

Executive Summary

1. Title: Long-Lasting Pavement Structure Rehabilitation: Hot-Mix Asphalt Overlay with Steel Reinforcement Netting Interlayer System

2. Summary: When existing airfield pavements experience severe deterioration or need to support more and heavier aircrafts, hot-mix asphalt (HMA) overlay is a commonly used. Due to the structural features, reflective cracking as a critical distress occurs early in the service life and accelerates to damage the overlay. This project proposes a long-lasting HMA overlay which is a performance- and cost-effective method to control reflective cracking. An interlayer system made of steel reinforcement netting installed at the bottom of HMA overlays provides a strong resistance against reflective cracking. To demonstrate the performance of the steel reinforcement interlayer system in airfield pavement, numerical analysis was performed using a three-dimensional finite element method. For a minimal thickness of HMA overlay (76mm) placed on jointed plain concrete pavement, transverse and longitudinal reflective cracking was developed by a moving Boeing 747 aircraft loading. The steel reinforcement interlayer reduced the fractured area by a factor of 2.2 compared to an unreinforced overlay. In addition, a life-cycle cost analysis was conducted to investigate the cost-effectiveness of the HMA overlay. Based on relative cost benefit, the steel reinforcement interlayer achieved a positive (up to 30%) or equivalent cost-effectiveness. Therefore, the proposed steel reinforcement netting interlayer system in HMA overlay meets the design goal of Federal Aviation Administration.

3. Participants: Jongeun Baek and Hao Wang, graduate students, conducted this design project with Prof. Imad L. Al-Qadi at University of Illinois at Urbana-Champaign.