U.S. Department
of Tronsportoflon
Federal Aviation Administration

Memorandum

Subject: INFORMATION: Engineering Brief No. 73
Use of Non-Standard 75-Foot-(23-M) Wide Straight Taxiway Sections for Boeing 747-8 Taxiing Operations

Date: December 4,2007

From: Manager, Airport Engineering Division, AAS-100

Reply to Attn. of:

To: All Regions
Attn: Manager, Airports Division

Engineering Brief No. 73, ***Use of Non-Standard 75-Foot Wide Straight Taxiway Sections for Boeing 747-8 Taxiing Operations,*** is attached. Approval authority for modifications to standards (MoS) that complying with the specific conditions of this engineering brief is delegated to the Airports Regional Division Manager.

In general, this aircraft can use existing 75-foot wide taxiways having 35-foot stabilized shoulders. The engineering brief describes the MoS process and the specific conditions for approving such MoSs.

Regional coordination of all proposed Moss is required with the other regional lines-of-business. Upon completion, a copy of the issued MoS is to be sent to the Airport Engineering Division, AAS-100.

Attachment

ENGINEERING BRIEF NO. 73

USE OF NON-STANDARD 75-FOOT- (23-M) WIDE STRAIGHT TAXIWAY SECTIONS FOR BOEING 747-8 TAXIING OPERATIONS

November 27, 2007

A. BACKGROUND

Within the next few years, we expect several U.S. airports to receive Boeing 747-8 aircraft, starting with a cargo version in 2009 and followed in 2010 by a passenger model. Both airplane models are categorized as Airplane Design Group (ADG) VI aircraft. In accordance with FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, the recommended taxiway straight section width for ADG VI equals 100 feet (30 m) with 40-foot (12-m) wide stabilized shoulders. However, most existing taxiway systems at affected airports were built to ADG V standards, which recommend a taxiway straight section width of 75 feet (23 m) with 35-foot (10.5-m) wide stabilized shoulders. In comparison, the overall widths, taxiway plus stabilized shoulders, are 180 feet and 145 feet (55 m and 44 m).

Taxiway Width

In an effort to mitigate operational impacts and airfield upgrades, the Airport Engineering Division, AAS-100, started running field tests in 1999 that focused on taxiway widths for straight sections. Field tests at John F. Kennedy International Airport and at Anchorage International Airport measured the wander rates of Boeing 747s from the taxiway centerline of 75-foot (23-m) taxiways to determine if it would be possible to reduce the 100-foot (30-m) taxiway width standard for all ADG VI airplanes.

Furthermore, several foreign aviation authorities implemented their own taxiway centerline wander field studies to determine if differences existed between taxiing operations in the United States and foreign international airports. The foreign evaluations being cited are those that have been concluded at London Heathrow International Airport, Charles de Gaulle International Airport, Frankfurt International Airport, and just recently, Sydney International Airport. Their independent findings further supported our preliminary observation prior to aircraft certification that taxiway centerline wander of observed aircraft on straight sections was independent of speed and time of day.

Based on our preliminary field test results and international findings, we have determined that it is possible to allow the use of existing non-standard 75-foot- (23-m) wide straight taxiway sections by this airplane on an interim basis under specific conditions. The conditions outlined in paragraph D help ensure the safety of the passengers and crew. One of these conditions is that airport operators submit for FAA review proposed designated Boeing 747-8 taxi routes. This engineering brief does not prohibit airport operators from imposing taxi speed restrictions to address unusual airfield or terminal area conditions.

Stabilized Shoulder Width

The design rationale for shoulder width focuses on maintaining all engines over a taxiway plus stabilized shoulders (overall taxi width) and on minimizing the engine exhaust velocities generated by inner engines during taxiing operations. The latter underlying principle uses the inner engine as compared to the outer engine because of its “closer-to-ground” proximity. This

design rationale further assumes that the airplane fuselage remains on centerline (CL) and that the inner engine exhausts velocity contours for 50 mph (80 km/hr) and 35mph (55 km/hr) fall within the overall taxi width.

Existing Condition - Airplane Design Group V Shoulders

The ADG V design standard for a 35-foot shoulder and a 75-foot wide taxiway provides the Boeing 747-400 [on CL] with an approximate 34-foot stabilized surface buffer to contain both engines with 9-foot engine diameters. For discussion, the distance between the inner engine CL and the fuselage CL is approximately 38 feet [reference *Boeing Document D6-58326-1, 747-400 Airplane Characteristics for Airport Planning*].

Preliminary figure 1, provided by the Boeing Company, shows the physical comparisons between the proposed 747-8 and the existing 747-400 freighter. As illustrated, the CLs for the inner engines are basically collocated but with a slightly larger engine diameter for the 747-8. Preliminary figures 2 and 3 illustrate that the jet engine exhaust velocity contours are similar in width for the taxi at ground idle operation and for the taxi at breakaway operation (stop and go). The significance of the latter preliminary figures is that a 35-foot wide stabilized shoulder is sufficiently wide enough to contain the 50 mph (80 km/hr) engine exhaust velocity contour in addition to containing the broader 35 mph (55 km/hr) contour. Additionally, the overall taxi width has sufficient buffer to account for aircraft wander from CL and a range of crosswinds.

Figure 1. Airplane comparison for the proposed 747-8 and existing 747-400 freighter

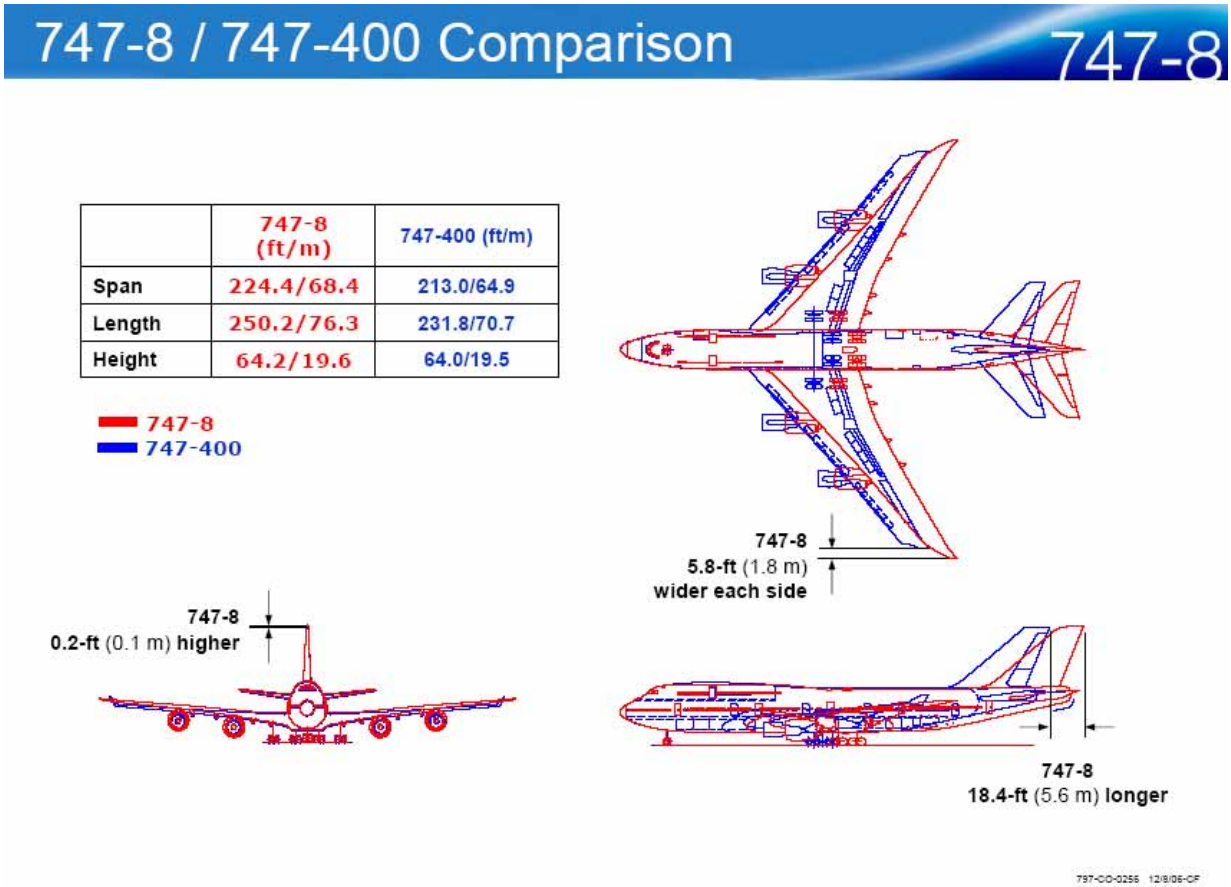


Figure 2. Comparison of Engine Exhaust Velocity Contours at Idle

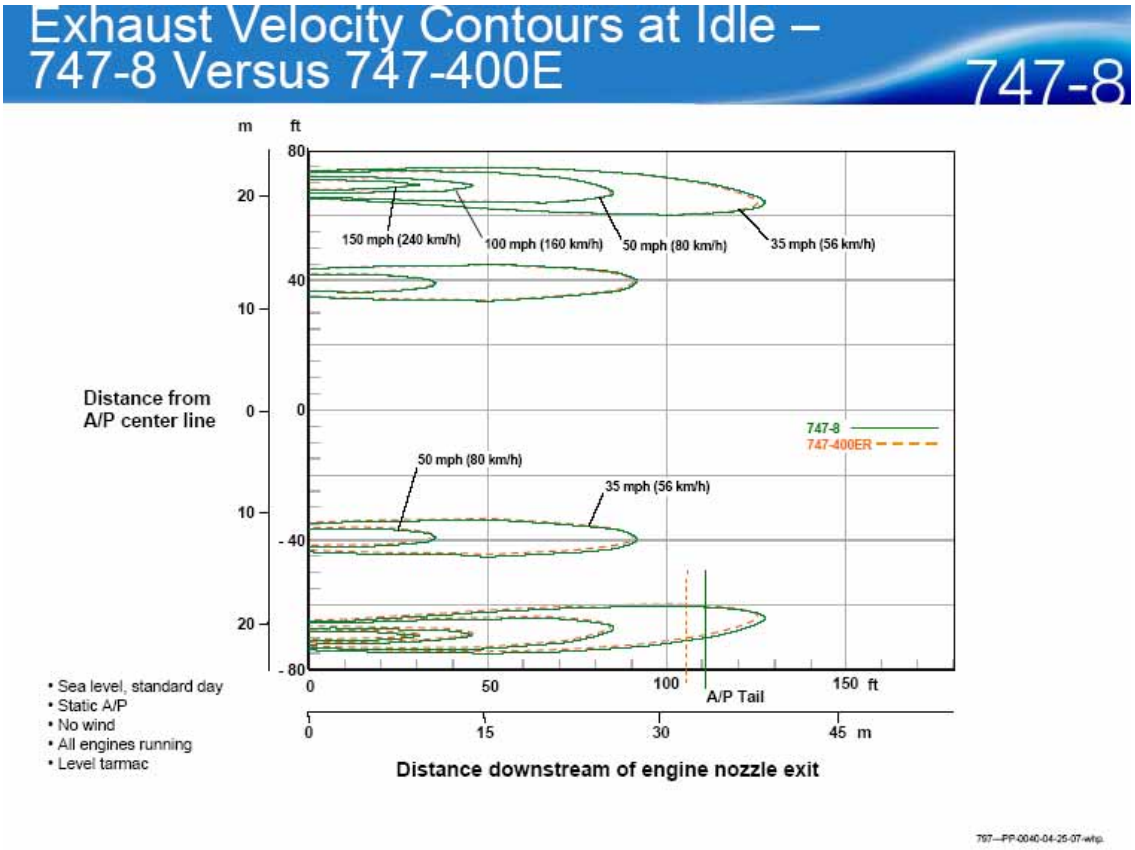
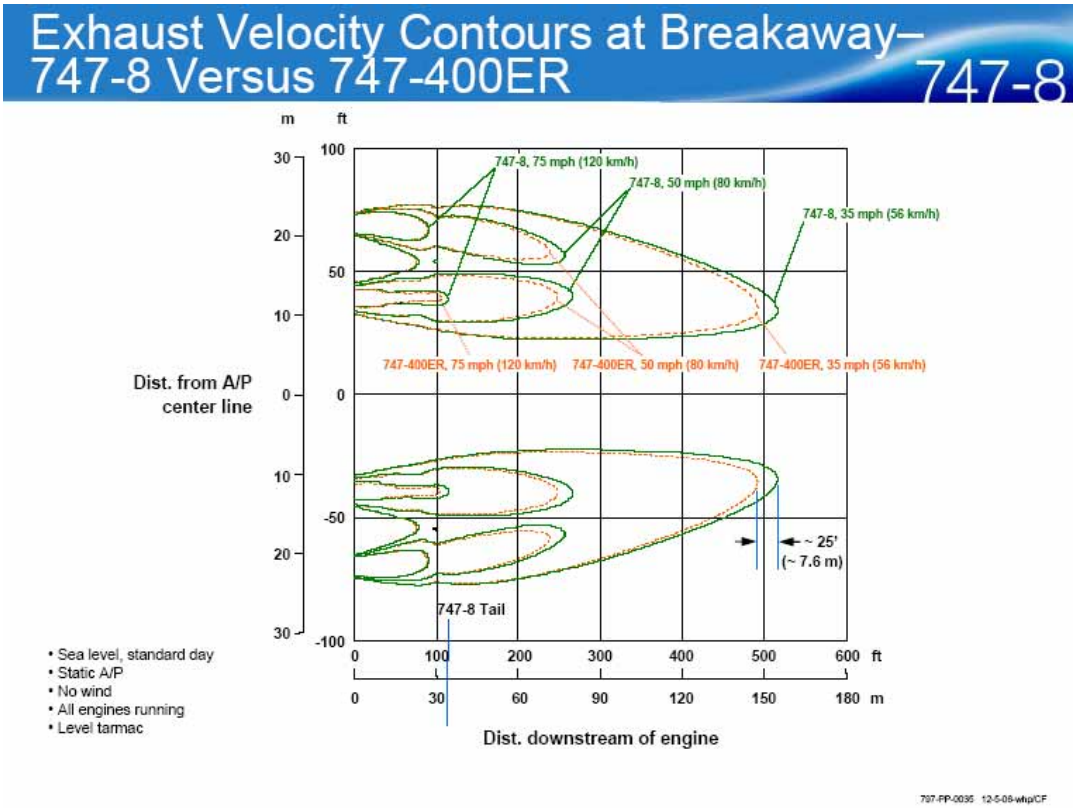


Figure 3. Comparison of Engine Exhaust Velocity Contours at Breakaway



Based on this preliminary information the 145-foot overall taxiway width for ADG V should suffice for taxiing operations of the proposed Boeing 747-8 and its family models.

In summary, the Boeing 747-8 may taxi on existing non-standard 75-foot- (23-m) wide straight taxiway sections whose overall taxi width is at least 145 feet (42 m) by filing a modification to standard (MoS) that references this engineering brief.

B. PURPOSE

This engineering brief allows Airports Regional Division Managers to approve a MoS for Boeing 747-8 using 75-foot- (23-m) wide straight taxiway sections with 35-foot stabilized shoulders. This guidance applies to existing taxiways only. Regional coordination of all proposed MoSs is required with the other regional lines-of-business. Upon completion, a copy of the issued MoS is to be sent to the Airport Engineering Division, AAS-100. New taxiway construction or reconstruction that receives Federal funding under the Airport Improvement Program (AIP) or is approved for the use of Passenger Facility Charges (PFC) are subject to Airplane Design Group VI design standards, as specified in *Advisory Circular (AC) 150/5300-13, Airport Design*.

C. DEFINITIONS

1. Interim Basis. A 5-year evaluation period to observe the in-service taxiing characteristics of Boeing 747-8 family models.

2. Overall Taxiway Width. The sum of the widths of the stabilized shoulders and full-strength taxiway pavement.

D. SPECIFIC CONDITIONS

Approval of modifications to standards for the use of 75-foot- (23-m) wide straight taxiway sections by Boeing 747-8 aircraft are subject to the conditions detailed below.

1. Taxi Routes. Proposed taxi routes should be designated by the airport operator.

2. Overall Taxiway Width. The overall taxiway width on 75-foot taxiways must be at least 145 feet (44 m). Airport operators should construct any additional stabilized shoulder width in accordance with design standards in AC 150/5300-13, *Airport Design*, paragraph 803, *"Shoulders and Blast Pads"* and construction standards in AC 150/5320-6, *Airport Pavement Design and Evaluation*.

3. Jet Blast Effects. All B747-8 designated taxi routes by the airport operator should be evaluated for the effects of jet blast.

a. Pre-B747-8 Service. The FAA will assist the airport operator in identifying areas that will require remedial action(s) to minimize excessive jet blast exposures.

b. **Post-B747-8 Service.** The airport operator should take action to remedy problems due to excessive jet blast exposure in areas not previously identified. The airport

operator should inform the appropriate FAA Airports District or Regional Office of what corrective action(s) was taken to address a troublesome area.

4. Taxiway Bridge and Culvert Load Bearing Capacity. All B747-8 designated taxi routes that cross over a bridge, culvert or such structures should be evaluated for their load bearing capacity to support the maximum design taxi weight of the heaviest B747-8 family model.

5. Excursions from Non-standard Taxiways. Taxiways should be widened to the Airplane Design Group VI design standard wherever repeated excursions from full-strength pavement occur. Damage to surfaces, lighting, or signage should be repaired as soon as possible.

E. NEW TAXIWAYS OR RECONSTRUCTED 75-FOOT WIDE TAXIWAYS

New taxiway construction or reconstruction of a taxiway that receives AIP Federal funding or PFC authority is subject to Airplane Design Group VI design standards, as specified in *AC 150/5300-13, Airport Design,* and construction standards in accordance with *AC 150/5320-6, Airport Pavement Design and Evaluation*. Any proposed deviation from those standards must be approved through the MoS procedures detailed in FAA *ORDER 5300.1, Modifications To Agency Airport Design, Construction, And Equipment Standards.*

Rick Marinelli
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