Advancing airport pavement management – development of a web-based IMS for Oklahoma’s general aviation airports and exploring the use of SASW and IR for pavement health monitoring

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The transportation infrastructure of the United States consumes over 17% of its Gross National product and is currently valued at $1.75 trillion. With the interstate system now 50 years old, the emphasis of the transportation community has shifted from building new assets to maintaining and improving existing assets. Expenditures on highways and bridges remain at record levels - $147.5 billion in 2004. FHWA advocates the use of transportation asset management rationale in addressing pavement needs and improving customer satisfaction. Transportation asset management is not merely a PMS software, it is a decision making process that helps network administrators efficiently allocate limited resources for maximum benefit. The Oklahoma Aeronautics Commission (OAC) felt the need for developing such a system to efficiently allocate scarce resources at Oklahoma’s GA airports.

OAC teamed up with the University of Oklahoma’s school of civil engineering and environmental science (CEES). The effort resulted in a web-based infrastructure management system (IMS). A far-cry from the previous “squeaky wheel” system, OAC’s web-based IMS presents a vast storehouse of information – visual distress survey based Pavement Condition Index (PCI) ratings, results of nondestructive tests, geotechnical information, and construction history details to stakeholders. CEES also felt the need to advance the condition monitoring aspect of existing PCI based PMS in use at the time. The challenge was to inspect the aging infrastructure without impairing its usefulness. Accordingly, the Spectral Analysis of Surface waves (SASW) method and the Impulse Response (IR) method were identified as tools for non-destructive pavement health monitoring. The efficacy of these non-destructive test methods was rigorously investigated. The findings of this research indicate validate the selection of SASW and IR for pavement health monitoring. SASW’s estimate of low-strain pavement modulus and IR’s estimated dynamic pavement stiffness were observed to decay with pavement age. Using a family approach, modulus and stiffness decay models were developed that are recommended for use in future condition estimation of Oklahoma’s General Aviation (GA) airport pavements.