ACRP Problem No. 12-07-03

*Runway and Taxiway Pavement Width Requirements for Group VI aircraft*

**ACRP Staff Comments:** No comments offered.

**TRB Aviation Group Committees Comments:** AIRCRAFT/AIRPORT COMPATIBILITY CMTE - Informal feedback suggests that this is an area ripe for study.

**Review Panel Comments:** *Not recommended* — The FAA sets design standards and is examining the possibility of revising Design Group IV standards. Research would benefit only a limited number of airports.

**AOC Disposition:** No funds allocated. No discussion.
I. PROBLEM TITLE
Runway and Taxiway Pavement Width Requirements for Group VI aircraft.

II. RESEARCH PROBLEM STATEMENT
Advisory Circular (AC) 150/5300-13, Airport Design, provides guidance for the planning and design of airports. Many of the standards are based on the airplane design group (ADG). The ADG is a grouping of airplanes based on wingspan and tail height. While many of the design standards have a direct correlation with wingspan and/or tail height there seems to be little correlation between these characteristics and pavement width requirements. For example the new Boeing 747-8 wingspan classifies the aircraft as Group VI. However, it has a main landing gear configuration that is almost identical to the Boeing 747-400 which is classified as a Group V aircraft. The Advisory Circular recommends 150-foot wide pavements for group V aircraft (wingspans less than 214 feet) and 200-foot wide pavements for group VI aircraft (wingspans greater than 214 feet).

Boeing, with the 747-8, and Airbus, with the A380, are currently the only manufacturers that are introducing ADG VI aircraft into the market for commercial service. FAA design standards for these aircraft have been around for some time and were developed before these new larger aircraft were designed and manufactured. Information on the operational characteristics of these aircraft that was not available at the time the standards were developed is now available and should be considered in the development of new standards. The majority of the Commercial Service airports in the county that will receive these aircraft operate Group V 150-foot wide runways. Boeing and Airbus have each contended that their respective airplanes can operate on existing Group V runways and that statistical data collected on the ground operations of these aircraft will show that these Group VI aircraft exhibit less deviation from centerline and therefore can operate safely on pavements designed for Group V aircraft. Upgrading runways across the country with better information and a sounder basis, resulting in a more appropriate design standard, has potential to reduce the need for modification of standards and serve as a more permanent solution, be much more effective, result in savings of millions of dollars in construction, and lessen significant delays to the NAS during construction.

III. OBJECTIVE
The objective of this project is to develop revised Airplane Design Group VI design standards for runway and taxiway widths based on an analytical, scientific or risk based approach. This expands upon the work of ACRP 04-09, which will provide a statistical basis for the standard separations recommended in the Advisory Circulars for aircraft in Groups V and VI, taking into account the performance of aircraft such as the Airbus A380 and Boeing 747-8 and 787 series.

IV. RESEARCH PROPOSED
Gather information that would allow consultant to formulate an approach that leads to a recommendation for runway and taxiway pavement widths. The following are examples of tasks envisioned in this project.

- Consult with the FAA to gain an understanding on the rationale that was used to develop the existing standards. Collect existing information that they have prepared through their research efforts.
- Consult the air carrier operators of the aircraft and the aircraft manufacturers, and collect existing information that has been developed that on the aircraft performance and characteristics.
- Conduct an independent evaluation of the information collected from FAA, manufacturers and air carriers to begin to formulate analytical approach to determining pavement widths and an experiment design for collecting sufficient operating data to allow an analysis of required pavement dimension strings.
- Estimate nationwide cost of runway taxiway improvements. The airports that are anticipating operation of the A380 and
B747-8 can be obtained from manufacturer.

- Develop a risk model that includes benefit cost analysis of improvements.
- Develop a formula to develop recommendations for widths including main pavement, shoulder and blast protection that considers variable airplane characteristics.
V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding:

Funds: $300,000 - $500,000
Contract Time: 18-24 months.

VI. URGENCY AND PAYOFF POTENTIAL

Delivery of the A380 has already begun and the Boeing 747-8 is expected to enter service in 2011. Airport Modifications to Design Standards that have been accepted by the FAA are on the condition that the airport complies with full Group VI standard when the facility (runway or taxiway) is reconditioned or rehabilitated. By today’s standard this would require 200-foot runways and 100 foot wide taxiways. If this research recommends reduced pavement widths for Group VI standards 100’s of millions of dollars in construction fees could be saved. There could also be significant savings in aircraft delays.

VII. RELATED RESEARCH

ACRP 04-09 - Risk Assessment Method to Support Modification of Airfield Separation Standards is currently underway and may offer insight into the development of airfield design criteria for Group V and Group VI aircraft. However, this ACRP will be more comprehensive and will endeavor to establish a statistical linkage between pavement dimensional requirements and observed aircraft performance.

Both the FAA and ICAO are studying the issue of appropriate dimensional requirements for the B747-8, and the FAA is addressing the issue of aircraft compatibility at individual airports on a case-by-case basis through the Modification of Standards (MOS) process. The intent of this ACRP research is to determine if one can transition from a MOS process to a more permanent new standard, which would be based on more in-depth analyses and a more precise identification of the margins of safety required for the aircraft. This would certainly involve studying the data and decisions in the various cases where MOS was applied and looking into common and unique considerations that can help facilitate development of a new and permanent standard. The findings and outcome of this research has potential to provide basis for development of such a new standard, which could benefit FAA, ICAO, airports, and consultants providing solutions to this challenging aircraft-airport compatibility problem. Development of such standard, in turn, could considerably reduce the time and paperwork involved in completing and approving an MOS for each airport, with each MOS being necessarily limited in scope and temporary in effect.

Within recent years, there have been studies on aircraft deviations on taxiways, including:

- Preliminary Analysis Of Taxiway Deviation Data And Estimates Of Airplane Wingtip Collision Probability (Cohen-Nir, Marchi; Transportation Research Record, Issue 1850; 2003)
- Pavement Monitoring and Analysis for Chiang Kai-Shek (CKS) International Airport (Chou, Cheng, Lee; 2007)

Deviation studies that have been conducted by the FAA in recent years include:

- Statistical Extreme Value Analysis of the SFO Taxiway Centerline Deviations for 747 Aircraft (2008)
- Statistical Extreme Value Analysis of the JFK Taxiway Centerline Deviations for 747 Aircraft (2003)
- Statistical Extreme Value Analysis of the ANC Taxiway Centerline Deviations for 747 Aircraft (2003)

Other relevant studies include:

VIII. PERSON(S) DEVELOPING THE PROBLEM

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IX. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Collaborative effort between individuals listed above. In addition, the problem statement was discussed with the TRB’s Aircraft-Airport Compatibility Committee (AV070) members, ASCE Transportation and Development Institute’s Aviation Council, and Airports Consultant Council. The original problem statement was modified taking the feedback from the committee members.

X. DATE AND SUBMITTED BY

Date: March 4, 2011
Submitted by: Mike. Hines, CM

Submit to:

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