Executive Summary

Wander on airports is much wider than wander on highways due to the non-channelized nature of airport traffic as well as different gear configurations between aircraft which introduce inherent wander separate from the variation of individual aircraft movements. Full scale pavement testing of aircraft loads at the FAA's National Airport Pavement Test Facility (NAPTF) indicate that wander can negate the stiffening in unbound granular layers (the shakedown effect), and make them prone to increased deformations on subsequent aircraft passes. As part of the research activities at the FAA's Center of Excellence for Airport Technology (CEAT) established at the University of Illinois, dynamic response data from airport pavement test sections were collected due to passing of each of the 6-wheel B777 type and the 4-wheel B747 type gears for various combinations of applied load magnitudes and loading sequences (application order and stress history effects), traffic directions, gear spacings, and wander positions and sequences. The field data showed that the permanent deformation during a complete wander cycle was negated due to aircraft wander, indicating movement and rearrangement of the particles in the unbound layers of the pavement system. Analysis of multi-depth deflectometer and heavy weight deflectometer data shows that there is an increased rate of pavement deterioration due to wander indicative of a reduction of the strength and modulus properties in the unbound granular base/subbase layers. The "anti-shakedown" of unbound aggregates should be accounted for in future design procedures with a performance based criterion whereby the dilative susceptibility of the aggregate layers is minimized through aggregate selection, stabilization, and/or improved lateral confinement.