Federal Aviation Administration
Airport Technology Research & Development (ATR)

One-of-a-kind facility simulates full range of accelerated airport pavement testing

Knowing what causes airport pavement failure is critical to the FAA as it responds to evolving industry requirements. Prompted by a need to accommodate complex gear configurations from new generation aircraft, the National Airport Pavement Test Facility (NAPTF) opened in 1999 to conduct realistic traffic testing on a variety of concrete and asphalt pavement structures.

The NAPTF features an indoor, instrumented test track 900 ft. long by 60 ft. wide, an entirely automated data acquisition system, and a rail-based test vehicle capable of simulating nearly any aircraft landing gear at full scale.

The fully-enclosed, state-of-the-art facility is an ideal environment for generating high quality, accelerated performance data.

Array of in-pavement sensors collects and records information on sections of pavement typically designed to withstand 20,000 or more passes of the test vehicle. Subgrade soils of varying strengths ensure that NAPTF test pavements are laid on foundations representative of those at airports across the U.S.

Since the inception of NAPTF, ATR has completed eight full-scale Construction Cycles, in addition to many specialized experiments such as Reflective Cracking (see reverse). Each study addresses real world issues such as effects of new aircraft gear configurations on pavement performance, validation of the FAA’s airport pavement thickness design software, and factors that impact pavement life, from overloading to temperature-induced cracking. Data collected at the NAPTF provide a basis for FAA Advisory Circulars and other guidance followed by airports nationwide and worldwide.
The National Airport Pavement Test Facility (NAPTF)’s purpose is to test pavements through failure. Each test requires demolition of old pavement, construction of new pavement, material characterization, load testing, and post-test structural and materials evaluation. Products of NAPTF testing include revised alpha factors (used to determine the damaging effect of aircraft on pavement), as well as pavement performance models for FAA’s airport pavement thickness design software, FAARFIELD.

Construction Cycles

A Construction Cycle (CC) is a collection of activities defining independent test areas designed and constructed to meet specific objectives as they relate to flexible (asphalt) pavements, rigid (concrete) pavements, or both.

Information on each of the eight complete cycles can be found at www.airporttech.tc.faa.gov/NAPTF. CC9 now investigates four areas related to flexible pavements:

1. A Fatigue Model test area generates data to refine the asphalt fatigue failure model currently in place. Fatigue occurs as a result of repeated loading on the asphalt pavement material. These tests also help to improve the base layer thickness design.

2. A Geosynthetics test area focuses on the effects of synthetic reinforcement or separation fabrics on flexible pavement performance. This experiment will help to create a reference model for comparison against other synthetic fabrics, composites, and membranes that may be tested at NAPTF in the future.

3. A Cement-Treated Permeable Base (CTPB) area tests how a CTPB compares to standard crushed stone base layers in flexible pavements. This type of base allows water to drain from under the asphalt to prevent damage typically caused by trapped water.

4. Lastly, an Overload test area examines the potential for airport pavements to sustain occasional overloads. NAPTF testing supports the FAA’s and the International Civil Aviation Organization’s allowable overload criteria for flexible pavements, which are based on the ratio of aircraft classification number (ACN) to pavement classification number (PCN).

Visit the ATR Website at www.airporttech.tc.faa.gov

Replication by rail

A rail-based test vehicle called the National Airport Pavement Test Vehicle (NAPTV) simulates controlled, realistic aircraft wander and loading during traffic testing at the National Airport Pavement Test Facility. The vehicle’s two carriages each accommodate up to five load modules, any of which can be operated independently for precise positioning of load and control of magnitude. This lets the vehicle operator simulate any desired configuration of aircraft during traffic testing. A common configuration allows for up to 18 wheels with loads of up to 75,000 lbs. per wheel. At maximum capacity, the NAPTV can simulate aircraft weighing up to 1.3 million lbs., meaning that FAA has the ability to replicate the loading of even the heaviest aircraft in service, the Airbus A-380 at 1.26 million lbs.