FAARFIELD Planned Developments

FAARFIELD 1.305 Hands-On Workshop

Federal Aviation Administration

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Ciudad de México, México

By: David R. Brill, P.E., Ph.D.

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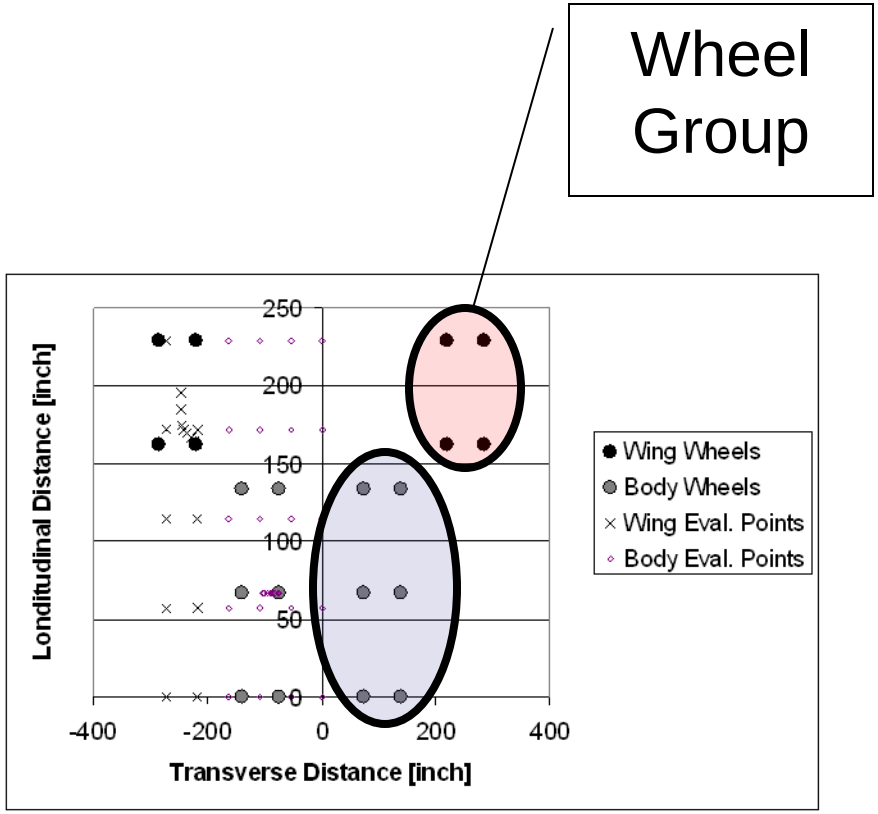
FAARFIELD – What's Coming?

- **External aircraft library upgrades.**
- **New flexible pavement failure model.**
- **New aggregate modulus model.**
- **Automated, design based compaction criteria.**
- **Revised 3D-FEM mesh.**
- **New energy-based HMA fatigue failure criterion.**

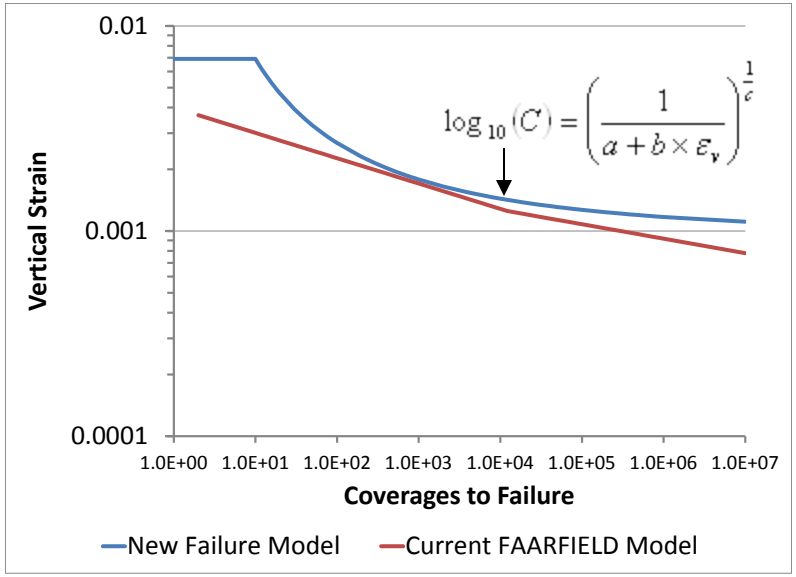
External Aircraft Library Upgrades

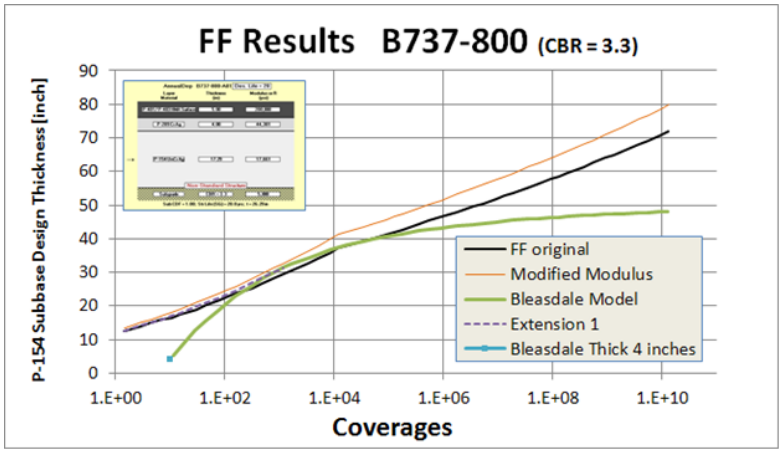
- **New feature allows users to specify arbitrary gear geometries in external library.**
- **Uses rewritten internal pass/coverage computation routine.**
- **Externally defined airplane such as the A380 gives the identical result as the internally stored airplane.**
- **New user guidance for the external library.**



New Flexible Failure Model

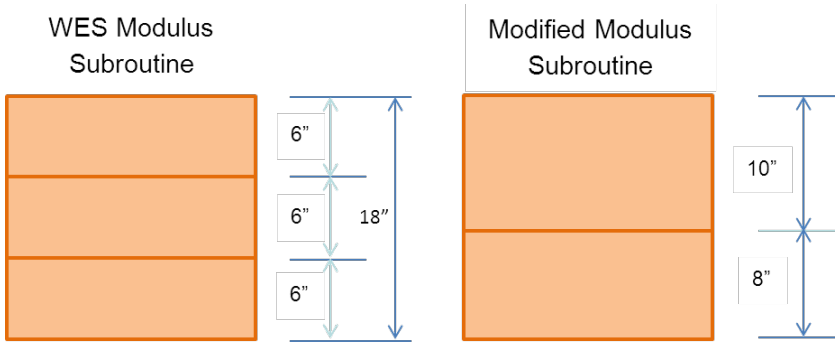
- **Developed from analysis of CC3 full-scale failure data.**
- **Bleasdale model found to give best match to backcalculated failure curves.**
- **Incorporates new alpha factors for 4- and 6-wheel gears.**
- **Better correspondence with PCN procedure (COMFAA 3.0).**
- **Reduces conservatism of existing FAARFIELD model, particularly at higher coverage levels.**

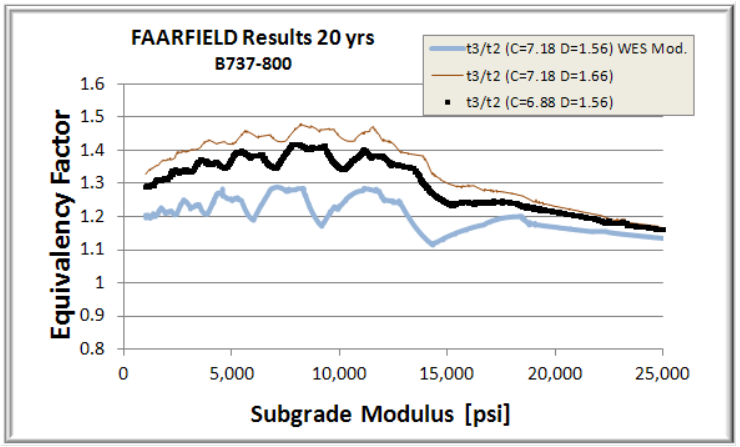




New Aggregate Modulus Model

- **Implemented & tested a new sublayering and modulus computation procedure for P-154 aggregate subbase.**
- **Why?**
  - Existing procedure (WES Modulus subroutine) has gaps that can cause illogical results under some circumstances.
  - New model provides a continuous function of modulus with changes in P-154 thickness.
  - Better overall agreement with the P-209/P-154 equivalency factor used in PCN computations.





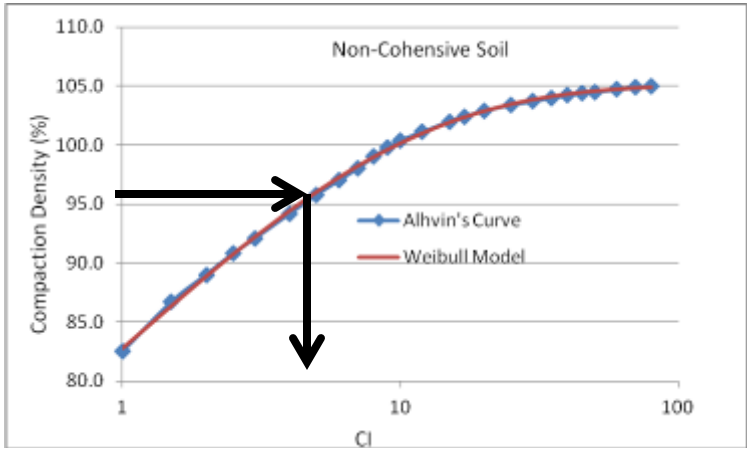
Automated Design-Based Compaction Criteria

- **New procedure computes the compaction index CI at any depth from the *vertical stress*:**

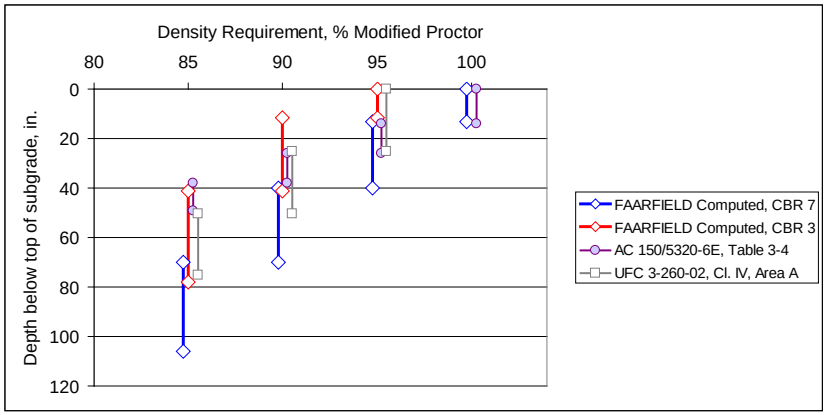
$$CI = \sigma_v \times \pi / \beta$$

- **In the equation above, stress cannot be used directly from LEAF, but must be adjusted to be consistent with the CBR eqn. (see Barker & Gonzalez, 2008).**
- **For a given percent compaction, get the corresponding CI from the appropriate curve (cohesive or non-cohesive). Then find the depth giving that CI recursively.**
- **Procedure has been implemented in FAARFIELD. Now in testing.**

CI Criteria Recommended by Ahlvin (1989)

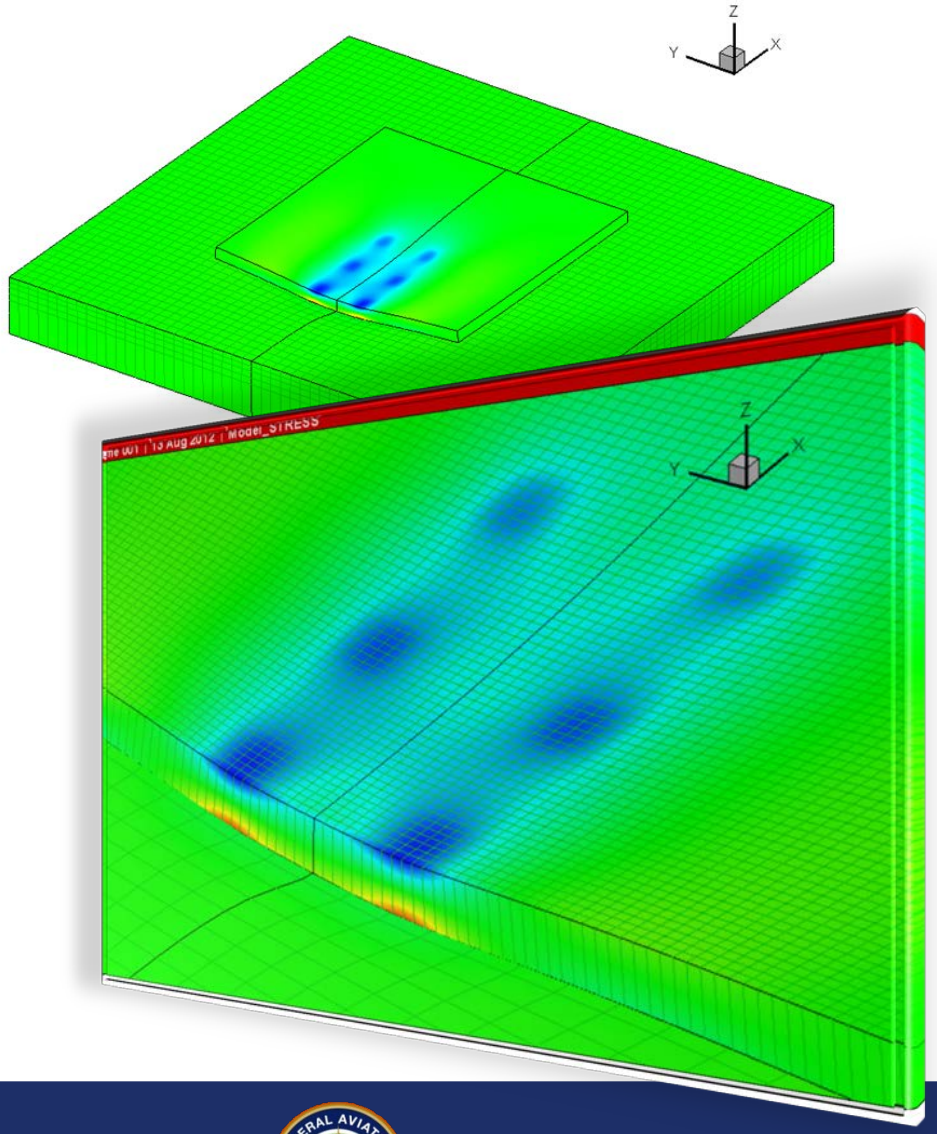


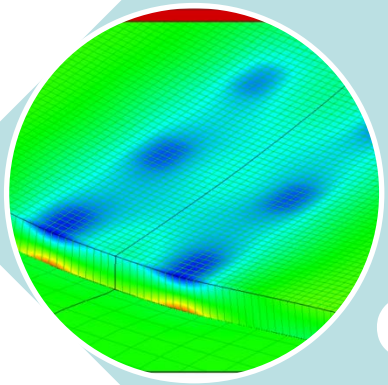
Sample Comparison with Existing Criteria (2D-100 Gear, Non-Cohesive Soil)



Revised 3D-FEM Mesh

- **Incorporates improvements from FEAFAA 2.0.**
  - Implemented new mathematical formulation for 3D infinite elements.
  - Added new decay function to improve accuracy for coupled finite and infinite elements.
  - Improved interface model corrects penalty stiffness factor depending on the current state of contact.
  - Nonconforming elements are now used only where needed.
- **Calibration factor can be eliminated from rigid failure model.**





Questions?
¿Preguntas?

www.airporttech.tc.faa.gov

David.Brill@faa.gov