



Appendix C

**MONTEREY REGIONAL AIRPORT TAXIWAY "A"
RELOCATION RISK ASSESSMENT**

November 4, 2015

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RE: Monterey Regional Airport – Taxiway “A” Relocation Risk Assessment

Dear Mark,

The purpose of this letter is to present the results of a risk assessment for the relocation of a portion of parallel Taxiway “A” which is located south of Runway 10R-28L at the Monterey Regional Airport (MRV). This risk assessment was requested during a June 16, 2015 MRV Airport Master Plan briefing meeting with the Airports Division Manager of the Federal Aviation Administration’s (FAA’s) Western-Pacific Region and his staff. As outlined below, increasing the runway centerline to taxiway centerline distance from 275 feet to 327.5 feet reduces the risk to less than 1.E-07 (1 accident per 10,000,000 landings) and would be considered acceptable to the FAA for purposes of issuing a Modification of Airfield Separation Standards.

Background

As part of the ongoing Airport Master Plan for the Monterey Regional Airport, one of the major issues that needed to be addressed is the 275 foot centerline-to-centerline separation distance between Runway 10R-28L and a ±2,800 foot portion of Taxiway “A” between exit Taxiways “E” and “K”. Because this portion of Taxiway “A” is only 275 feet from the runway centerline, the wingtips of aircraft with wingspans greater than 50 feet operating on Taxiway “A” penetrate the Runway Safety Area (RSA) of Runway 10R-28L. In addition, the Hold Line locations for Taxiways “F”, “G”, “J”, and “K” are located at 200 feet from the centerline of Runway 10R-28L, and are inside the RSA.

According to FAA Advisory Circular (AC) 150/5300-13A (Change 1), the runway centerline to parallel taxiway centerline separation should be 400 feet. However, during the evaluation of alternatives for the Airport Master Plan, it was determined that is was not practicable, or feasible, to relocate Taxiway “A” to the 400 foot separation distance due to various engineering and environmental issues. As a result, the recommendation was to relocate the ±2,800 foot section of

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Taxiway "A" to 327.5 feet which would then be consistent with the separation distance of the balance of Taxiway "A". Moving the $\pm 2,800$ foot section of Taxiway "A" to 327.5 feet would ensure that Airplane Design Group (ADG) III aircraft (wingspans less than 118 feet) could taxi the full length of Taxiway "A" and their wingtips would not penetrate the RSA. In addition, the Hold Line locations for Taxiways "F", "G", "J", and "K" could be moved to 250 feet and remain outside of the RSA. Correcting the RSA issue by relocating a portion of Taxiway "A", however, would limit the apron space available for parking and maneuvering of commercial passenger aircraft directly in front of the existing Passenger Terminal Building. The limited apron space as well as the age (60 plus years) and condition of the Terminal Building resulted in the additional master plan recommendation to construct a new Terminal Building in a new and better location.

Methodology

Because the 327.5 foot runway centerline-taxiway centerline distance does not meet the 400 foot separation distance recommended by FAA's AC, a Modification of Standards (MOS) will need to be approved by the FAA. During a recent meeting between the FAA and the Monterey Peninsula Airport District staff to discuss this issue, FAA requested that the Airport District analyze the reduction of risk associated with moving the $\pm 2,800$ portion Taxiway "A" to the 327.5 distance. Because FAA does not provide any specific guidance on how to quantify the risk associated with the separation between a runway centerline and a parallel taxiway centerline, it was decided that the use of Airport Cooperative Research Program (ACRP) Report 51 (*Risk Assessment Method to Support Modification of Airfield Separation Standards*) would provide the appropriate guidance. According to ACRP Report 51:

"The Risk Assessment Method to Support Modification of Airfield Separation Standards provides a methodology that airports can use to support their request for modification of standards. It is intended to be used in those circumstances where the design criteria for separations between taxiways/taxilanes and (1) other taxiways/taxilanes and (2) fixed or movable objects as well as separations between taxiways and runways cannot be met. This risk-based methodology will be useful to airport staff and their consultants as they assess the risks associated with non-standard separations at existing constrained airports where the standards can't be practicably met."

ACRP Report 51 further states:

"What is the risk if larger aircraft are allowed to operate at these airports with non-standard separations? Currently, there are no risk-based methodologies for assessing such risks, and each situation is treated as a unique case. The FAA may allow operations at airports that do not comply with minimum separation distances by evaluating an MOS submitted by the airport operator. The objective is to keep the airport/aircraft operations at a level of safety equivalent to that achieved by standard separations."

The objective of ACRP Report 51 research effort was to develop a simple and practical methodology for assessing the risk of aircraft collisions associated with non-standard airfield separations. The tool which was developed for analysis is intended to support MOS requests for non-standard separations. The methodology is based on the probability of lateral and vertical deviations from the intended path during landing, takeoff, and taxiing operations. A series of risk

plots based on centerline or wingtip separations is provided for each Aircraft Design Group (ADG), and step-by-step procedures are described for each type of separation involved in the analysis, such as runway and taxiway, and taxiway and taxiway. The methodology was validated using actual MOS cases approved by the FAA that covered a spectrum of scenarios, airports, and FAA regions. Relevant information was gathered by the ACRP consultant for each case to characterize the non-standard situation and was analyzed using the methodology developed in this study. Risk criteria were suggested based on the risk matrix used by the FAA in safety management systems, on the evidence of accident and incident rates, and the consequences gathered in this research effort.

Risk Assessment Results

Based on the guidance provided in ACRP Report 51, two (2) risk assessment scenarios for Monterey Regional Airport were evaluated. The first scenario (Scenario #1) provided an assessment of the risk associated with keeping the centerline of the $\pm 2,800$ foot segment of parallel Taxiway "A" in its present location which is 275 feet from the centerline of Runway 10R-28L. The second scenario (Scenario #2) provides an assessment of the risk associated with relocating the same segment of parallel Taxiway "A" to 327.5 feet. According to the ACRP Report 51, two segments of the aircraft's flight should be evaluated: the segment associated with the airborne (approach) phase, and the ground phase associated with the landing rollout of the aircraft. The takeoff phase is not evaluated because the highest risk condition is for landing. Figure AA-33 of the ACRP Report was used to estimate the risk of collision for the approach phase for Aircraft Design Group III aircraft utilizing a Category I Instrument Landing System (ILS). Figure AA-43 of the ACRP Report was used to estimate the risk of collision for the landing roll-out phase for Aircraft Design Group III aircraft.

Scenario #1 (275 foot separation)

- Probability of an accident during the airborne (approach) phase: 1 accident per 588,235,294 landings (1.7E-9)
- Probability of an accident during the ground (landing rollout) phase: 1 accident per 7,692,307 landings (1.3E-7).

Scenario #2 (327.5 foot separation)

- Probability of an accident during the airborne (approach) phase: 1 accident per 1,333,333,333 landings (7.5E-10).
- Probability of an accident during the ground (landing rollout) phase: 1 accident per 12,048,192 landings (8.3E-8).

According to the ACRP Report, FAA's acceptable level of risk is considered to be less than 1 accident per 10,000,000 landings (1.E-07). As outlined above, the risk associated with the approach phase for both Scenarios is less than 1.E-07. The existing risk for the landing rollout phase is greater than 1.E-07 for Scenario #1 (275 foot separation) and is considered by FAA to be unacceptable. However, increasing the separation to 327.5 feet reduces the risk to less than

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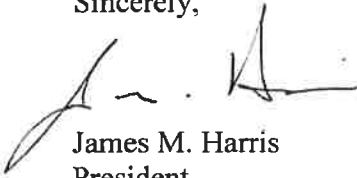
1.E-07 and would be considered acceptable to the FAA for purposes of issuing a Modification of Standards.

Conclusions

Increasing the separation distance from the centerline Runway 10R-28L to the centerline of Taxiway "A" from 275 feet to 327.5 feet reduces the probability of an accident during the airborne (approach) phase by approximately 127 percent. In both cases, the level of risk is less than 1 accident per 10,000,000 landings. However, for the landing rollout phase, the increase in separation distance reduces the probability of an accident by approximately 57 percent and the level of risk is reduced from greater than 1 accident per 10,000,000 landings (**unacceptable**) to less than 1 accident per 10,000,000 landings (**acceptable**). As a result, based on the significant increase in safety resulting from the change in separation distances, the FAA should support a Modification of Airfield Separation Standards for the increase of runway to parallel taxiway centerline separation distance of 327.5 feet.

If you have any questions regarding this evaluation, or if you need additional information, please don't hesitate to give me a call.

Sincerely,

A handwritten signature in black ink, appearing to read "James M. Harris". The signature is stylized with a large initial "J" and a long horizontal stroke.

James M. Harris
President