Introduction
Following its official establishment in May 2017, the USC Airport Pavement Research Program (APRP) has focussed on set-up activities and agreeing research priorities, as well as staff recruitment. As of September 2017, the the program is being supported by:

• Australian Airports Association (AAA) in conjunction with the Department of Defence
• Perth Airport
• Sunshine Coast Regional Council/Sunshine Coast Airport.

Positive discussions continue with other airports.

Staffing
The establishment of the APRP in May 2017 allowed Dr Greg White to be appointed as the program’s Director until 2021. Greg will coordinate the APRP and is the primary point of contact for all APRP matters.

A three-year post-doctoral research position was recently advertised and the preferred candidate will be confirmed shortly and is expected to commence in March 2018.

The post-doctoral researcher will primarily support students in undertaking APRP research projects, as well as undertaking a number of the APRP priorities.

Active and recent projects
The following student and staff projects are currently being completed at USC, either directly under or associated with the APRP.

Comparing Layer Elastic and Published Finite Element Airport Pavement Responses
Undertaken by Warren Smith (undergraduate Civil Engineering student) under the supervision of Dr Greg White

This project was completed in late 2016 and published in 2017, with the aim to determine when layered elastic tools are adequate for airport pavement structural analysis and when the benefits of finite element tools are warranted. The research included comparison of published finite element model calculated pavement response to aircraft loads with equivalent layered elastic model calculated response, including the Australian design tool (APSDS).

Unfortunately, the quantity of well-defined finite element airport pavement modelling publications was restrictive and the analysis was subsequently limited in its scope and the findings were inconclusive. However, the project proved the viability of the concept and our imminent post-doctoral researcher is expected to complete a thorough analysis in collaboration with leading pavement finite element modellers from the University of Illinois, USA, in 2018.

Developing a Performance Based Airport Asphalt Specification
Undertaken by Greg White

This project includes the review of international literature on airport asphalt performance requirements and modification of the traditional prescriptive asphalt specification to provide a performance-based specification for airport asphalt. The project has been supported by the asphalt industry, as well as AAA member airports and leading design firms.

The specification is complimented by example warranty schedules and other contractual documentation, as well as a detailed commentary on its development, detail and intent. Following a final review with asphalt contractors, the specification is expected to be published by the Australian Asphalt Pavement Association (AAPA) and will be revised after 2-3 projects are completed. To date, Proserpine Airport and Dubbo Airport have executed runway resurfacing contracts based on draft versions of the specification and Rockhampton airport is progressing on a similar basis.

The University of the Sunshine Coast gratefully appreciates the support provided by:
Ungrooved Stone Mastic Asphalt for Runway Surfacing

Undertaken by Sean Jamieson (Master of Science in Civil Engineering) under the supervision of Dr Greg White and Dr Adrian MacCallum

The project will adapt the composition of Stone Mastic Asphalt (SMA) used on Australian roads, as well as overseas airports, to develop the Australian airport SMA requirements within the performance-based airport asphalt specification. A number of ‘typical’ mixtures will be produced and tested with the support of the asphalt industry (AAPA members) to validate the mixture design requirements. An airport asphalt resurfacing project, scheduled for the second half of 2018, is currently being sought to allow a small field trial to be constructed and evaluated over time.

Sean will be full time at USC in 2018 and the findings of this project are expected to be available towards the end of 2018 and early in 2019.

Grooved Runway Asphalt Preservation Trials

Undertaken by Scott Wallace and Fraser McLachlan (undergraduate Civil Engineering students) under the supervision of Dr Greg White and with the support of Sunshine Coast Regional Council/Sunshine Coast Airport

Field trials of sand-filled and non-sand-filled preservation or enrichment products currently offered in Australia, applied on the same grooved runway surface at various application rates. Friction, texture and permeability were monitored over six months to determine the short and medium-term impact of the treatments. The sand-filled and non-sand-filled treatment types are compared, as well as the various products offered by Australian contractors. Future work will include an assessment of the long-term efficacy of the various treatments.

Falling Weight Deflectometer Survey for Airport Pavements

Undertaken by Andrew Barbeler (undergraduate Civil Engineering student) under the supervision of Dr Greg White

The first step in a planned series of projects relating to Falling Weight Deflectometer (FWD) use for airport pavements, with a focus on the sensitivity of ELMOD software to deflection results and other assumptions when estimating layer modulus and Pavement Classification Number (PCN). Guidance for the use of FWD for PCN determination will be available in early 2019.

Further research is expected to analyse the variability and reliability of FWD data and the use of work-energy to determine homogenous sections instead of maximum deflection and/or curvature.

Whole of Life Cost Comparison of Rigid and Flexible Airport Pavements

Undertaken by Rohan Kitchen (undergraduate Civil Engineering student) under the supervision of Dr Greg White

Project is estimating the whole of life cost of rigid and flexible airfield pavements constructed to accommodation various design aircraft for a range of subgrade conditions. The aim is to provide guidance to assist airports to assist in determining which pavement type is most appropriately. As well as assessing the sensitivity to various input parameters, the associated risks not considered in pavement thickness design (eg rigid pavement failure due to differential settlement and asphalt surface shear distress) are also being considered.

Reflection Cracking of Concrete Pavement Joints through Asphalt Overlays

Undertaken by Sahar Deilami (part-time PhD student) under the supervision of Dr Greg White and Associate Professor Christophe Gerber

Project will develop a laboratory test machine and protocol for measuring the propagation rate of reflection cracks from joints through asphalt overlays. Once developed, the testing will enable the efficacy and cost-effectiveness of different asphalt mixtures, strain alleviating membranes and geofabric interlayers.

Future research initiatives

The initial setting of the research agenda was discussed in detail at the AAA Pavement Working Group (PWG) meeting held in Sydney on 13 September. The following have been endorsed as future APRP projects/topics:

- Alternates to bituminous binders for airport asphalt surfacing.
- Advanced asphalt test methods for improved characterisation of performance properties.
- Correlations between flexural strength and other properties for airfield concrete mix acceptance.
- Developing instrumentation standards for intelligent airport pavement structures.
- Variation in supply of binder performance and the impact on airport asphalt.
- Foamed bitumen base for expedient airfield pavement upgrades.
- The relevance of asphalt fatigue for airport pavement thickness design.
- The cost of adopting FAA design standards for Australian airports.
- The comparative cost of thick and full depth high modulus asphalt pavements for airports.
- Variability of deflection survey results and their effect on airport pavements.
Industry support and representation

In additional to APRP research and projects, USC APRP staff and students have also supported and represented the Australian airport industry through a range of initiatives, including:

- Pavement engineering inputs to CASA’s MOS 139 review throughout 2017.
- Member and Secretary of the AAA PWG throughout 2017, including telecons and meetings.
- Attended the ICAO Airport Pavement Expert Group meeting (including ACN-PCN changes discussion) in Montreal, Canada, March 2017.
- USC APRP presentation to the NZ Airport Association conference, September 2017.

Research publications

The following papers and articles have been publications in 2017. All publications and associated student theses will be available from the USC APRP webpage once established.

Journal articles


Conference papers


MORE INFORMATION

For more information or to enquire about undertaking an airport pavement-related postgraduate research degree, please contact.
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