

MEMORANDUM
Ricondo & Associates, Inc.

VIA E-Mail

Date: December 5, 2007

To: Jon Woodward, Landrum & Brown

CC: Terry English, FAA; Stephen Smith, R&A, Sandra Kunz, CAC

From: Chris Jones, R&A _____

Subject: BOS – Response to Question on Divergent Departure Heading Procedures

The following information is being provided in response to questions asked by members of the CAC regarding the use of “fanned” departure procedures as noise abatement measures. The original questions have been somewhat modified to better provide satisfactory answers. For example, one question requested information on how “fanned” departure noise abatement measures affected the noise environment within the DNL 60 contour. In general, this information is not readily available as DNL 65 is the federally mandated threshold of significance for noise, and is the focus of most Federal Aviation Regulation (FAR) Part 150 studies. Furthermore, population figures regarding noise reduction associated with just the “fanned” heading measure was not evaluated in all but one of the Noise Compatibility Plans the Project Consultant (PC) was able to obtain. Those airports that utilize fanned departure headings and that have Noise Compatibility Plan documents readily available are included in this memorandum and discussed in further detail below.

1. What is a fanned departure procedure? Does it have an efficiency enhancing effect?

Fanned, or divergent departure procedures, are procedures whereby departing aircraft are assigned headings that are 15-degrees or more to the right or left of the heading assigned to the previous aircraft departing from the same or a parallel runway. As aircraft move further away from the airport, their fanned headings result in increased separation between aircraft, allowing for quicker departure of other aircraft waiting to depart. Joe Davies, Manager of the Boston TRACON, has also provided further information related to divergent departure headings.

Divergent departure headings maximize runway capacity, thus reducing delay and increasing efficiency. From a noise abatement perspective, divergent headings allow for a distribution of noise over a wider area by dispersing aircraft that might otherwise utilize a narrower corridor, thus concentrating noise in a particular area. While the procedure is used at many airports to increase efficiency, it may be considered for noise abatement.

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2. Where is fanning being used successfully as a noise abatement procedure at a major airport in proximity to a densely populated city like Boston? How has the fanning procedures affected the noise environment surrounding the Airport?

Large airports similar to Logan International Airport that utilize dispersed departure headings include Detroit Metropolitan Wayne County Airport, Minneapolis-St. Paul International Airport, and Cleveland Hopkins International Airport. In addition, fanned departure headings have been proposed for Newark Liberty International Airport and Philadelphia International Airport as part of the New York/New Jersey/Metropolitan Philadelphia Airspace Redesign project. Each airport, their location, procedures utilized, and the resulting effects on noise are described in greater detail below.

Detroit Metropolitan Wayne County Airport (DTW): DTW is located 20 miles southwest of downtown Detroit within the City of Romulus. Seven municipalities and five townships are located within a five mile radius of the Airport. The Airport operates six runways, three passenger terminals, and 150 aircraft gates. According to 2006 statistics collected by Airports Council International (ACI), in terms of passenger traffic, DTW was the 11th busiest airport in North America, and the 20th busiest airport in the world. In terms of operations, DTW was the 11th busiest airport in North America and the 13th busiest airport in the world. In comparison, for the same year, Boston Logan International Airport was the 17th busiest airport in North America and the 23rd busiest airport in the world.

DTW currently utilizes divergent departure procedures for both northbound and southbound traffic from Runways 3R/21L and 3L/21R. Northbound departures are assigned headings between 350 degrees clockwise and 050 degrees, and southbound departures are assigned headings between 185 degrees clockwise and 225 degrees. These noise abatement procedures were created in response to noise complaints resulting from changes in airspace implemented by FAA in 1989. In 1990, a technical working group was formed to review potential noise abatement procedures that might minimize noise impacts to communities surrounding the Airport. Following a 180-day test, the current divergent heading procedures were implemented.

Table 1 shows information provided in the 1992 Noise Compatibility Plan for DTW. Data compares the noise impacted population under 1992 conditions, forecast 1997 conditions, and forecast 1997 conditions with the noise abatement procedures implemented. The noise abatement procedures included with forecast 1997 conditions include only the divergent departure procedures utilized off Runways 3R/21L and 3L/21R.

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Table 1

DTW – Noise Impacted Population

<u>DNL Contour Band</u>	<u>1992 Actual</u>	<u>Forecast 1997¹</u>	<u>1997 with ATC Procedures¹</u>
DNL 75+	400	290	340
DNL 70-75	2,450	1,800	1,290
DNL 65-70	8,750	8,280	7,570
Total	11,600	10,370	9,200

1/ Includes forecast increase of operations from 396,278 to 542,130 in 1997 and completion of DTW Master Plan projects, including 2nd crosswind and fourth parallel runway.

Source: Detroit Metropolitan Wayne County Airport Noise Compatibility Plan, 1992.
Prepared by: Ricondo & Associates, Inc.

As shown in Table 1, under forecast 1997 conditions, implementation of the noise abatement procedures results in a reduction of 1,170 people exposed to noise levels of DNL 65 or higher. This indicates that the divergent heading departure procedures result in a reduction in the number of people exposed to incompatible levels of noise.

Minneapolis-St. Paul International Airport (MSP): MSP is located approximately 12 miles from downtown Minneapolis and 8 miles from downtown St. Paul. The airport is situated between the Twin Cities and their southern suburbs of Bloomington, Eagan, Richfield and Mendota Heights. The Airport operates four runways and two passenger terminals. According to ACI's 2006 statistics, in terms of passenger traffic, MSP was the 12th busiest airport in North America and the 21st busiest airport in the world. In terms of operations, MSP was the 12th busiest airport in North America and the 15th busiest airport in the world.

MSP utilizes a Straight-Out Departure Procedure to relieve noise impacts to members of the community who reside at the opposite end of Runways 30L/R. This procedure recommends that when conditions are permissible, Air Traffic Control (ATC) provide headings other than the extended runway heading for aircraft departing from Runways 30L/R. This procedure allows for three primary divergent headings of 90, 105, and 120 degrees in a 30 degree corridor. Dispersing aircraft departing from Runways 30L/R via these headings results in a reduction in the frequency of overflights and thus abates noise impacts for these residents.

MSP conducted a F.A.R. Part 150 Study Update in 2004. Noise resulting from aircraft operations at MSP was evaluated for 2002 existing conditions and a 2007 future baseline year that included operations on the then under construction Runway 17/35. The DNL contours developed were based on conditions that included implementation of all noise abatement procedures at MSP, including the Straight-Out Departure Procedure. Therefore, data showing noise effects for only the Straight-Out Departure Procedure is not available. However, because of its effectiveness, the study update

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recommended that the noise abatement procedure be retained in the Noise Compatibility Plan. This would indicate that utilization of the noise abatement measure helped reduce the number of noise sensitive receptors exposed to noise levels of DNL 65 or higher.

Cleveland Hopkins International Airport (CLE): CLE is located approximately nine miles from downtown Cleveland and is the largest airport in Ohio. The Airport operates three runways and one main passenger terminal. According to ACI's 2006 statistics, CLE was the 37th busiest airport in North America in terms of passenger traffic.

CLE currently utilizes two noise abatement measures that include divergent departure headings. These noise abatement procedures were initially approved in the 1987 Noise Compatibility Plan adopted by the Airport and recommended for continued use in the 2000 comprehensive update to the Airport's Noise Compatibility Plan. The noise abatement measures are described as follows:

- NA-3: Equitably turn jet departures from Runways 5L/5R, between 6:00 a.m. and 11:00 p.m., left to headings within a corridor between 360 and 035 or right to headings within a corridor between 065 and 095 , until reaching five miles from the Airport or an altitude of 5,000 feet above MSL.¹
- NA-4: Equitably turn jet departures from Runways 23L/23R, between 6:00 a.m. and 11:00 p.m., left to headings within a corridor between 190 and 220 or right to headings within a corridor between 250 and 280, until reaching five miles from the Airport or an altitude of 5,000 feet above MSL.²

These procedures were implemented to alleviate noise impacts to residents near the ends of Runways 5L/23R and 5R/23L, as well as people living in outlying areas along the extended centerlines. The procedures are voluntary and utilized between the hours of 6:00 am and 11:00 pm.

The noise analysis conducted for CLE's 2000 FAR Part 150 Study Update compares 1999 existing conditions and 2006 baseline conditions to 2006 conditions with implementation of CLE's Noise Compatibility Plan, including the above described noise abatement measures. The DNL contours developed were based on conditions that included implementation of all noise abatement procedures at CLE. Therefore, data reporting noise reduction effects for just the above described noise abatement measure is not available. However, because of its effectiveness, the study update recommended that the noise abatement procedures, slightly modified, be retained in the Noise Compatibility Plan. The recommended modifications were as follows:

¹ Cleveland Hopkins International Airport, *F.A.R. Part 150 Study Update*, Pg. 3-18, February, 2000.

² *Id.*, Pg. 3-19.

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- NA-3: Modified measure which designates two corridors for takeoffs to the northeast and defines a distance or altitude for the second turn point. This alternative is designed to modify a previous measure that called for an equitable fan-out of departures to the northeast and southwest. This measure directs some of the departure noise away from areas that are subjected to the noise patterns from aircraft arriving to Runways 23L/23R. This action still utilizes the fan-out procedures implemented under the previous FAR Part 150 Study, but modifies them by redefining the corridors for departures.
- NA-4: Modified measure that designates two corridors for takeoffs to the southwest and also sets a distance or altitude requirement for the second turn point. This measure modifies the existing procedures by allowing the tower controllers to assign a departure heading to the aircraft prior to takeoff. This will allow pilots to implement the first turn closer to the Airport than the current procedure. This should redirect a portion of the departure noise away from areas already subjected to arrival noise to Runways 5R/5L. This alternative modifies a previous measure that called for an equitable fan-out of departures to the southwest.³

The modifications included in the 2000 Noise Compatibility Plan generally refined the divergent departure heading procedures used for noise abatement purposes. Their continued inclusion indicates that utilization of the noise abatement measure helped reduce the number of noise sensitive receptors exposed to noise levels of DNL 65 or higher.

Newark Liberty International Airport (EWR): EWR is located in northeastern New Jersey, approximately 16 miles from New York City. The airport currently operates three runways and three passenger terminals. According to ACI's 2006 statistics, in terms of passenger traffic EWR was the 10th busiest airport in North America and the 19th busiest airport in the world. From an operations perspective, as of 2006 EWR was the 13th busiest airport in North America and the 16th busiest airport in the world.

In July 2007, FAA completed an Environmental Impact Statement (EIS) for the New York/New Jersey/Philadelphia Metropolitan Area Airspace Redesign (the Airspace Redesign). The preferred alternative in the Airspace Redesign called for use of divergent departure headings at EWR to increase efficiency for both the airport and the airspace surrounding the airports. The EIS for the Airspace Redesign described the proposed procedures as follows:

At EWR the Preferred Alternative called for use of three initial jet departure headings when the Airport was operating in the southwest flow configuration (departures from Runways 22L/R). These headings were included in the Preferred Alternative to improve operational efficiency because EWR effectively uses only one jet departure heading under current conditions. The noise analysis of the Preferred Alternative showed that use of the fanned

³ Id., Pg. I-11.

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headings would potentially cause noise impacts. Therefore, opportunities to mitigate noise impacts associated with the fanned headings were explored. Alternative headings, different numbers of headings, limited use of headings and routing over water were considered.⁴

Following evaluation of a two different scenarios, divergent departure headings that would reduce noise impacts while increasing operational efficiency at EWR were identified. In addition, conditions were placed on when the departure headings would be deemed acceptable for use. The final headings and the conditions under which their use would be acceptable are as follows:

- Light Demand - Uses single 190 heading like current conditions.
- Moderate Demand - Uses two departure headings of 215 and 239.
- Heavy Demand - Uses three departure headings of 215, 239, and 263.
- At night (10:30 pm – 5:59 am) the headings use 190 heading only and route traffic over the ocean.⁵

Table 2 shows the number of people who would experience noise impacts under the final mitigated headings included in the Preferred Alternative compared to the No Action alternative. The future project year is 2011.

Table 2

EWR Fanned Departure Headings - Noise Impacts (2011)

	DNL Noise Exposure		
	DNL 65 +	DNL 60 to 65	DNL 45 to 60
Minimum Change in DNL	1.5 DNL	3.0 DNL	5.0 DNL
Noise Increase - Preferred Alternative	0	16,803	19,357
Noise Decrease – Preferred Alternative	3,201	1	0

Source: New York/New Jersey/Philadelphia Metropolitan Airspace Redesign Draft EIS, Noise Mitigation Report, 2007.
Prepared by: Ricondo & Associates, Inc.

The divergent departure headings proposed for EWR would result in no significant noise impacts and a reduction of 3,201 people currently experiencing incompatible noise impacts. A total of 36,160 people would experience slight to moderate noise impacts.

This procedure has not yet been implemented by the FAA.

⁴ Federal Aviation Administration, *New York/New Jersey/Philadelphia Metropolitan Airspace Redesign Draft EIS*, Pg. 5-21, July 2007.

⁵ Id.

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Philadelphia International Airport (PHL): PHL is located approximately seven miles from downtown Philadelphia and currently operates four runways and seven passenger terminals. According to ACI's 2006 statistics, in terms of passenger movement, PHL was the 16th busiest airport in the United States 28th busiest airport in the world. In terms of operations, PHL was the 9th busiest airport in North America and the 10th busiest airport in the world.

PHL, like EWR, was included in the Airspace Redesign project for which an EIS was completed in July 2007. The Preferred Alternative in the Airspace Redesign called for use of divergent departure headings at PHL to increase efficiency for both the Airport and the airspace surrounding the Airport. The EIS for the Airspace Redesign described the proposed procedures as follows:

At PHL the Preferred Alternative called for use of six initial jet departure headings in the east flow configuration (Runways 9L/R) and seven jet departure headings in the west flow configuration (Runways 27L/R). These fanned headings were designed in the Preferred Alternative to improve operational efficiency because PHL effectively uses only one jet departure heading under current conditions in each direction of flow. Because noise analysis completed for the Draft EIS showed that use of the fanned headings would potentially cause noise impacts, a strategy for mitigation was developed to investigate reducing the number of headings and alternative headings that locate overflights over more compatible areas. Additionally, a mitigation strategy was designed for nighttime departures to use only the current over-river departure heading when traffic levels are low enough such that operational efficiency would not be compromised.⁶

The FAA evaluated a number of different combinations of divergent departure headings to identify which ones would reduce noise impacts while increasing operational efficiency. The final headings and the conditions under which their use would be acceptable are as follows:

- East Flow –
 - Uses 4 departure headings, 081, 096, 112, and 127 during daytime hours, and
 - Uses 1 departure heading of 085, like current conditions during nighttime hours.
- West Flow –
 - Uses 3 departure headings of 230, 245, and 268 during daytime hours.
 - Uses 1 departure heading of 255, like current conditions during nighttime hours.⁷

⁶ Federal Aviation Administration, *New York/New Jersey/Philadelphia Metropolitan Airspace Redesign Draft EIS*, Pg. 5-23, July 2007.

⁷ Id.

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Table 3 shows the number of people who would experience noise impacts under the final mitigated headings included in the Preferred Alternative compared the No Action alternative.

Table 3

PHL Fanned Departure Headings - Noise Impacts (2011)

	DNL Noise Exposure		
	DNL 65 +	DNL 60 to 65	DNL 45 to 60
Minimum Change in DNL	1.5 DNL	3.0 DNL	5.0 DNL
Noise Increase - Preferred Alternative	0	0	6,920
Noise Decrease – Preferred Alternative	0	0	67

Source: New York/New Jersey/Philadelphia Metropolitan Airspace Redesign Draft EIS, Noise Mitigation Report, 2007.
Prepared by: Ricondo & Associates, Inc.

The divergent departure headings proposed for PHL would result in no significant noise impacts. A total of 6,920 people would experience slight to moderate noise impacts and 67 people would experience slight to moderate relief from noise.

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