

FAARFIELD 2.1 Hands-On Training

Introduction to FAARFIELD 2.1

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International Airfield & Highway Pavements Conference

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Date: June 28, 2026



**Federal Aviation
Administration**



FAARFIELD 2.0.19h (Build 03/01/2023)

New Job Open Job New Section Save Job Save As Save All Close Job User Defined Aircraft Create Edit Batch Run Selection Select All Deselect All Rpt/FAAR Access

File Edit View Help

User Information Current User: FAA Logout

Software Information Installed Version: 2.0.19h Available Version: 2.0.18

Aircraft Library Information Installed Version: 1.0.5 Available Version: 1.0.1 Download Aircraft Library

Notes User Information

Section: FAAR Access

Section

Job Name: Demo Example 2 Thickness Design Run Status Gear Structure

Section Name: Rigid Option Include in Summary Report Add To Batch

Pavement Layers

Pavement Type: New Rigid

Material	Thickness (in.)	E (psi)	k (pci)	R (psi)
P-501 PCC Surface	16.6	4,000,000		650
P-401/P-403 HMA Stabilized	5.0	400,000		
P-209 Crushed Aggregate	6.0	15,753		
Subgrade		4,500	67.5	

Select As The Design Layer Delete Selected Layer

Design Life (Years): 20

The standard design life for pavement section is 20 years (1 to 50 allowed).

Results

Calculated Life (Years): Total thickness to the top of the subgrade (in.): 27.6

Traffic

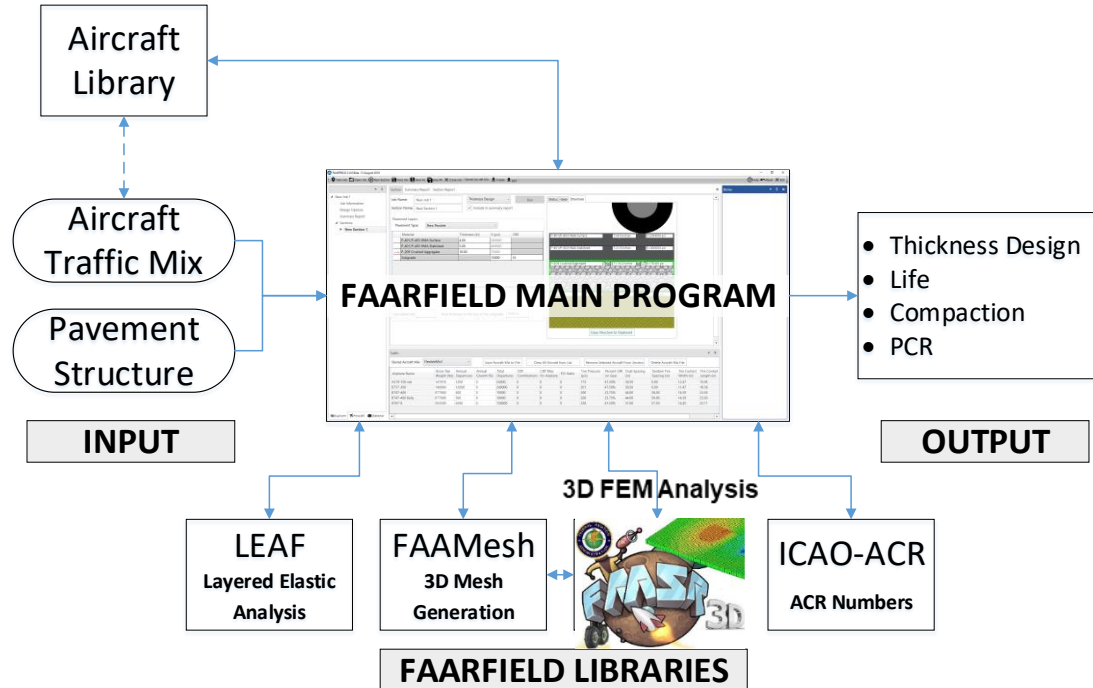
Stored Aircraft Mix Save Aircraft Mix to File Clear All Aircraft from List Remove Selected Aircraft from Section Delete Aircraft Mix File

Airplane Name	Gross Taxi Weight (lb)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (psi)	Percent GW on Gear	Tire Contact Width (in.)	Tire Contact Length (in.)	Tire Contact Area (in. ²)
B737-900	174,700	3,000	0	60,000	0.03	0.05	3.53	204	0.95	12.7	20.4	263.4
A321-200 opt	207,025	2,500	0	50,000	0.97	0.97	3.42	218	0.95	13.4	21.5	226.0
EMB-195 STD	107,916	4,500	0	90,000	0	0	3.9	154	0.95	11.5	18.4	166.4
CRJ700	73,000	3,500	0	70,000	0	0	4.21	142	0.95	9.9	15.8	122.1

Copy Structure to Clipboard

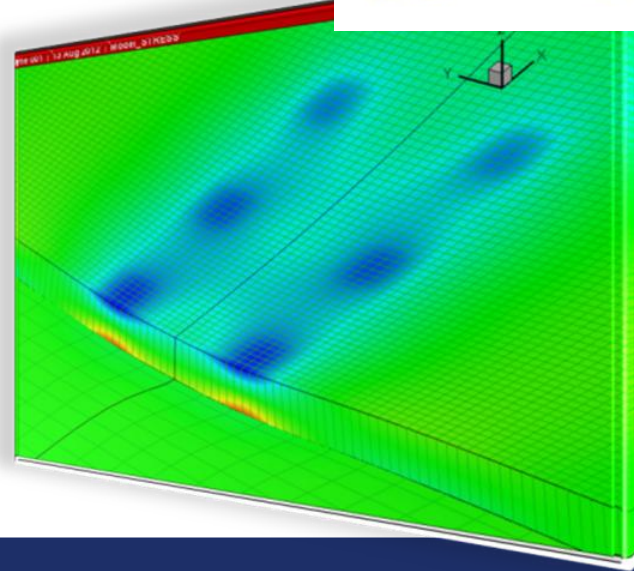
Navigating FAARFIELD 2.1 Software

FAARFIELD 2.1 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.



Navigating FAARFIELD 2.1

TOOLBAR

The screenshot shows the FAARFIELD 2.1 software interface. The top toolbar includes buttons for New Job, Open Job, New Section, Save Job, Save As, Close Job, Stored Aircraft Mix, Create, Edit, Batch Run Selection, Select All, DeSelect All, Help, Reset, and Exit.

Explorer (Green Highlight): A sidebar on the left containing a tree view for navigation. It includes sections for Airport A, Airport B, and PCC Overlay Example, each with sub-items like Job Information, Design Options, Summary Report, Section Report, CDF Graph, PCR Report, PCR Graph, and Form 5010.

Section Area (Red Highlight): The central workspace for defining a pavement section. It includes fields for Job Name (Airport A), Section Name (Section 01), and Thickness Design. A table lists the Pavement Layers:

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

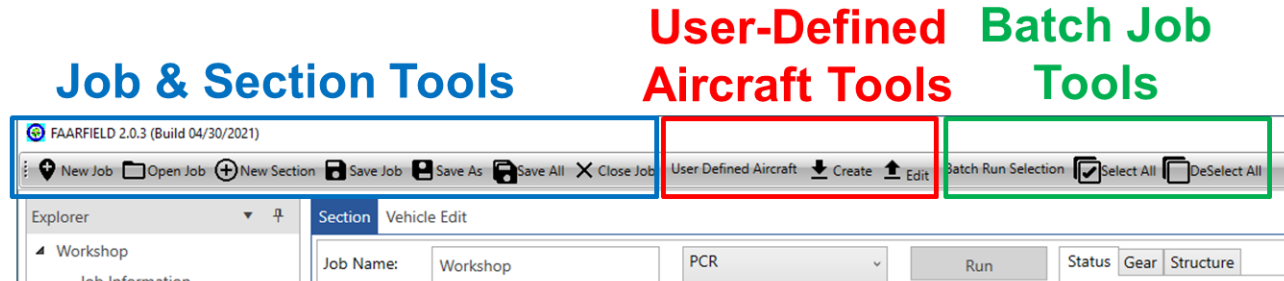
Below the table are buttons for 'Select As The Design Layer' and 'Delete Selected Layer'. A 'Results' section shows 'Calculated Life (Years):' and 'Total thickness to the top of the subgrade: 20.0 in.'. A 'Traffic' table is also present at the bottom of this area.

Options (Purple Highlight): A panel on the right for design options. It includes settings for 'Calculate HMA CDF' (No), 'Automatic flexible base design' (Yes), 'Output file' (No), 'Units' (US Customary), 'Allow Flexible Computation for Thick Overlays on PCC' (Yes), and 'Compute ACR for All Subgrade Categories' (No). It also has buttons for 'Show Advanced Options', 'Design Program Default', 'Design Program Initial', 'Show/Hide Pavement Image', and 'Change Pavement Graphics'.

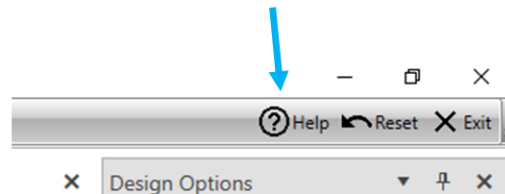
Traffic Area (Blue Highlight): A table at the bottom of the Section Area showing aircraft mix data.

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Gross Weight	Annual Total Weight	CDF	CDF Max	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.)
B737-900	174700	3000	0	0	0	0	0	75	34.0	0.0	0.0	12.7	20.4
A321-200 opt	207014	2500	0	0	0	0	0	216	36.5	0.0	0.0	13.6	21.7
EMB-195 STD	107916	4500	0	0	0	0	0	147	0.475	34.0	0.0	11.8	18.8
CRJ700	72500	3500	0	0	0	0	0	142	0.95	0.0	0.0	9.9	15.8

FAARFIELD 2.1 – Toolbar

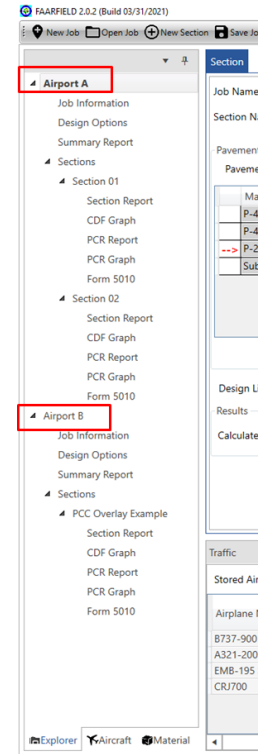


Help File



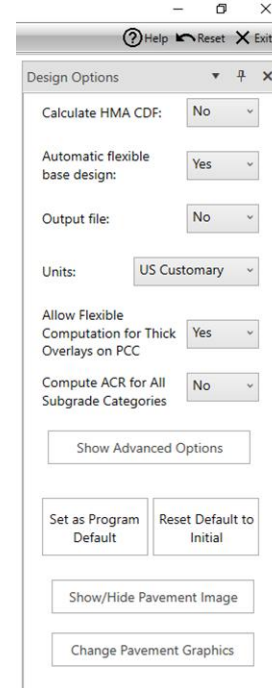
FAARFIELD 2.1 – Explorer Navigation

- FAARFIELD 2.1 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 (high-level run information on selected sections in a job)



FAARFIELD 2.1 – Options

- Toggle between U.S. and metric units.
- Set user preferences for graphic display.
- One click restores default options.



FAARFIELD 2.1 – Pavement Section Area

FAARFIELD 2.0.2 (Build 03/31/2021)

File Edit View Window Help

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

Section

Job Name: Airport A Thickness Design Run

Section Name: Section 01 ☒ Include in preliminary report Add To Batch

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in.)	E (psi)	CBR
P-401/P-403 HMA Surface	5.0	200000	
P-401/P-403 HMA Stabilized	5.0	400000	
--> P-209 Crushed Aggregate	12.7	50889	
Subgrade		15000	10

Select As The Design Layer Delete Selected Layer

Design Life (Years): 20

Results

Calculated Life (Years): Total thickness to the top of the subgrade: 22.7 in.

Traffic

Status Gear Structure

P-401/P-403 HMA Surface T=5.0 inches E=200000 psi

P-401/P-403 HMA Stabilized T=5.0 inches E=400000 psi

P-209 Crushed Aggregate T=12.7 inches E=50889 psi

Subgrade CBR=10 E=15000 psi

Copy Structure to Clipboard

Job and Section Controls

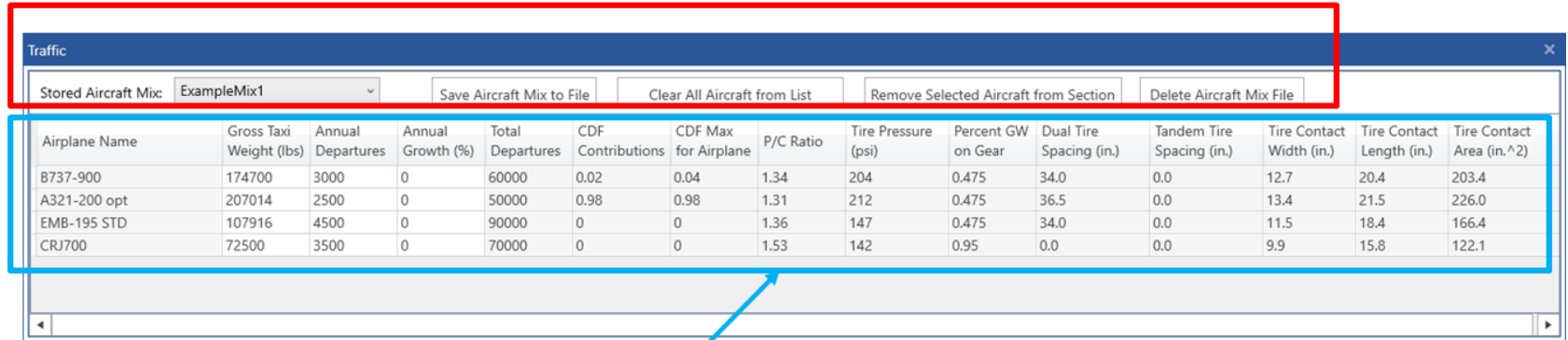
Pavement Layer Table

Pavement Section Clickable Image

Results Area

FAARFIELD 2.1 – Traffic Table (dockable)

Aircraft Selection Tools



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.)	Tire Contact Area (in.^2)
B737-900	174700	3000	0	60000	0.02	0.04	1.34	204	0.475	34.0	0.0	12.7	20.4	203.4
A321-200 opt	207014	2500	0	50000	0.98	0.98	1.31	212	0.475	36.5	0.0	13.4	21.5	226.0
EMB-195 STD	107916	4500	0	90000	0	0	1.36	147	0.475	34.0	0.0	11.5	18.4	166.4
CRJ700	72500	3500	0	70000	0	0	1.53	142	0.95	0.0	0.0	9.9	15.8	122.1

Selected Aircraft Data

Aircraft Selection

Aircraft library has been completely reorganized and updated for FAARFIELD 2.1!

Aircraft Group

Library Aircraft

Traffic List

Aircraft Name	Gross Taxi Weight (kg)	Annual Departures	Annual Growth (%)	Total Departures	CDF Contributions	CDF Max for Airplane	P/C Ratio	Tire Pressure (kPa)	Percent GW on Gear	Dual Tire Spacing (mm)	Tandem Tire Spacing (mm)	Tire Contact Width (mm)
A300-B4/C4 Std Bogie	165900	600	0	12000	0	0	0	1490	47.50%	927	1397	321
A319-100 std	64400	1000	0	20000	0	0	0	1193	47.50%	927	0	316
B727-200 Advanced Basic	84000	1000	0	20000	0	0	0	1020	47.50%	964	0	391
B737-300	63503	1200	0	24000	0	0	0	1386	47.50%	775	0	291
B747-400	397801	300	0	6000	0	0	0	1379	23.75%	1118	1473	366
B747-400 Belly	397801	300	0	6000	0	0	0	1379	23.75%	1118	1473	366
B767-200 ER	179623	2000	0	40000	0	0	0	1310	47.50%	1143	1422	351
B777-200 ER	298460	1000	0	20000	0	0	0	1413	47.50%	1397	1448	578

FAARFIELD 2.1 – Aircraft Library

Aircraft	Aircraft	Aircraft	Aircraft	Aircraft	Aircraft	Aircraft	Aircraft
FAARFIELD Aircraft Group	FAARFIELD Aircraft Group	FAARFIELD Aircraft Group	FAARFIELD Aircraft Group	FAARFIELD Aircraft Group	FAARFIELD Aircraft Group	FAARFIELD Aircraft Group	FAARFIELD Aircraft Group
Generic	Generic	Generic	Generic	Generic	Generic	Generic	Generic
Airbus	Airbus	Airbus	Airbus	Airbus	Airbus	Airbus	Airbus
Boeing	Boeing	Boeing	Boeing	Boeing	Boeing	Boeing	Boeing
McDonnell Douglas	McDonnell Douglas	McDonnell Douglas	McDonnell Douglas	McDonnell Douglas	McDonnell Douglas	McDonnell Douglas	McDonnell Douglas
Other Large Jet	Other Large Jet	Other Large Jet	Other Large Jet	Other Large Jet	Other Large Jet	Other Large Jet	Other Large Jet
Regional/Commuter	Regional/Commuter	Regional/Commuter	Regional/Commuter	Regional/Commuter	Regional/Commuter	Regional/Commuter	Regional/Commuter
General Aviation	General Aviation	General Aviation	General Aviation	General Aviation	General Aviation	General Aviation	General Aviation
Military	Military	Military	Military	Military	Military	Military	Military
Non-Airplane Vehicles	Non-Airplane Vehicles	Non-Airplane Vehicles	Non-Airplane Vehicles	Non-Airplane Vehicles	Non-Airplane Vehicles	Non-Airplane Vehicles	Non-Airplane Vehicles
External Library	External Library	External Library	External Library	External Library	External Library	External Library	External Library
FAARFIELD Aircraft Library	FAARFIELD Aircraft Library	FAARFIELD Aircraft Library	FAARFIELD Aircraft Library	FAARFIELD Aircraft Library	FAARFIELD Aircraft Library	FAARFIELD Aircraft Library	FAARFIELD Aircraft Library
SWL-2	A300-B2	B707-320C	DC3	An-124	BAe 146-300/300QC/300QT	Beechcraft Baron 55	A400M LH
SWL-5	A300-B2K	B717-200 HGW	DC8-63/73	An-225	Beechlet-400/400A	Beechcraft Bonanza F33A	A400M LN1
SWL-10	A300-B4/C4 Std Bogie	B727-100C Alternate	DC9-32	Bombardier CS100	Bombardier CL-604/605	Beechcraft King Air 300	A400M TLL1
SWL-50	A300-B4/C4 LGA Bogie	B727-200 Advanced Basic	DC9-51	COMAC C919	Cessna Citation II/Bravo C550	Beechcraft King Air 350	A400M TLL2
S-3	A300-600 Std Bogie	B727-200 Advanced Option	DC/MD-10-10/10F	COMAC C919 ER	Cessna Citation V	Beechcraft King Air B100	B-52
S-5	A300-600 LGA Bogie	B737-100	DC/MD-10-30/30F/40	Fokker-F-100	Cessna Citation VI/VII	Beechcraft King Air B200	C-5
S-10	A310-200	B737-200 Advanced QC	MD-11	Fokker-F-28-1000/2000	Cessna Citation X	Beechcraft King Air C90	C-17A
S-12.5	A310-300	B737-200	MD-83	F-28-3000/4000/6000	CRJ100/200	Cessna 172 Skyhawk	C-123
S-15	A318-100 std	B737-300	MD-90-30 ER	IL-62	CRJ100ER/200ER	Cessna 182 Skylane	C-130
S-20	A318-100 opt	B737-400		IL-76T	CRJ100LR/200LR	Cessna 206 Stationair	C-130-57
S-25	A319-100 std	B737-500		IL-86	CRJ700	Cessna 208B Grand Caravan	C-130-70
S-30	A319-100 opt	B737-600		L-100-20	CRJ900	Cessna 414/414A Chancellor	F-15C
S-30 HTP	A319neo	B737-700		L-1011	CRJ1000	Cessna C210 Centurion	F-16C
S-35 HTP	A320-200 std	B737-800		TU-134A	Dassault Falcon 50/50EX	Cessna C441 Conquest II	F/A-18C
S-40 HTP	A320-200 opt	B737-900		TU-154B	Dassault Falcon 900B/C	Cessna Citation M2 C525	KC-10
S-45	A320-200 WV000 Bogie	B737-900 ER					P-3C

New User-Defined Aircraft Mode

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

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

Plot showing gear positions (X, Y coordinates in inches).

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

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 Cont. 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

User-Defined Aircraft Mode

- **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.**

FAARFIELD 2.1 – User Defined Aircraft

The screenshot displays the FAARFIELD 2.0.3 (Build 04/30/2021) software interface. A red box highlights the 'User Defined Aircraft' toolbar at the top right, which includes 'Create' and 'Edit' buttons. Another red box highlights the 'Thickness Design' dropdown menu in the 'Section' area. A third red box highlights the 'User Defined Aircraft' toolbar again, with an arrow pointing to the 'Create' button. A text box with the text 'Access the editor using the User Defined Aircraft tools on the toolbar.' is overlaid on the interface.

Access the editor using the User Defined Aircraft tools on the toolbar.

Section

Job Name: Workshop
Section Name: Flexible Example
Include in summary report ☒ Add To Batch

Pavement Layers

Pavement Type: New Flexible

Material	Thickness (in.)
P-401/P-403 HMA Surface	4.0
P-401/P-403 HMA Stabilized	5.0
P-209 Crushed Aggregate	26.8
Subgrade	

Select As The Design Layer Delete Selected Layer

Design Life (Years): 20
Results
Calculated Life (Years): Total thickness to the top of the subgrade: 35.8 in.

Copy Structure to Clipboard

Traffic

User Defined Aircraft: 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 W4
S-30	30000	8000	0	160000	0	0	1.75	75	0.475	0.0	0.0	12.3
Fokker-F-100	98000	6500	0	130000	0	0	1.33	151	0.475	23.1	0.0	11.1
B737-300	138500	5000	0	100000	0	0	1.26	199	0.475	30.5	0.0	11.5
B767-300 ER	350000	3200	0	64000	0.01	0.02	1.14	171	0.475	45.0	56.0	13.5
A380-800 WW000	1200000	400	0	8000	0.35	0.4	1.15	211	0.19	53.1	66.9	14.7
A380-800 WW000 Belly	1200000	400	0	8000	0.02	0.76	1.25	211	0.285	0.0	0.0	14.7
B777-300	580000	1500	0	30000	0.62	0.62	1.19	188	0.475	55.0	57.0	13.5

FAARFIELD 2.1 – User Defined Aircraft Mode

FAARFIELD 2.0.18 (Build 05/26/2022)

Section: **Vehicle Edit**

User Defined Aircraft Info

New User Defined Aircraft:

Gross Taxi Weight (lbs)

Percent Gross Weight on Whole Main Gear

PCR Percent Gross Weight on Gear

Tire Pressure (psi)

Gear Orientation

Tires

X Coord. (in.)	Y Coord. (in.)

Delete Tire

Evaluation Points

X Coord. (in.)	Y Coord. (in.)

Delete Eval. Point

Update Gear Image

Save New User Defined Aircraft

1. Enter a name for the new UDA
2. Enter the gross weight (lbs.)
3. Enter percent gross weight on the main gear as a decimal value (e.g., 0.95)
4. Enter the percent gross weight on the main gear for PCR calculations as a decimal value.
5. Enter the tire pressure (psi)

User-Defined Aircraft Mode

FAARFIELD 2.0.18 (Build 05/26/2022)

Section: **Vehicle Edit**

User Defined Aircraft Info

New User Defined Aircraft: B77

Gross Taxi Weight (lbs): 145,000

Percent Gross Weight on Whole Main Gear: 0.95

PCR Percent Gross Weight on Gear: 0.95

Tire Pressure (psi): 200

Gear Orientation: 0

Tires

X Coord. (in.)	Y Coord. (in.)
-118.3	0.0
-87.8	0.0

Delete Tire

Evaluation Points

X Coord. (in.)	Y Coord. (in.)
-103.1	0.0
-100.0	0.0
-97.0	0.0
-93.9	0.0
-90.9	0.0
-87.8	0.0

Delete Eval. Point

Update Gear Image

Save New User Defined Aircraft

Define the tire coordinates.

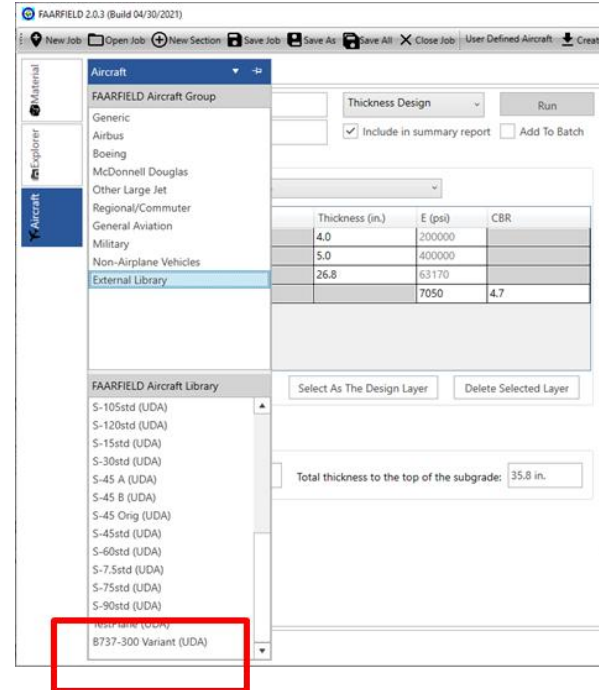
- X-coordinate is lateral.
- Y-coordinate is longitudinal (in direction of travel)
- Only enter coordinates for one set of wheels (left or right, doesn't matter). They will be reflected on the centerline.

Define the evaluation points. These are used for layered elastic analysis computations.

- Must have at least one evaluation point.
- Typically, under the wheel, at the gear CG, and evenly spaced between.
- Again, only enter coordinates for one set of points (left or right, doesn't matter).

User-Defined Aircraft Mode

- New UDA will appear in your External Library group.
- Identified by the suffix (UDA)
- Can be used in designs the same as internal library aircraft.
- Use the editor to define non-airplane vehicles (snow plows, tugs, etc.) not in the internal library.



Editing an Existing UDA

Section Save Job Save As Close Job User Defined Aircraft Create Edit Batch Run Selection Select All DeSelect All

Section

Job Name: Workshop Thickness Design

Section Name: Flexible Example 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	26.8	63170	
Subgrade		7050	4.7

Select "Edit" from the UDA Tools

1

Select the aircraft you want to edit from the drop-down list.

Select the aircraft you want to edit from the drop-down list.

2

3

Four Functions in FAARFIELD 2.1

FAARFIELD 2.0.0 Beta 22 January 2020

Section Report CDF Graph Form

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

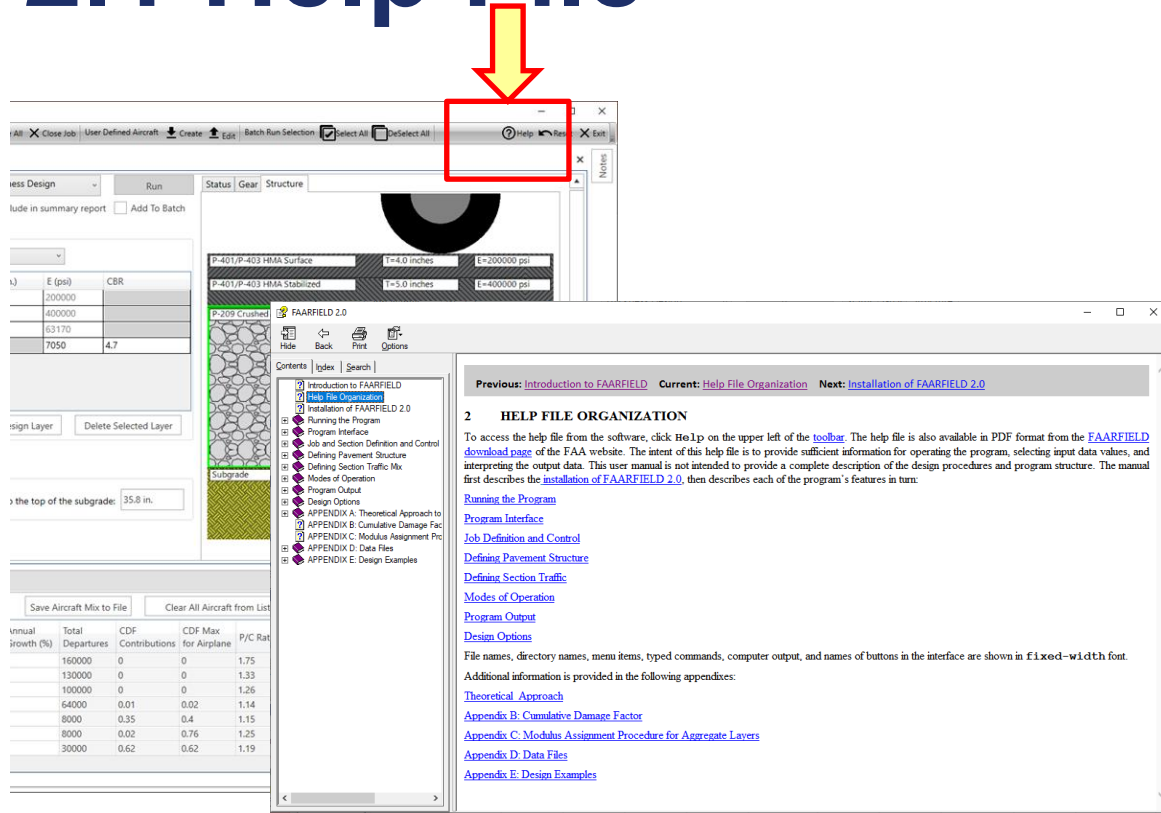
Stored Aircraft Mix: FlexExampleMix Save Aircraft Mix to File

Airplane Name	Gross Taxi Weight (lbs)	Annual Departures	Annual Growth (%)	Total Departures	C	G
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	

- **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.

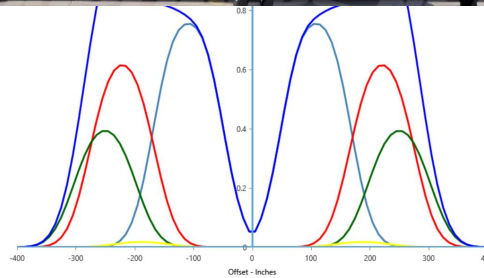
FAARFIELD 2.1 Help File

- Completely rewritten from FAARFIELD 1.42.
- This is the first resource you should go to with your questions on FAARFIELD.
- Contains examples.





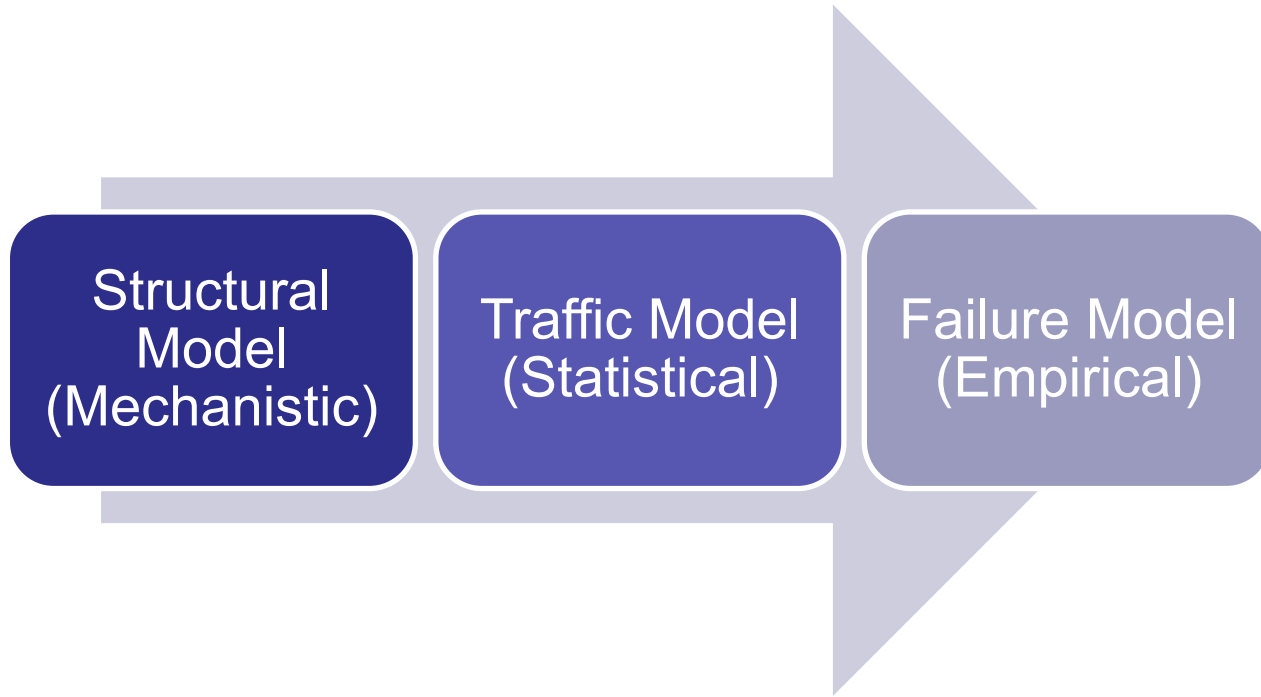
Alex Belyukov - RuSpotters Team, CC BY-SA 3.0 GFDL 1.2, via Wikimedia Commons



Review of Key Concepts in FAARFIELD

Mechanistic/Empirical Design; Pass-to-coverage; Cumulative Damage Factor (CDF)

Mechanistic-Empirical Design

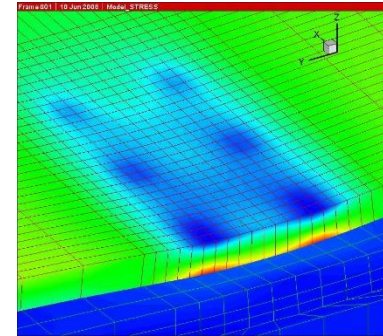
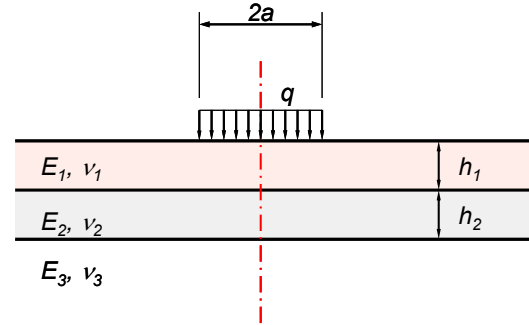


Key Concepts in FAARFIELD

- **Layered Elastic Analysis**
- **Wander**
- **Pass/Coverage Ratio (P/C)**
- **Miner's Rule (linear summation of damage)**
- **Cumulative Damage Factor (CDF)**

Structural Models in FAARFIELD

- Both layered elastic (LEAF) and 3D-FEM (FAASR3D) are used in FAARFIELD.
- Flexible pavement design
 - LEAF is used for all structural computations.
 - For flexible, no advantage to using 3D-FEM.
- Rigid pavement design
 - LEAF to generate a preliminary thickness design.
 - Final iterations are done using FAASR3D.

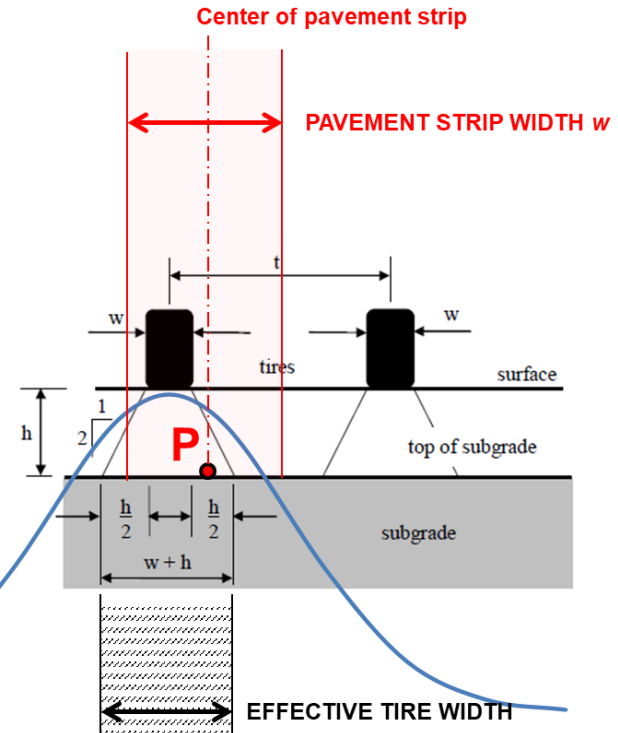


Definitions

- **Coverage** = application of the maximum stress or strain at a point on the pavement.
- **Pass/Coverage Ratio** = the number of aircraft passes resulting in one coverage on a given strip.
- **Wander** = the width over which the centerline of the aircraft is distributed 75% of the time.
- **Effective Tire Width** = the width of a horizontal surface assumed to be affected by a tire load at a given depth.

P/C Ratio in FAARFIELD

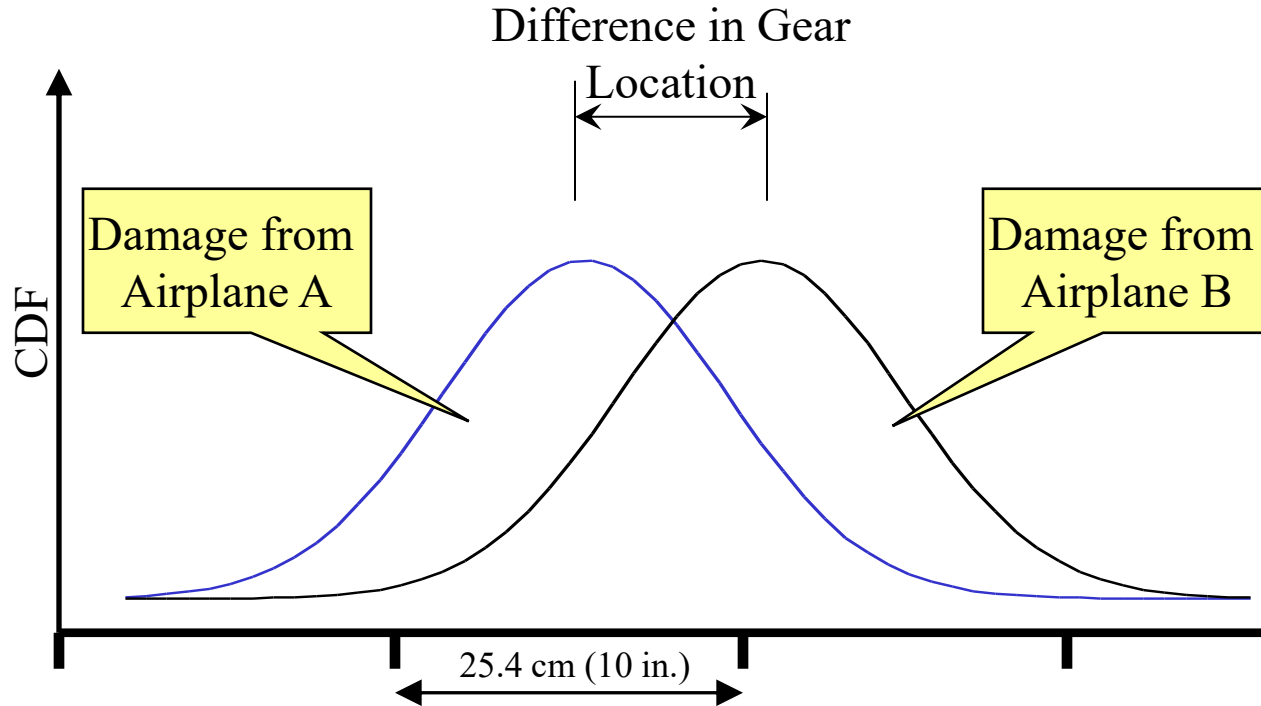
- Assume the tire has a normal lateral distribution with wander width = 1.78 m (70 in.).
 - Equivalent to standard distribution $\sigma = 30.54$ in.
- The probability that, for a given pass, any part of the effective tire width covers point P, is defined as the coverage/pass ratio (C/P) for point P.
- **P/C is the reciprocal of C/P.**
 - P/C is always greater than or equal to 1.0.
 - When does $P/C = 1.0$?
- On a pavement strip of width w , P is the center point of the strip, and we define P/C as applying to the whole strip.
- Depending on which layer is being evaluated, the P/C ratio may vary with thickness!



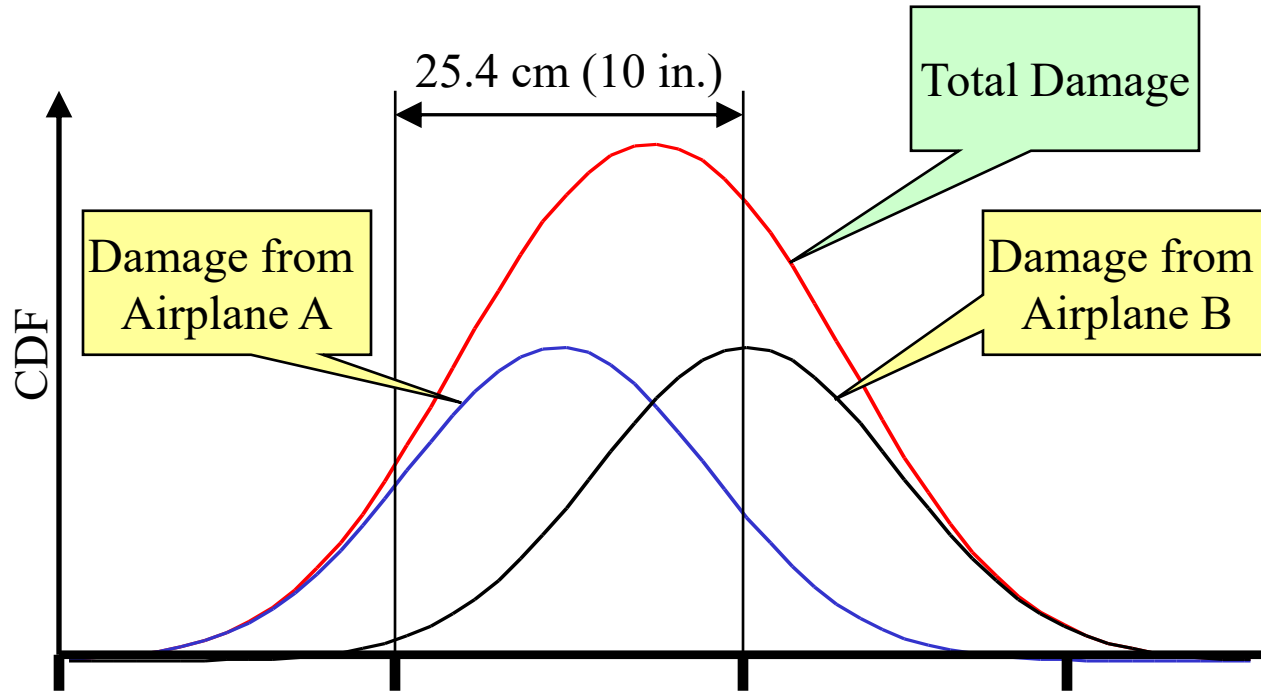
Cumulative Damage Factor (CDF)

- **Sums the damage contributed from each aircraft - not from equivalent aircraft.**
 - **$CDF = \sum (n_i / N_i)$, where:**
 - n_i = actual passes of individual aircraft i
 - N_i = allowable passes of individual aircraft i
 - **When CDF = 1, design life is exhausted.**
 - **In FAARFIELD:**
 - The gear location and wander are considered separately for each aircraft in the total mix.
 - CDF is calculated for each 25.4 cm (10 inch) wide strip over a total 20.83 m (820 inch) width.
 - Use Miner's rule to sum damage for each strip.
- **Important: Input the fleet mix, NOT equivalent departures of design aircraft.**

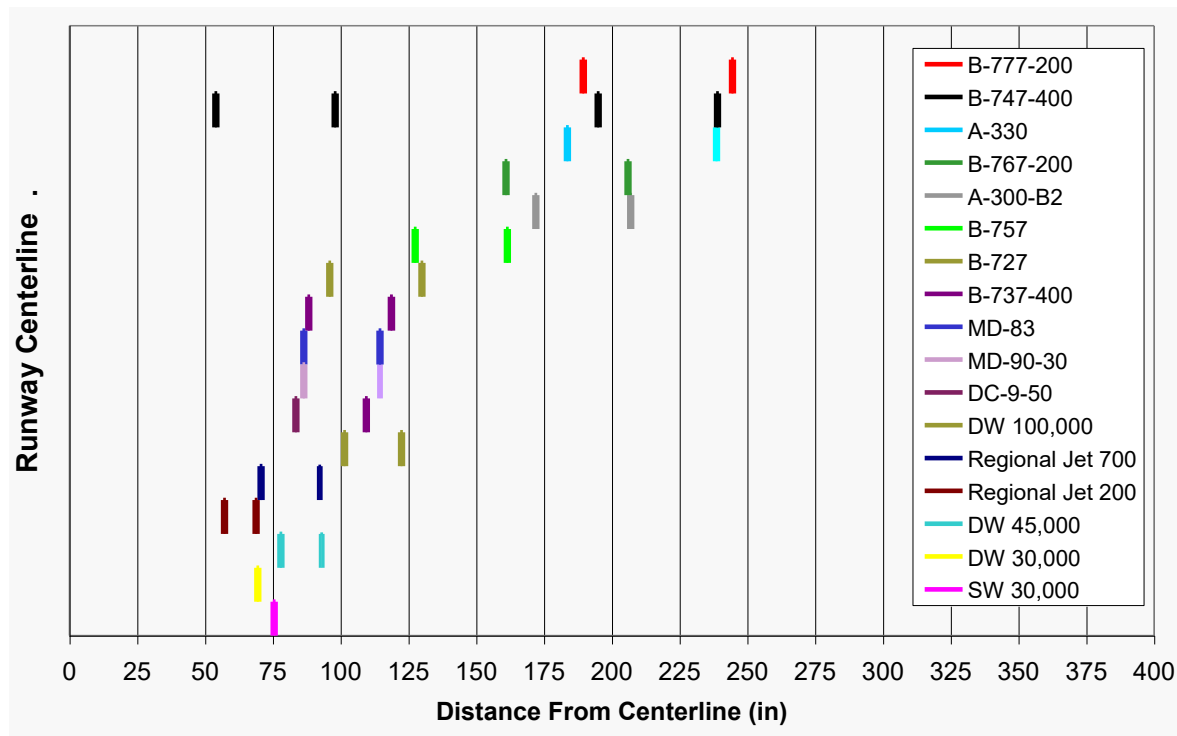
Cumulative Damage Factor (CDF)



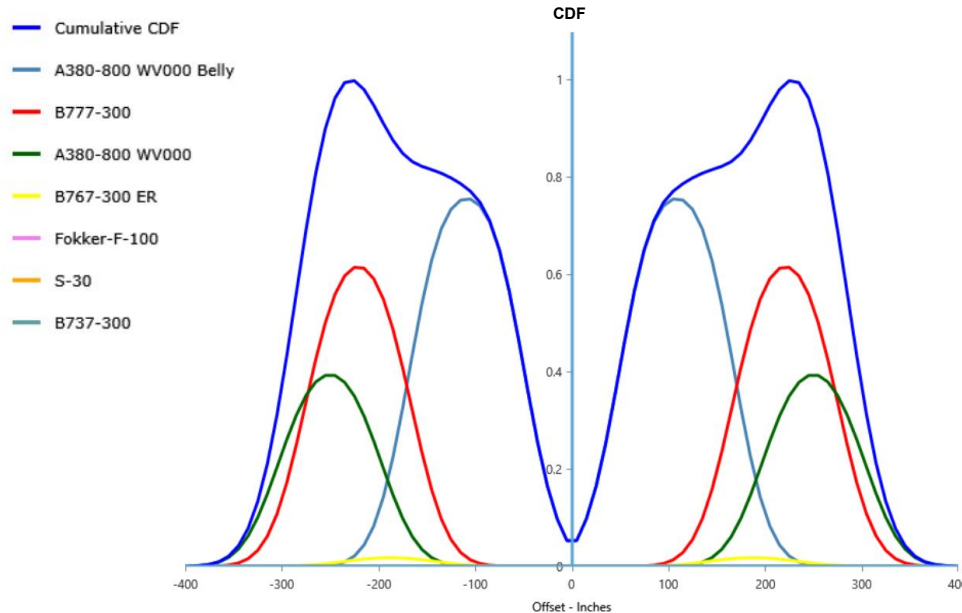
Cumulative Damage Factor (CDF)



Large Airplane Traffic Mix Gear Locations



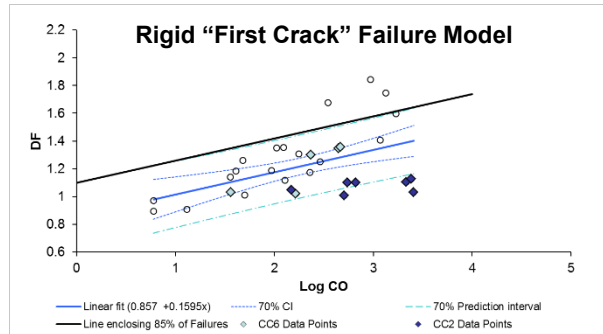
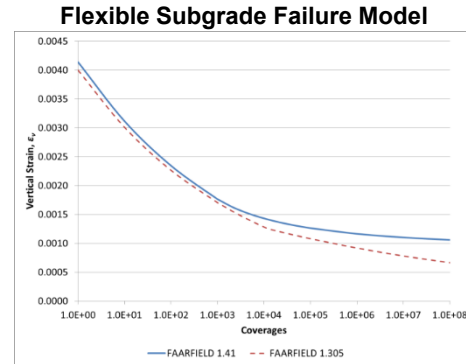
FAARFIELD – CDF Graphical Display



- **Design based on critical offset from centerline.**
- **Does not necessarily agree with track of “most demanding” aircraft.**

Failure Models in FAARFIELD

- This is the “empirical” part of mechanistic-empirical.
 - Derived from full-scale traffic tests at NAPTF.
 - Relates strain or stress to allowable coverages (fatigue).
 - Tied to CDF through P/C ratio.
- **Flexible:** Function of maximum vertical strain at the top of the subgrade.
- **Rigid:** Function of maximum horizontal stress in concrete slab.



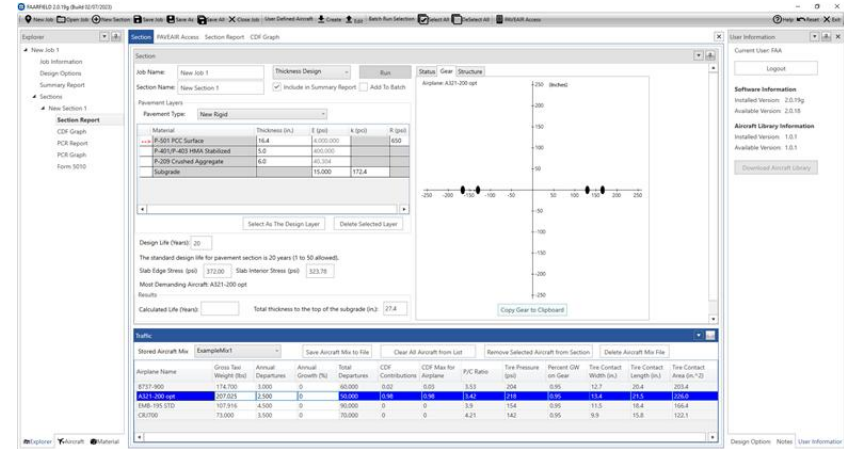
FAARFIELD 2.1 – New Features and Links to FAA PAVEAIR

• Data Integration with FAA PAVEAIR

- Log in to PAVEAIR using PAVEAIR user credentials
- Update to current library version (and eventually to current software version) online
- Access user-owned PAVEAIR databases
- Populate Job Information from PAVEAIR data
- Upload/download/store FAARFIELD job files under appropriate PAVEAIR network/branch/section

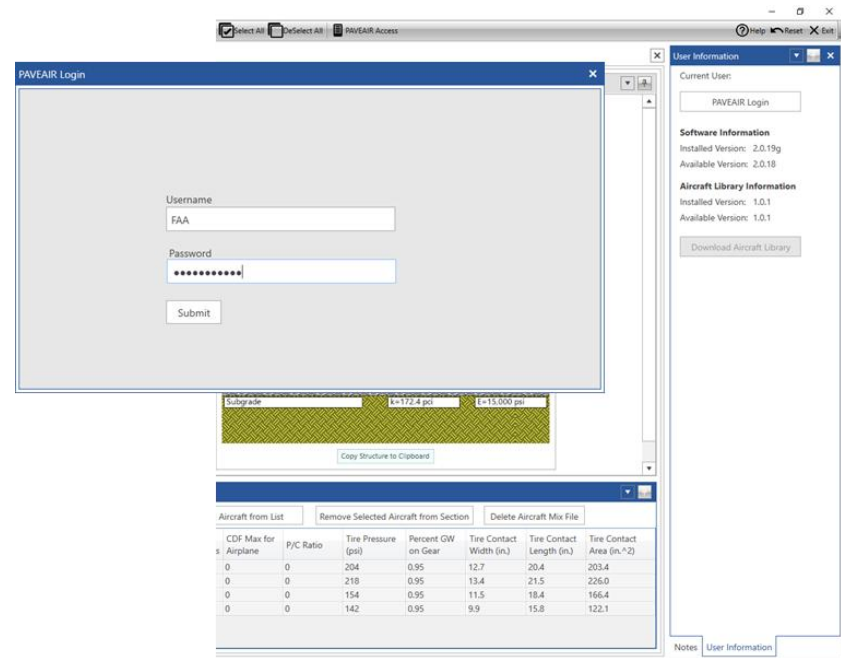
• More New Features

- Display critical design stresses for rigid slabs (and most demanding aircraft for A-1 joint design).
- Option to automatically perform reduced cross section design (1% of traffic).



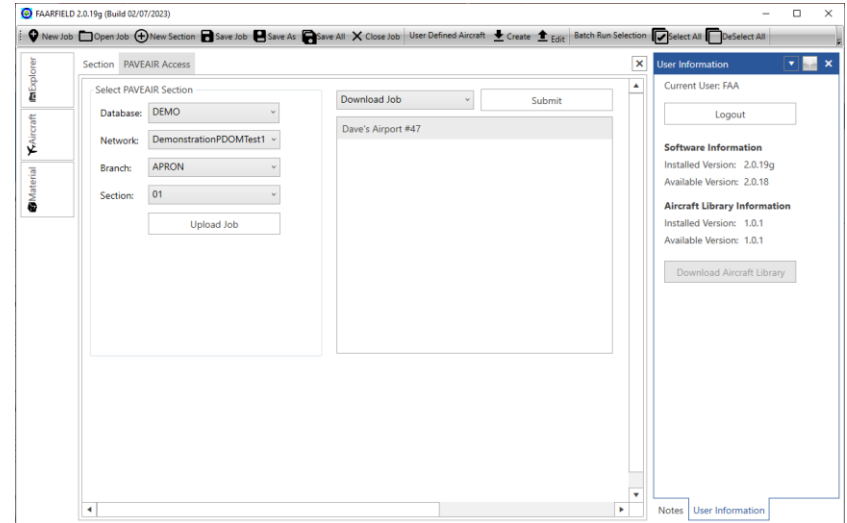
FAARFIELD User Sign-In

- Select “User Information” tab at right
- Sign in using existing PAVEAIR account login and password.
- Panel displays installed and currently available versions of software and aircraft library.
- If your aircraft library is out of date, you have the opportunity to download the latest version.
- In the future, you will be able to update to a newer version of FAARFIELD, run software patches and bug fixes, etc.



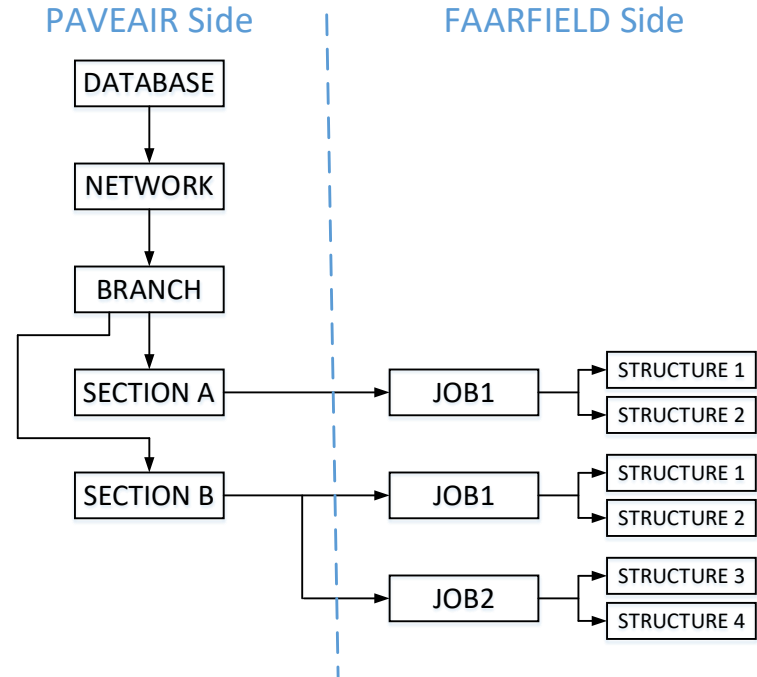
FAARFIELD – PAVEAIR Access Screen

- Once signed in, you have access to all user-owned databases in PAVEAIR.
- Navigate to Network/Branch/Section
- Four possible actions:
 - **Upload Job** – Uploads the current FAARFIELD job to the selected PAVEAIR Network/Branch/Section
 - **Download Job** – Downloads and opens the selected job from the PAVEAIR list in FAARFIELD
 - **Update Job** – Overwrites the selected job
 - **Delete Job** – Deletes the selected job from the PAVEAIR database. (Does not delete from FAARFIELD or the FAARFIELD job file).



Data Organization

- The same FAARFIELD job can be uploaded to multiple locations in a PAVEAIR database.
- In future versions of FAARFIELD, “Sections” will be renamed to “Structures.” This is to avoid confusion with sections as defined in APMS.
- For the PAVEAIR user, structures can represent:
 - Asphalt vs. concrete options, for use in PAVEAIR LCCA tool
 - Before/after overlay or replacement of section
 - Different possible traffic mixes
 - Etc.



Thank You!



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