



Los Angeles  
World Airports

April 29, 2013

LAX  
LA/Ontario  
Van Nuys  
City of Los Angeles

Los Angeles City Council  
200 North Spring Street, Room 395  
Los Angeles, California 90012

Antonio R. Villaraigosa  
Mayor

Honorable Councilmembers:

Board of Airport  
Commissioners

RE: CF13-0285, Los Angeles International Airport Specific Plan Amendment  
Study, Response to Trade, Commerce and Tourism Committee  
Questions

Michael A. Lawson  
President

During the April 9, 2013 hearing on the referenced Council File, the Chair of the Trade, Commerce and Tourism Committee requested that LAWA provide a report on runway safety analyses that have been completed.

Valeria C. Velasco  
Vice President

Joseph A. Aredas  
Robert D. Beyer  
Ann M. Hollister  
Fernando M. Torres-Gil

During the course of the SPAS process, LAWA arranged for a number of independent safety studies related to the LAX north airfield. In response to the Chair's question, we have attached a summary of that prior work.

Gina Marie Lindsey  
Executive Director

We look forward to discussing this with the City Council.

Sincerely,

  
Gina Marie Lindsey  
Executive Director



## Los Angeles International Airport (LAX) North Airfield Safety Studies

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### Summary of Findings Specific Plan Amendment Study

In conjunction with the Specific Plan Amendment Study (SPAS) process, a number of studies addressing the safety of the north airfield at LAX have been conducted.

Seven independent assessments of north airfield safety were completed. The following is a summary of each of these studies.

- ◆ LAX North Airfield Special Peer Review, March 2007 - A special peer review process involving airport industry experts was formed to objectively review the facts concerning the north airfield improvements (i.e., various options for increasing the separation distance between Runways 6L/24R and 6R/24L, adding a centerfield parallel taxiway, and modifying the locations designs of taxiway/runway intersections) and to provide the group's insight and advice on the best solution and way to move forward. The Peer Review Group consisted of 13 aviation experts from the private, airport, and public sector with experience in planning, engineering and operations of major U.S. airports.

The Peer Review Group<sup>1</sup> evaluated the north airfield from the perspectives of operational safety, airfield balance, and efficiencies. They found that there is a definite need for improvements to the north airfield, that doing nothing is not an option, and massive terminal demolition is not feasible. The Group concluded that shifting the northerly runway 340 feet northward offers maximum safety, balance, and efficiency advantages. This option provides for new large aircraft operations, does not impact the apron/gate terminal infrastructure, presents fewer construction phasing impacts, and provides for a full-length center taxiway to promote safe and efficient aircraft landing and takeoff operations.

- ◆ Analysis of LAX North Airfield Alternatives, May 2007 - An analysis of LAX north airfield alternatives was prepared by the International Aviation Management Group, Inc.,<sup>2</sup> an aviation planning firm headed by a professor of Airport Operations and Management from Embry Riddle Aeronautical University. The purpose of this study was to provide expert and objective guidance as to which alternatives being considered for the SPAS at the time (i.e., provide more separation between runways by moving Runway 6L/24R north by either 100 feet or 340 feet, or moving Runway 6R/24L south by either 100 feet or 340 feet, or keeping runways in current locations) were most appropriate for further study as they relate to operational safety, aircraft compatibility, capacity, and environmental considerations.

The study determined that the alternatives that provided an additional runway separation of 340 feet (LAX Master Plan Alternative D [340 feet south] and 340-foot north alternative) were the most appropriate for further study, while the least appropriate alternatives were the no additional separation and the 100-foot south concepts.

- ◆ Los Angeles International Airport North Airfield Assessment, May 2007 - A north airfield assessment was prepared by URS Corporation,<sup>3</sup> a large multi-disciplinary worldwide aviation-consulting and engineering firm. The study examined options for reconfiguring the north airfield to address airfield safety related to runway incursions, the need to accommodate ADG VI aircraft, operational efficiencies, and cost factors.

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<sup>1</sup> DMJM Harris-AECOM and Peer Review Group, LAX North Airfield Special Peer Review, Summary Report, March 2007.

<sup>2</sup> International Aviation Management Group, Inc., Analysis of LAX North Airfield Alternatives, May 2007.

<sup>3</sup> City of Los Angeles, Los Angeles World Airports, Los Angeles International Airport North Airfield Assessment, prepared by URS Corporation, May 2007.

The study concluded that several aircraft types create operational challenges to the existing airfield and that addition of a center taxiway, which could occur if there was more separation between the existing runways, would eliminate several risks and problems. The study recommended, based upon FAA standards, pursuing relocating Runway 6L/24R 350 feet northerly and increasing its runway takeoff length. Current FAA design standards require greater separation between parallel runways and between runways and taxiways than what exists in the north airfield today, to safely and efficiently accommodate larger aircraft.

- ◆ Los Angeles International Airport Modernization - Tomorrow is Now, May 2007 - Twenty-two members of the Airline Pilots Association (ALPA)<sup>4</sup> formed a committee to present their findings and recommendations in a presentation entitled "Los Angeles International Airport Modernization - Tomorrow is Now." ALPA is an international organization of over 60,000 pilots representing over 40 airlines that is heavily engaged in safety issues and improvements for the airline industry.

The ALPA Committee recommended that Runway 6L/24R be relocated northward to provide 623 feet, but not less than 550 feet, of runway to taxiway separation and that mirroring the separation on the south airfield is not an option.

- ◆ LAX North Airfield Proposed Runway Configuration - Safety Risk Assessment, May 2007 - The Washington Consulting Group, Inc. (WCG)<sup>5</sup> led a panel of subject matter experts through a safety risk assessment on the north airfield proposed runway configurations. WCG is an Air Traffic Management Systems and Air Traffic Controller Training firm that is expert in conducting an FAA defined Safety Risk Management (SRM) Study. The SRM panel was to identify operational hazards, analyze associated risks, and establish mitigating strategies to ensure the safe and expeditious management of air traffic and then specifically develop and prioritize improvements that will increase the level of airfield safety.

The analysis by panel produced a list of ten preliminary hazards associated with aircraft operating on the existing north airfield. **Table 4.7.2-5** describes the ten hazards.

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<sup>4</sup> Airline Pilots Association, Los Angeles International Airport Modernization - Tomorrow is Now, May 18, 2007.

<sup>5</sup> Washington Consulting Group, Inc., LAX North Airfield Proposed Runway Configuration - Safety Risk Assessment, May 2007.

Table 4.7.2-5

Preliminary Hazard List from 2007 North Airfield Safety Risk Assessment

Hazard Number	Summary of Hazard Description	Summary of Possible Effect
LAX 001	Aircraft landing on Runway 24R, crossing Runway 24L without Air Traffic Control Tower (Control Tower) clearance at Taxiway (Twy) Y or Twy Z with a non-heavy aircraft departing on 24L.	Reduction of separation by a high severity operational error that could lead to an aircraft collision, large reduction in safety margin, serious or fatal injury, physical distress and excessive workload
LAX 002	Same as LAX 001 above, but with a heavy aircraft departing on Runway 24L.	Same as LAX 001 above
LAX 003	Aircraft landing on Runway 24R, crossing Runway 24L without Control Tower clearance at Twy AA or Twy BB with a heavy aircraft departing Runway 24L.	Significant increase in ATC and Flight Crew workload; reduction in safety margin and physical discomfort of passengers
LAX 004	Same as LAX 003 above, but with a non-heavy aircraft departing on Runway 24L.	Slight reduction in ATC capability, slight increase in Flight Crew workload, reduction in safety margin and physical discomfort of passengers
LAX 005	Arrival and departure occurring simultaneously on Runway 24L.	Reduction of separation by a moderate severity operational error, significant increase in Flight Crew workload, significant reduction in safety margin, physical distress to passengers or possible injury
LAX 006	Arrival and departure occurring simultaneously on Runway 24R.	Same as LAX 005 above
LAX 007	An arrival off of Runway 24R is holding at Twy AA or Twy BB when there is both a departure on Runway 24L and a new (trailing) arrival on Runway 24R, resulting in the aircraft at Twy AA or BB being within an area designated as an Obstacle Free Zone (OFZ).	Reduction of separation by a high severity operational error that could lead to an aircraft collision, large reduction in safety margin, serious or fatal injury, physical distress and excessive workload
LAX 008	Runway 24L in use for (sequenced) arrivals and departures and Taxiway E in use with an Aircraft Design Group (ADG) V aircraft (i.e., B747-400) or ADG VI aircraft (i.e., A380), resulting in the taxiing aircraft tail impeding on the runway OFZ.	Reduction of separation by a moderate severity operational error, significant increase in Flight Crew workload, significant reduction in safety margin, physical distress to passengers or possible injury
LAX 009	Runways 6R/24L and 6L/24R in use with increase of complexity associated with new fleet mix of ADG V/VI aircraft.	Same as LAX 008 above
LAX 010	Runway 24R in use and Aircraft Rescue and Fire Fighting (ARFF) equipment operating in runway safety area northeast of the runway, resulting in ARFF equipment inadvertently being within the runway OFZ.	Slight increase of ATC complexity, no effect on Flight Crew, inconvenience

Source: CDM Smith, 2012, as summarized from Washington Consulting Group, Inc. LAX North Airfield Proposed Runway Configuration - Safety Risk Assessment, May 2007.

The panel evaluated each of the ten risks using the FAA SRM process and data specific to the design and operation of the north airfield, and rated each risk in terms of severity of safety consequences and likelihood of occurrence. The panel then reevaluated each of the ten risks assuming relocation of Runway 6L/24R 340 feet northward with a westward extension for a total length of 10,420 feet, addition of a centerfield parallel taxiway, eastward extension of Runway 6R/24L for a total length of 11,700 feet departure length, and realignment of exit taxiways. In light of these improvements, the risk levels of three of the hazards were eliminated due to the benefits of

a centerfield taxiway, six were reduced, and the one hazard that did not change was a low risk to begin with. **Figure 4.7.2-5** provides a copy of the summary matrix delineating the shifts in existing risk characteristics for the ten hazards if the aforementioned airfield improvements were implemented. The conclusions of the evaluation indicated that the risk reductions associated with those improvements directly relate to the removal of the midfield high speed turnoffs to the immediate and adjacent parallel runway, increased distance between the parallel runways and operational opportunity for large/heavy aircraft to fully clear a runway after landing, and the change to procedures for aircraft taxiing on Taxiway E, as facilitated by and/or associated with, the addition of a centerfield parallel taxiway.

- ◆ LAX North Airfield Safety Study (NASS) - Following the completion of the five studies described above, City of Los Angeles elected officials requested preparation of an additional independent safety study, referred to as the LAX NASS, and formed the North Runway Safety Advisory Committee (NRSAC) composed of LAX stakeholders to oversee the study. The study's objective was to "inform decision makers on the scope and severity of operational safety problems of the north airfield and a range of potential solutions." The primary aim of the study was to estimate as specifically as possible the level of future safety associated with each of the alternate configurations of the north airfield, and, secondarily, look at capacity implications of each. In support of the safety study, LAWA contracted with NASA Ames in May 2008, to perform detailed airfield simulation modeling, and with a six-member Academic Panel in July 2008, made up of distinguished professors and aviation safety efficiency experts from the Massachusetts Institute of Technology; Virginia Polytechnic Institute and State University (Virginia Tech); University of California, Berkeley; George Mason University; and University of Maryland.

The Preliminary NASS Report was released in February 2010, and the Final Report with all supportive documentation was submitted in May 2010.<sup>6</sup> The following were the Academic Panel's main conclusions:

- ◆ The LAX north airfield is extremely safe under the current configuration for the projected 2020 forecast.
  - ◆ New configurations of the north airfield that include increased runway separation and the addition of a centerfield taxiway would reduce by a substantial percentage (40-55 percent) the risk of a fatal runway collision.
  - ◆ Since the baseline level of risk is so low, reducing that risk by a substantial level is of "limited practical importance."
  - ◆ The 340-foot north alternative significantly improves the operational efficiency of LAX and it would improve safety.
  - ◆ Based on safety grounds alone, the Panel found it hard to argue for reconfiguring the north airfield.
- ◆ FAA's Response to the NASS Report - In response to the NASS Report, the FAA's Office of Airports, Office of Accident Investigation and Prevention, Runway Safety Office, Western Pacific Regional Flight Standards Division, and the Air Traffic Organization conducted a detailed review of the study and identified several critical flaws in the assumptions, methodology, and conclusions. In April 2010, the FAA Administrator provided FAA's comments and position on the NASS and the north airfield in a letter to the Mayor of Los Angeles and to Los Angeles World Airports.<sup>7</sup>

The FAA stated that they strongly disagree with the study's main conclusion that reducing the risk of a fatal runway collision is of limited practical importance and the study's conclusion that

<sup>6</sup> Academic Panel, Los Angeles International Airport North Airfield Safety Study, May 11, 2010.

<sup>7</sup> Babbitt, Randolph J., FAA Administrator, Letter to Mayor Villaraigosa, Los Angeles International Airport North Airfield Safety Study, April 2, 2010.

reconfiguring the north airfield on the grounds of safety alone is not a compelling argument. Besides taking issue with several of the assumptions, methodologies, and uses of data in the report, the FAA made the following statements:

- ♦ The only complete and single-most significant solution for LAX's safety and efficiency needs must include airfield geometry designed to accommodate modern aircraft. Everything possible must be done to make the north airfield as safe as it can be.
- ♦ North airfield safety and efficiency would be greatly improved by further separating the two runways and constructing a center taxiway between them. This would address equally important issues of standards, safety, and efficiency.
- ♦ FAA firmly believes the 40-55 percent reduction in risk would be more than sufficient justification for the reconfiguration of the north airfield on safety grounds alone.

### **Interim Taxiway Safety Improvement Project (ITSIP)**

As a result of the north airfield evaluations described above and the short-term technological improvements that have already been implemented at LAX as also described above, the LAWA Board of Airport Commissioners (BOAC) requested that additional interim improvements in airfield design, and subsequent risk assessment to address as many identified hazards as possible, go forward while the long-term future layout for the north airfield continues to be addressed through SPAS. The main goals and objectives of the subject assessment, referred to as the Interim Taxiway Safety Improvement Project (ITSIP), were to identify changes to the existing north airfield that would mitigate, or lessen the degree of, identified airfield hazards and reduce the level of safety risk without adversely affecting operational efficiency and Runway Occupancy Time (ROT).

In November 2007, the FAA released Engineering Brief No. 75, *Incorporation of Runway Incursion Prevention into Taxiway and Apron Design*,<sup>8</sup> that contained design recommendations for exit taxiways between runways to promote safety. Particularly applicable to ITSIP were the preferences for aircraft to cross in the last third of the runway and to have a 90 degree angle at the intersection of a taxiway and runway in order to enhance pilot visibility to the end of the runway to be crossed. Using this guidance as well as other modeling analysis, several airfield concepts were developed and evaluated using the SRM process. The results were recorded in a July 2010 Comparative Safety Risk Assessment Interim Taxiways Safety Improvement Project Report<sup>9</sup> prepared by Ricondo & Associates, in association with CDM, Johnson Aviation, and WCG.

An LAX Safety Panel, comprised of subject matter experts assembled to develop recommendations for the ITSIP design, concluded that relocating Taxiways Y and Z from their current locations to new locations further east and west, respectively, would be a less hazardous situation and reduce the likelihood of a collision. This airfield design change would lower the risk of two identified hazards from a medium risk to a low risk classification.

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<sup>8</sup> U.S. Department of Transportation, Federal Aviation Administration, Engineering Brief 75: Incorporation of Runway Incursion Prevention into Taxiways and Aprons, November 19, 2007.

<sup>9</sup> Ricondo & Associates, Inc., Comparative Safety Risk Assessment Interim Taxiways Safety Improvement Project, July 2010.

Figure 4.7.2-5

Residual Risk Management Matrix from 2007 Safety Risk Assessment

Severity Likelihood	No Safety Effect 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A					
Probable B					
Remote C			▲ LAX 005 ▲ LAX 008 ▲ LAX 009		
Extremely Remote D		▲ LAX 003 ▲ LAX 004 ▲ LAX 010	▲ LAX 006	▲ LAX 001 ▲ LAX 002 ▲ LAX 007	
Extremely Improbable E					*

\* Unacceptable with Single Point and Common Cause Failures

High Risk
Medium Risk
Low Risk

## Aviation Accidents, Incidents, and Runway Incursions at LAX

Information regarding accidents, incidents, and runway incursions at LAX was obtained from the FAA ASIAS System, NTSB Accident Database and Synopses, and LAWA. **Table 4.7.2-6** presents the accident history of LAX for the 11-year period ending in the year 2011. As shown in **Table 4.7.2-6**, between 2001 and 2011, there were 12 accidents at LAX, with no loss of life occurring in any of the accidents. **Table 4.7.2-7** presents the incident and runway incursion history of LAX including severity of runway incursions. Factors affecting the severity of a runway incursion include: proximity of the aircraft and/or vehicle; geometry of the encounter; evasive or corrective action; available reaction time; environmental conditions; and factors that affect system performance.<sup>10</sup>

**Table 4.7.2-6**

**Aircraft Accidents at LAX (2001-2011)**

Year	Accidents	Fatal Injuries	Location
2001	0	0	--
2002	0	0	--
2003	1	0	West Helipads
2004	1	0	In-flight
2005	3	0	South Airfield(2), In-flight(1)
2006	0	0	--
2007	1	0	South Airfield
2008	2	0	Taxiway(1), Gate(1)
2009	1	0	Gate
2010	2	0	Gate(1), In-flight(1)
2011	1	0	Gate

Source: National Transportation Safety Board, Accident Database and Synopses, Available: <http://www.nts.gov/aviationquery/index.aspx>, accessed December 19, 2011.

<sup>10</sup>

U.S. Department of Transportation, Federal Aviation Administration, Aviation Safety Information Analysis and Sharing System, Available: [http://www.asias.faa.gov/portal/page/portal/asias\\_pages/asias\\_home/](http://www.asias.faa.gov/portal/page/portal/asias_pages/asias_home/), accessed December 15, 2011.

Table 4.7.2-7

## Runway Incursions/Incidents at LAX (2001-2011)

Year	Runway Incursions								Incidents <sup>5</sup>	
	Category A <sup>1</sup>		Category B <sup>2</sup>		Category C <sup>3</sup>		Category D <sup>4</sup>		North Airfield	South Airfield
	North Airfield	South Airfield								
2001	0	0	0	1	0	3	0	4	4	9
2002	0	0	0	2	1	1	0	2	1	8 <sup>6</sup>
2003	0	0	0	0	0	1	2	8	2	3
2004	0	0	1 <sup>9</sup>	0	0	2	1	1	0	5
2005	0	0	0	0	0	1	1	4	5	6
2006 <sup>7</sup>	0	1	0	1	0	0	2	4	0	3 <sup>8,10</sup>
2007	0	0	2	0	1	2	2	5	2	12 <sup>8</sup>
2008	0	0	0	0	2	0	1	4	0	0
2009	0	0	0	0	0	4	3	2	2 <sup>8</sup>	0
2010	0	0	0	0	3	7	1	2	0	3
2011	0	0	0	0	7	4	1	6	0	0

<sup>1</sup> Category A = A serious incident in which a collision was narrowly avoided.

<sup>2</sup> Category B = An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.

<sup>3</sup> Category C = An incident characterized by ample time and/or distance to avoid a collision.

<sup>4</sup> Category D = An incident that meets the definition of a runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.

<sup>5</sup> Annual number of incidents listed include those listed on FAA's ASIAs System which had an overall higher number of incidents listed than LAWA.

<sup>6</sup> Of the eight incidents that occurred in 2002, seven occurred in the south airfield. It is unknown where the incident on February 1, 2002 occurred. For purposes of this table, this incident has been included in the total for the south airfield.

<sup>7</sup> FAA had one of the events from 2006 listed as an "incident," whereas LAWA had the same event listed as a runway incursion, Category D. For purposes of this table, this event is counted as an incident.

<sup>8</sup> Of these incidents, one was only listed on the NTSB Accident Database and Synopses as "incidents" and it is therefore included in this total.

<sup>9</sup> FAA and LAWA identified the event on August 19, 2004 as a runway incursion, category B while the NTSB identified the same event as an incident. For purposes of this table, it is included as a runway incursion, Category B.

<sup>10</sup> The incident from NTSB included here did not occur on the north or south airfield, rather while the plane was in-flight. For purposes of this table, it is included in the south airfield total.

Sources: Federal Aviation Administration, [Aviation Safety Information Analysis and Sharing System](http://www.asias.faa.gov/portal/page/portal/asias_pages/asias_home/), Available: [http://www.asias.faa.gov/portal/page/portal/asias\\_pages/asias\\_home/](http://www.asias.faa.gov/portal/page/portal/asias_pages/asias_home/), accessed December 15, 2011; LAWA, LAX Airport Operations, 2011; National Transportation Safety Board, [Accident Database and Synopses](http://www.ntsb.gov/aviationquery/index.aspx), Available: <http://www.ntsb.gov/aviationquery/index.aspx>, accessed December 19, 2011.

As of October 2007, FAA has been using the definition for a runway incursion adopted by the International Civil Aviation Organization (ICAO): "Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft." The biggest difference between the ICAO definition and the definition previously utilized by the FAA is that ICAO defines a runway incursion as any unauthorized intrusion onto a runway, regardless of whether or not an aircraft presents a potential conflict. For the FAA, an incident without an aircraft in potential conflict -- such as an unauthorized aircraft crossing an empty runway -- was previously defined as a "surface incident" and not a runway incursion. The new definition means that some incidents formerly classified as surface incidents are instead classified as C or D category runway incursions, which are low-risk incidents with ample time and/or distance to avoid a collision. The classification of the most serious kinds of runway incursions, Categories A and B, remains unchanged.<sup>11</sup>

<sup>11</sup> U.S. Department of Transportation, Federal Aviation Administration, "Fact Sheet - FAA Adopts ICAO Definition for Runway Incursions,"

As such, the data in **Table 4.7.2-7** indicate that the number of Category C incursions on the south airfield increased following completion of the SAIP, compared to prior years; however, that comparative increase is the result of the definition change and is not a reflection of actual events, as evidenced by the concomitant decrease in the number of (surface) incidents listed after 2007 for the south airfield. Prior to the change in definition, surface incidents included events such as aircraft not following a prescribed route as instructed by ATC, as well as the improper movement of aircraft onto the runway where there was no conflict with arriving or departing aircraft. The first incident described above occurred on a taxiway whereas the second occurred on a runway. Under today's definition, surface incidents that remain incidents would be those events that fall outside the new definition of a runway incursion: "Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft" such as the aircraft not following a prescribed route. In essence, surface incidents would entail all events that occur outside the runway environment.