**RESEARCH ISSUES/NEEDS**REDAC Subcommittee on Airports
August 12, 2014

**Issue 1: Improved Pavement Management Approaches (discussions from TRB AOC)**

EMERGING ISSUE: Managing pavements requires a reliable pavement performance indicator. Existing pavement management systems are based upon a visually inferred Pavement Condition Index. PCI approach measures some distresses that indirectly relate to structural degradation, such as cracking or rutting, yet no well-defined relationship between structural and functional performance.

RESEARCH NEED: Examine the suitability of using the modulus derived from the falling weight deflectometer method of pavement structural health monitoring. Mechanistically derived pavement condition parameter will provide engineers and improved understanding of pavement distress and lead to the selection of best suited maintenance.

**Issue 2: Next Generation RWSLs**

EMERGING ISSUE: Current Runway Status Lights program will soon be discontinued.

RESEARCH NEED: Examine cost effective solutions that could be deployed at airports to strengthen safety and situational awareness.

**Issue 3: Maintenance Technologies/Practices for LED Airfield Lighting**

EMERGING ISSUE: Advancements in Light Emitting Diode (LED) technology and their implementation to airfield lighting systems has become commonplace in the aviation world. As opposed to burning out like an incandescent fixture (easy to see with the naked eye), an LED fixture’s light output slowly decreases (hard to see with the naked eye). The Illuminating Engineering Society (IES) determined that the usable life of an LED fixture is its L70 value, or point at which the light fixture is at 70% its original light output levels. Due to the slow decrease in light output, an LED fixture may not become noticeably dimmer until it’s well past its technical lifespan. This creates a problem in accurately determining the useful life of LED light fixtures.

RESEARCH NEED: Since a single light meter cannot accurately measure the output of an LED airfield light fixture to FAA Advisory Circular standards, one possible solution would be to develop an array of portable light output meters that can be placed over a light fixture to quickly measure the light output of that fixture. The light meter array would be installed on a single frame cylindrical in shape. This would provide a more accurate and repeatable test to quickly determine the light output of the LED light fixture, allowing airport maintenance staff to ensure their lights are operating at FAA and IES standards.

**Issue 4: Commercial Spaceport Infrastructure and Operational Standards**

EMERGING ISSUE: It is projected that by the end of 2015 it is possible that there will be up to eight licensed commercial spaceports that were derived from existing airports and at least one operational horizontal spaceport that was built from the ground up. The network will include spaceports on the East Coast, West Coast, Central United States, the Coast of Gulf of Mexico, and in the middle of the Pacific Ocean. While initially, the focus on many sites may be spaceport tourism, ultimately the spaceports will provide the foundation for a point to point network and serve as primary spaceport hubs within the network.

RESEARCH NEED: The FAA needs to have a better understanding of how spaceports will impact existing and future infrastructure development at airports. There is a need to develop a better understanding of significant environmental issues they may cause and how they will be accommodated with a significant mix of vehicles.

**Issue 5: Portland Cement Concrete Paving Trends and Advancements**

EMERGING ISSUE: In the last 50 years there have been significant changes in concrete technology as well as concrete pavement construction technology. As construction technology, material suppliers and production techniques change, so does the predictability of the end product, which can significantly impact the 20 year life expectancy and required maintenance of runways .

RESEARCH NEED: The assignment of a historian on construction trends looking at materials, mixtures & pavement construction technology. The historian would also oversee the development of a library of case studies documenting significant success and failures following the industry trends.

Potential Areas to be studied.

1. Overall changes in design mixes and additives.

2. Consistency and availability of raw material from open-pit mines.

3. Changes in the availability, production and alkaline of Portland used in concrete construction.

D. Historical tracking of success and failures of RWY and TWY construction across the country and their relationship to the materials, equipment and construction techniques used over the last 50-75 years.

E. Examine issues associated with local availability of sub-bases and their effect on constructability and the overall life of the pavement dependent on the area of the county they are constructed.

F. Overall trends in the industry.

**Issue 6: NextGen and Airport Noise**

EMERGING ISSUE: Not many years ago the severity of aircraft noise issues on and around many major airports was seriously constraining the expansion of such facilities, and thus casting doubt on the degree to which such airports could be relied on to meet the needs of a growing civil aircraft industry. In more recent years, the less-noisy generations of aircraft, coupled with aggressive airport noise steps such as flight path adjustments, sound-proofing, and land acquisition programs have established a new balance of interests that is much more accommodating of airport growth and expansion.

RESEARCH NEEDED: The perils to airport growth which noise problems have posed in the past are serious enough to warrant extreme care in anticipating and recognizing the potential of such issues to again arise as Nextgen moves in the direction of increasing the density of overflight activity in the airport environs and in altering flight paths to accomplish that end. Research could well determine whether the consideration of this issue has grasped the real, on-the-scene factors that have eased this anti-growth dynamic of the past, as opposed to generalized rules of thumb that, while useful in some respects may seriously misjudge the potential for this growth constraint to re-emerge as a problem.

**Issue 7: Managing Irregular Operations in a NextGen Environment**

ISSUE: Over the years, as the airlines have receded from being viewed as public utilities, airport operators have increasingly been faced with the task of accommodating passengers who, often because of weather factors, become isolated at the airport terminal complex. As NextGen comes into widespread use, it seems likely that the ability of the aviation system to deliver passengers to an airport in inclement weather will often surpass the capabilities of the ground transportation systems to move those passengers to their local destinations, thus making it likely that there will be more situations where crowds of travelers will need to be sheltered at a terminal.

RESEARCH NEEDED: Today’s measures employed at airports vary widely, but are fairly rudimentary with emphasis on delaying nightly terminal closing times, providing blankets and cots, and where possible, extending food and beverage hours. While such measures are welcomed by stranded passengers (given the alternatives), the prospect that the NextGen era could multiply the frequency of these sort of situations raises the question of whether or not a more orderly, more uniform approach to this issue would be feasible and desirable.

**Issue 8: Updating Exit Taxiway Location and Design Guidance**

EMERGING ISSUE: With the implementation of the FAA’s NextGen improvements that provide more consistent and possibly decreased aircraft in-tail separations on final approach (such as ReCat, etc.), there will be increased emphasis on minimizing runway occupancy times for landing aircraft.  Guidance on planning and design optimal exit taxiway locations and geometry is dated.  For example the primary model for locating exit taxiways -- Runway Exit Interactive Design Model (REDIM) -- was developed under FAA contract by Virginia Tech in the early 1990s.  REDIM does not include many of today’s aircraft including regional jets, newer, heavier models of 737s and A320s, 777 and 787s.

RESEARCH NEED:Research is needed to update REDIM and or create an improved model that provides practical guidance on optimal exit taxiway locations for new runways or improvements to existing runways.  Also, high speed and angled exit taxiway design geometry should be reviewed to ensure efficient layout.

**Issue 9: Spaceport Airfield Design Standards (Similar to Issue 4)**

EMERGING ISSUE:Commercial space flight activity is expected to increase substantially in the next few years, a number of those operations, especially “space tourist” flights initially launched from and landing on conventional runways, will use existing or expanded airport facilities.  Due to the nature of the spacecraft, their performance and servicing facilities required, current airfield design standards (AC150/5300-13) should be reviewed for applicability for aircraft/spacecraft horizontal launch and landing operations.

RESEARCH NEED:Research is needed to support the review the continued applicability of FAA Airport Design Standards in regard to dual-use commercial spaceport operations at conventional airports.

**Issue 10: Use of Variable Message Airfield Signing**

EMERGING ISSUE:The FAA and airport operators continue to focus on ways to prevent incursions into runways, construction areas, and other closed portions of the airfield.  One idea that has been suggested is the use of variable message signing that would supplement conventional airfield signs to enhance “hot spots” and other key areas.  These programmable signs (similar to those used for roads) could be relocatable or permanently installed.

RESEARCH NEED:Research is needed to investigate the feasibility of installing and operating variable message signs on the airfield and related technologies and consideration of standards.  Technologies may include LED and LCD displays.

**Issue 11: Use of ASDE-X or Surface Multi-lateral System Data in Pavement Management and Evaluation**

EMERGING ISSUE:In the effort to reduce the impact on aircraft operations and the significant airport costs for airfield repairs and rehabilitation, there is a need to improve the quality of the input to pavement managementsystems.   The availability of data to better characterize aircraft flow patterns and repetitions provided by FAA’s ASDE-X system and/or third-party now being installed at larger airports provide an opportunity to improve the fidelity of the assumptions input into pavement management models such as the FAA’s PAVEAIR.  These pavement use history assumptions are often hard to estimate accurately.

RESEARCH NEED:Develop an interface that will allow direct or near-direct downloading to PAVEAIR model (or similar models) from data provided from ASDE-X and third-party surface surveillance systems.

**Issue 12: Runway/Taxiway Separation Standards Reassessment**

EMERGING ISSUE: The steady increase of NLA into the overall commercial aviation fleet is forcing land restricted airports into accepting capacity reductions due to conflicts with runway centerline to taxiway separation standards. As these NLA continue to come on-line and make up a growing proportion of the fleet, these losses in efficiency will dramatically increase.

While much has been done to research taxiway deviations for NLA, a better understanding of runway centerline deviations are needed.

RESEARCH NEED: Research is needed to study runway centerline deviations specifically as they relate to NLA. The number of NLA in the fleet and their operating to multiple facilities worldwide represents a good pool of data. This research should measure a statistically representative number of NLA Runway centerline deviations and the data should be analyzed through a formalized safety risk assessment process. The results of this research should be used to assess existing runway to taxiway and runway width standards for Group VI aircraft and determine the sufficiency of existing requirements.

**Issue 13: Obstruction Standards Reassessment in a NextGen Environment**

EMERGING ISSUE: Aircraft manufacturers and airlines are showing commitments to equipping their fleets with technology that enables them to use more advanced (accurate) approach procedures at airports (RNAV, GBAS). Airports have invested in these technologies only to find that the airspace needed to protect from an obstructions standpoint spans a much wider area than traditional instrument approach technologies. In order for the efficiencies promised by these advanced systems to be realized, airspace protection needs to be commensurate with the accuracy of the technology providing approach guidance.

RESEARCH NEED: Research is needed to look at the improvement of the protected surfaces for these more advanced approach navigation procedures. Specifically, this research should look at existing procedures (airspace separation, closely-spaced parallel operations, etc) and recommend improvements to standards based on the accuracy of these next-generation systems.

**Issue 14: Reassessment of Rationale for Airport Beacons**

EMERGING ISSUE: A continued issue for large hub airports is the constant need to relocate or dedicate valuable land to accommodating the airport beacon. The costs and time needed to plan for, design and relocate for beacons is surprisingly significant. For land constrained airports with active tenant communities, this issue continues to present a problem as airport structures are added or demolished.

RESEARCH NEED: Research is needed to determine the utility of airport beacons as they relate to air navigation, specifically at large airports located in sizable metropolitan (brightly-lit) areas.

**Issue 15: Risk Assessment Processes for Airport Design Standards (related to Issues 12 and 13 above)**

EMERGING ISSUE: As formalized safety risk assessment processes proliferate in the U.S. aviation industry, increasing tensions are arising between historical airport design standards (e.g., those developed without the use of safety risk assessment techniques, including quantitative assessment of risk) and newer generation standards that take these techniques into consideration. Perhaps more problematically, some “new-generation” standards have been developed without apparent assessment of risk, raising the question regarding the safety justification of these standards.

RESEARCH NEED: Research is needed to develop improved guidance regarding risk assessment methods that can be applied in airfield standards development—particularly when these risks are associated with rare or very-rare events for which limited historical records of occurrence are available.

**Issue 16: Airport Data Management**

EMERGING ISSUE: Over the past decade, there has been a proliferation of geospatial, operational, and safety databases pertinent to airport operations, maintenance, safety, and planning. These data are spread across a wide variety of “owners”—including airport operators, airlines, the FAA, and private providers—creating a patchwork of data with varying degrees of accuracy, currency, and accessibility. This patchwork has created duplicative and sometimes conflicting aviation data in areas including airspace obstructions, airport surface surveillance, flight status, safety risk assessment, etc.. It has also raised significant questions regarding who “owns” particular types of data and how the accessibility of critical operational and safety data can be provided to those that have a need for it.

RESEARCH NEED: Research is needed regarding how airport operators, the FAA, and airport users can best manage and use the vast array of geospatial, operational, and safety data that are available both within the FAA and commercially to improve the safety and operational efficiency of the airports within the National Airspace System. This research should look beyond the FAA’s ongoing Airport GIS program to future needs for airport data management.