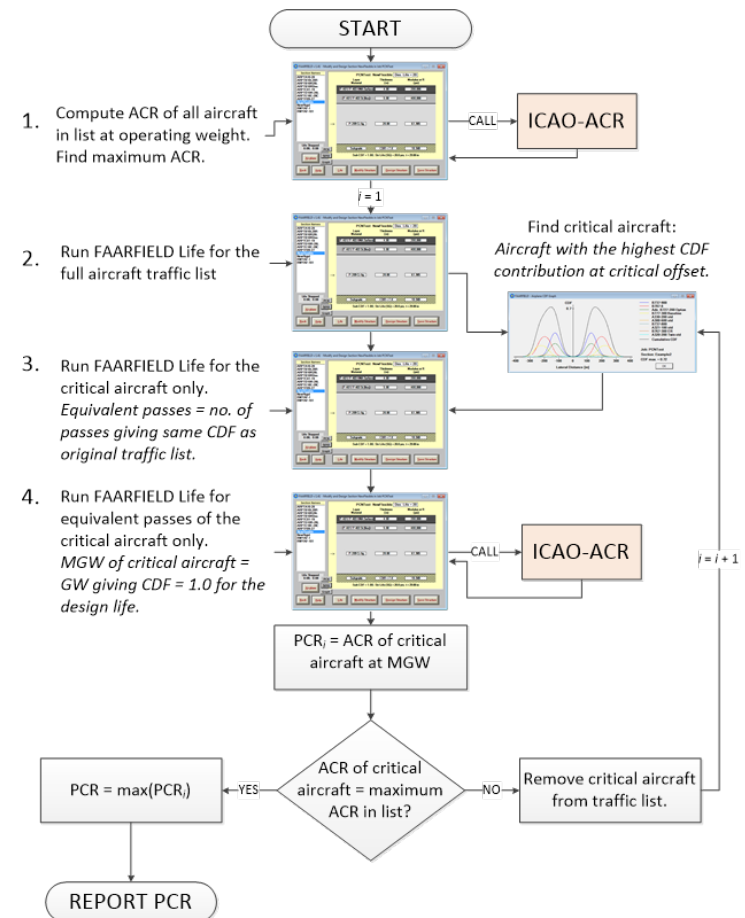
ACR-PCR Subgrade Categories

Category	A	B	C	D
Strength	High	Medium	Low	Ultra-Low
<i>E</i> Value, MPa	200	120	80	50
Range, MPa	$E \geq 150$	$150 > E \geq 100$	$100 > E \geq 60$	$60 > E$

- **Categories are defined by *E*, not CBR or *k*.**
- **Same categories for rigid and flexible pavements.**
- **All values defined at top of subgrade.**

FAARFIELD 2.0 Can Provide PCR

- **Directly uses FAARFIELD structure and traffic list.**
- **Replacement for COMFAA 3.0 & support spreadsheets.**
- **Method yields uniquely defined PCR – no more looping through all aircraft in the list.**
- **Implemented in FAARFIELD 2.0**
 - Solves problem of computing PCR for mixed traffic (narrow bodies and LR aircraft) without unnecessary operating weight restrictions.
 - Seamlessly handles HMA overlays on flexible pavements.



FAARFIELD 2.0 PCR Example

FAARFIELD 2.0.0.e RC 06/19/2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit

Explorer

- ACC Workshop
 - Job Information
 - Design Options
 - Summary Report
 - Sections
 - New Flexible
 - Section Report**
 - CDF Graph
 - PCR Report
 - PCR Graph
 - Form 5010

Job Information Section Summary Report Section Report

Job Name: ACC Workshop PCR Run Status Gear Structure

Section Name: New Flexible ☒ Include in summary report Run Bar

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in.)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	8.0	400000	
--> P-209 Crushed Aggregate	8.5	75000	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life: 20 P/TC Ratio: 1

Results

Calculated Life: Total thickness to the top of the subgrade: 20.5 in.

For analysis type select 'PCR', then select 'Run'

Subgrade CBR=10.0 E=15000 psi

Copy Structure to Clipboard

Traffic

Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft from Section Delete Aircraft Mix File

Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in.)	Tandem Tire Spacing (in.)	Tire Contact Width (in.)	Tire Contact Length (in.)	Tire Contact Area (in ²)	ACR Thick(in.) (B)	ACR
1000	0	60000	0	0	0	204	93.56%	34.0	0.0	13.4	21.5	226.4	0.0	0
1500	0	50000	0	0	0	212	94.60%	36.5	0.0	13.4	21.4	225.0	0.0	0
1500	0	90000	0	0	0	147	95.00%	34.0	0.0	11.5	18.4	166.4	0.0	0
1500	0	70000	0	0	0	142	95.00%	0.0	0.0	9.9	15.8	122.1	0.0	0

Design Options Notes

FAARFIELD 2.0 PCR Example

FAARFIELD 2.0.0.e RC 06/19/2020

New Job Open Job New Section Save Job Save As Save All Close Job Stored Aircraft Mix Create Edit

Explorer

- ACC Workshop
 - Job Information
 - Design Options
 - Summary Report
 - Sections
 - New Flexible
 - Section Report**
 - CDF Graph
 - PCR Report
 - PCR Graph
 - Form 5010

Job Information Section Summary Report Section Report

Job Name: ACC Workshop PCR Run

Section Name: New Flexible ☒ Include in summary report ☐ Run Batch

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in.)	E (psi)	CBR
P-401/P-403 HMA Surface	4.0	200000	
P-401/P-403 HMA Stabilized	8.0	400000	
P-209 Crushed Aggregate	8.5	75000	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Status Gear Structure

PCR Calculation Completed
Run Time: 6 seconds

PCR displays here:
PCR 504/F/B/X/T

PCR reports, graph and Form 5010

Traffic


Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft From Section Delete Aircraft Mix File

Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Dual Spacing (in.)	Tandem Tire Spacing (in.)	Tire Contact Width (in.)	Tire Contact Length (in.)	Tire Contact Area (in^2)	ACR Thick(in.) (B)	ACR//F/B
00	0	60000	0.02	0.03	1.4	204	93.56%	34.0	0.0	13.4	21.5	226.1	21.1	410
00	0	50000	0.9	0.9	1.39	212	94.60%	36.5	0.0	13.4	21.4	225.0	22.8	500.4
00	0	90000	0	0	1.44	147	95.00%	34.0	0.0	11.5	18.4	166.4	16.3	227.7
00	0	70000	0	0	1.58	142	95.00%	0.0	0.0	9.9	15.8	122.1	13.5	155.9

Design Options Notes

FAARFIELD 2.0 Download

<http://www.airporttech.tc.faa.gov/Products/Airport-Pavement-Software-Programs>

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FAA NATPF / Monday, June 22, 2020 / Categories: AirportPavementSoftware

FAARFIELD 2.0.0.e RC

FAARFIELD 2.0.0.e RC is the evaluation version of the FAARFIELD 2.0 airport pavement thickness design software accompanying DRAFT AC 150/5320-6G, Airport Pavement Design and Evaluation.



FAARFIELD 2.0.0.e RC (Release Candidate) is the evaluation version of the airport pavement thickness design software accompanying DRAFT AC 150/5320-6G, Airport Pavement Design and Evaluation. FAARFIELD 2.0 features:

- A completely redesigned graphical user interface (GUI) with improved screen flow and explorer-based navigation.
- A new 3D finite element computational library, FAASR3D (FAA Structural Response – 3D), written in Visual Basic.NET™.
- Support for the new ICAO ACR-PCR system (planned to replace ACN-PCN).
- New graphical vehicle editor provides the ability to add, save and edit user-defined vehicles.
- Updated aircraft library.
- Ability to work with multiple jobs/sections at once.

Notes:

- FAARFIELD stands for FAA Rigid and Flexible Iterative Elastic Layered Design. FAARFIELD 2.0 incorporates full 3D finite element responses to aircraft loads (for new rigid pavements and rigid overlays). The 3D finite element models used for rigid pavement designs are computationally intensive and may result in long run times, depending on the computer characteristics. We would appreciate your comments concerning this program and your suggestions on how it could be improved.
- FAARFIELD 2.0 runs on Windows™ operating systems. Windows 7 or higher is recommended. Please follow installation instructions in the readme file.
- Point of contact: For questions, comments or further information concerning this program, please contact Dr. David R. Brill, FAA Airport Technology R&D Branch, ANG-E262.

FAARFIELD 2.0.0.e RC is an evaluation version and is not currently an FAA design standard. To download the current standard software FAARFIELD 1.42, use the following link: [FAARFIELD 1.42](#)

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