Integration of FAA Software Programs

Presented to: IX Seminario ALACPA de Pavimentos Aeroportuarios

By: Jeffrey S. Gagnon, P.E.
Manager, ANG-E262

Date: 13-September-2012
Current Status

- Since publication of the first airport pavement R&D plan in 1993, a comprehensive collection of airport pavement design and evaluation computer programs have been developed.
- Development of the computer programs was supported by analytical and full-scale test work.
## Computer Programs Since 1993

<table>
<thead>
<tr>
<th>Name</th>
<th>Date of Adoption</th>
<th>Advisory Circular</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAKFAA 2.0</td>
<td>2012</td>
<td>150/5370-11A</td>
<td>FAA Backcalculation of elastic layer properties using LEAF. Also computation of elastic layered system responses and used for LEAF development.</td>
</tr>
<tr>
<td>PAVEAIR</td>
<td>2011</td>
<td>NA</td>
<td>Web-based application for airport pavement management, including PCI evaluations.</td>
</tr>
<tr>
<td>COMFAA 3.0</td>
<td>2011</td>
<td>150/5335-5B</td>
<td>Automatic PCN computation.</td>
</tr>
<tr>
<td>FAAFIELD 1.3</td>
<td>2009</td>
<td>150/5320-6E</td>
<td>FAA Rigid and Flexible Interactive Layer Design. Fully tested thickness design. Uses NIKE3D for rigid and LEAF for flexible.</td>
</tr>
<tr>
<td>ProFAA</td>
<td>2009</td>
<td>150/5380-9</td>
<td>Longitudinal roughness profile analysis, roughness index computation, and aircraft ride simulation.</td>
</tr>
<tr>
<td>LEDFAA 1.3</td>
<td>2003</td>
<td>150/5320-6D Change 3</td>
<td>Rewrite of LEDFAA 1.2 as a 32-bit program. Uses LEAF instead of JULEA. Updated flexible failure model. Updated aircraft library, includes A380.</td>
</tr>
<tr>
<td>FEAFAA</td>
<td>NA</td>
<td>3D FEM program for rigid pavement response computation. Up to 9 slabs. Used to improve and extend FAA-NIKE3D.</td>
<td></td>
</tr>
<tr>
<td>FAA-NIKE3D</td>
<td>NA</td>
<td>3D finite element modeling system. Custom modification of the NIKE 3D FEM system developed by Lawrence Livermore Labs.</td>
<td></td>
</tr>
<tr>
<td>COMFAA 2.0</td>
<td>2006</td>
<td>150/5335-5A</td>
<td>ACN computation and thickness design by the FAA CBR and Westergaard methods.</td>
</tr>
<tr>
<td>BAKFAA</td>
<td>2003</td>
<td>150/5370-11A</td>
<td>FAA Backcalculation of elastic layer properties using LEAF. Also computation of elastic layered system responses and used for LEAF development.</td>
</tr>
</tbody>
</table>
10-Year FAA R&D Plan

Airport Technology Research Plan

...for the NextGen Decade
FAA Pavement Software Integration

FAARFIELD
Thickness Design

BAKFAA
Strength Evaluation

PAVEAIR
Web-Based PMS

COMFAA
PCN Load Rating

ProFAA
Roughness Condition Evaluation
Software Structures

• FAA Pavement R&D Section is committed to further development and maintenance of computer program applications.

• FAA PAVEAIR is considered to be the “hub” application and should be the depository of almost all data required by the other programs.

• Current thinking is that the “satellite” programs should remain as individual applications linked to PAVEAIR by specialized services or other data pathways.
Software Structures

• All programs, including PAVEAIR, should be capable of being run stand-alone on individual personal computers.
• All programs should be capable of communicating with PAVEAIR over the internet.
Software Structures (continued)

- Different levels of integration.
- FAARFIELD, COMFAA, and BAKFAA should share pavement structures.
- FAARFIELD and COMFAA should share aircraft mixes.
- ProFAA should probably be almost completely independent, unless profiles are stored by PAVEAIR.
Software Development Models

• All programs except PAVEAIR were developed in VB 6.0.
• VB 6.0 is no longer supported by Microsoft and all programs must be translated into .NET applications, including all ancillary programs.
• Windows 7 should be the target operating system. The future of Windows 8 is not clear.
Software Development Models

- PAVEAIR is an ASPX web application and will remain so.
- FAARFIELD and BAKFAA have been translated from VB 6.0 into VB.NET Windows Forms applications.
- ProFAA is being translated from VB 6.0 into a VB.NET Windows Presentation Foundation application.
Windows Forms

• Windows Forms is the traditional Microsoft Windows software model.
• It might not be developed significantly beyond its current state.
• It is strictly a single computer software model.
• Communication over the internet is difficult (consider the 1-Click distribution model).
Windows Presentation Foundation

• Windows Presentation Foundation (WPF) is an alternative Windows software model with potential to displace Windows Forms for single computer use and allow a path to conversion to web-based applications.

• Features of WPF distinct from Forms are:
Features of WPF distinct from Windows Forms

• User interface and application code bases are almost completely separate (XAML versus VB).
• Automatic component resizing is built in.
• Can be compiled as a browser plug-in with reduced functionality.
• Can be translated to a Microsoft Silverlight application with reduced functionality with manageable effort.
Microsoft Silverlight

• Silverlight is Microsoft’s version of Adobe Flash.
• Can be compiled as a true single computer application or a true web-based application (plug-in) by changing only a couple of lines of code.
• Need to decide which model to use very soon.
Download the Brochure for More Information

Airport Technology Research Plan

...for the NextGen Decade

http://www.airporttech.tc.faa.gov/10YearPlan/
Airport Technology R&D Branch
http://www.airporttech.tc.faa.gov