



Heathrow Airport Joining Point Distance Analysis for 2017

Heathrow Airspace and Noise Performance Team

Heathrow
Making every journey better

Executive summary

Summary of average Joining Point (JP) distance from runway threshold for 2017		
Variation	Overall	JP = 13.9 nautical miles (NM) JP distance increased between 2001-2009 JP distance reduced between 2011-2014 JP distance increasing since 2015
	Runway	Easterly operations JP was closer for 09L than in 2016 JP for 09L is closer than for other runway ends JP was closer for 09R than in 2016
		Westerly operations JP was slightly farther out for both 27L and 27R than in 2016
	Arrival rate	JP was farther out than average with less than 17 arrivals/hour JP was closer when utilisation was between 30 and 48 arrivals/hour
	Day vs. Night	JP was farther out at night
	Season	JP was farther out during the Winter Season
	Wake category	JP was farther out for Small & Light aircraft JP was closer for Super & Upper aircraft
	Weather	JP was farthest when there were headwinds JP was typically farther out when disruptive conditions were present

Introduction

- This slide pack represents an update of the Joining Point study undertaken by NATS last year. The focus of the updated version is the analysis of 2017 data on its own and in relation to previous years' trends as elaborated in the previous version.

In assessing the Joining Point the primary areas of evaluation to understand the impact on changes in Joining Point were as follows:

- Time of year/season
- Time of day
- Arrival rate and utilisation
- Traffic type by wake vortex category
- Weather conditions

Additionally, variations by runway end were assessed.

Definition

- (a) Between 0600 and 2330 hours (local time) where the aircraft is approaching Runway 27 (L or R) and is using the ILS in IMC or VMC it shall not descend on the glidepath below an altitude of 2500 ft (Heathrow QNH) before being established on the localizer, nor thereafter fly below the glidepath. An aircraft approaching without assistance from the ILS shall follow a descent path which will not result in its being at any time lower than the approach path that would be followed by

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an aircraft using the ILS glidepath, and shall follow a track to intercept the extended runway centre-line at or above 2500 ft.

- (b) Between 2330 and 0600 hours (local time) where the aircraft is approaching runway 27 (L or R) and is using the ILS in IMC or VMC it shall not descend on the glidepath below an altitude of 3000 ft (Heathrow QNH) before being established on the localizer at not less than 10nm from touchdown, nor thereafter fly below the glidepath. An aircraft approaching without assistance from the ILS shall follow a descent path which will not result in its being at any time lower than the approach path that would be followed by an aircraft using the ILS glidepath, and shall follow a track to intercept the extended runway centre-line at or above 3000 ft.
- (c) Between 0700 and 2300 hours (local time) where the aircraft is approaching Runway 09 (L or R) and is using the ILS in IMC or VMC it shall not descend on the glidepath below an altitude of 2500 ft (Heathrow QNH) before being established on the localizer, nor thereafter fly below the glidepath. An aircraft approaching without assistance from the ILS shall follow a descent path which will not result in its being at any time lower than the approach path that would be followed by an aircraft using the ILS glidepath, and shall follow a track to intercept the extended runway centre-line at or above 2500 ft.
- (d) Between 2300 and 0700 hours (local time) where the aircraft is approaching Runway 09 (L or R) and is using the ILS in IMC or VMC it shall not descend on the glidepath below an altitude of 3000 ft (Heathrow QNH) before being established on the localizer at not less than 10 nm from touchdown, nor thereafter fly below the glidepath. An aircraft approaching without assistance from the ILS shall follow a descent path which will not result in its being at any time lower than the approach path that would be followed by an aircraft using the ILS glidepath, and shall follow a track to intercept the extended runway centre-line at or above 3000 ft.

Landing aircraft on approach to the airport have to align directly with the runway and intercept the Instrument Landing System (ILS). The distance from the runway from which the aircraft intercepts the ILS is known as the Joining Point. The full definition as described in the AIP snapshot (left). A Joining Point summary paragraph from the annual Flight Performance report is copied below.

Throughout the presentation the Joining Point will be referenced in the context of an average value. Unless stated this will be calculated as the mean average.

Noise Abatement – Joining Point

Although there are no set heights for arriving aircraft, the Government has specified the minimum heights at which the aircraft must be established on the final approach. The aim of these requirements is to keep aircraft higher for longer and avoid prolonged periods of level flight, therefore benefiting communities close in to the airport.

• Westerly operations

Between 06.00 and 23.30 hours local, aircraft are required to be established on the ILS not below 2,500ft above mean sea level. This equates to a distance of about eight nautical miles. Between 23.30 and 06.00 hours local, the altitude is raised to 3,000ft above mean sea level together with an additional requirement to join the ILS no closer to the runway than 10 nautical miles.

• Easterly operations

Between 07.00 and 23.00 hours local, aircraft are required to be established on the ILS not below 2,500ft above mean sea level. This equates to a distance of about eight nautical miles. Between 23.00 and 07.00 hours local, the altitude is raised to 3,000ft above mean sea level together with an additional requirement to join the ILS no closer to the runway than ten nautical miles.

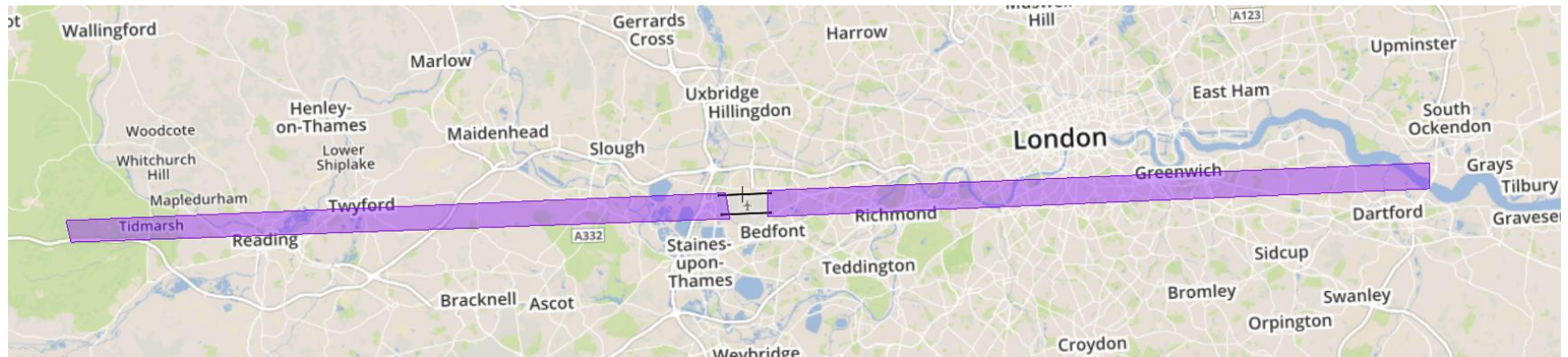
Data

The data used to support this assessment is data from ANOMS (Airport Noise Operational Management System), Heathrow's noise and track keeping system. The data is derived from radar feeds.

The weather data comes from actual weather recordings as reported in METAR messages for Heathrow.

The Joining Point for an aircraft is considered to be the point when it enters either the Easterly polygon (when arriving on Runways 09L and 09R), or the Westerly polygon (when arriving on Runways 27L and 27R). The polygons are depicted below.

Only flights which entered the polygons with an altitude above 1,500ft and below 8,500ft, and at a distance between 5.0 and 26.0 nautical miles (NM) from the threshold have been included in the analysis.



Data

Sample communities under flight path (listed for geographical purposes only):

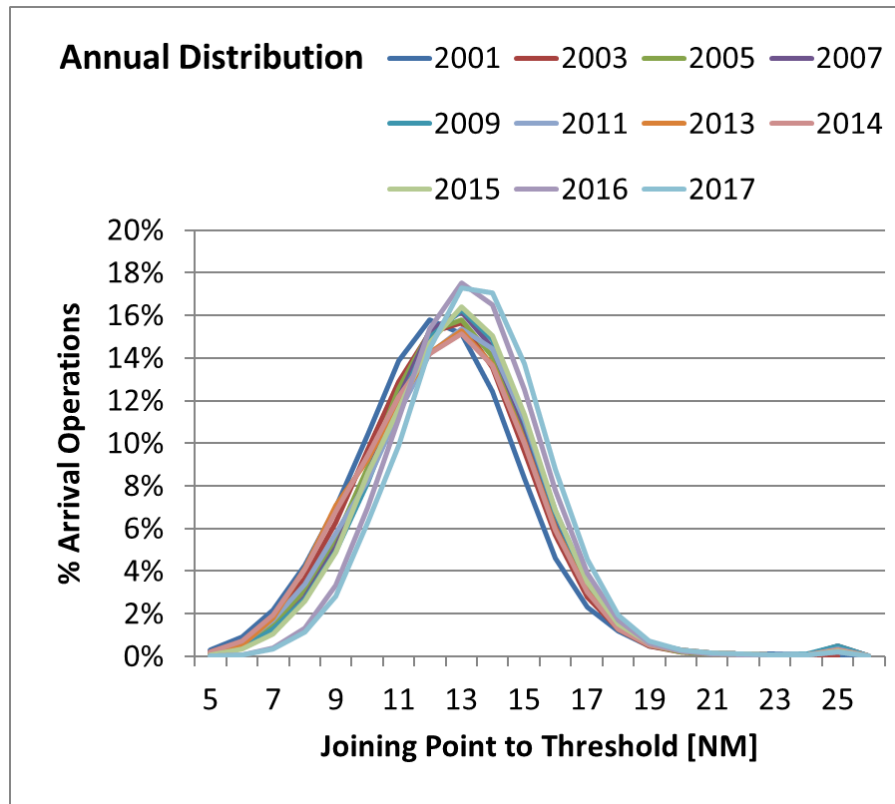
Distance in nautical miles and statute miles, to runway threshold	Westerly Arrivals 27L & 27R	Easterly Arrivals 09L & 09R
5 (5.75)	Isleworth, Richmond	Windsor
6 (6.90)	Richmond, Kew, North Sheen	Clewer Green
7 (8.05)	Mortlake, East Sheen	Oakley Green, Legoland Windsor
8 (9.20)	Barnes, Putney	Fifield
9 (10.35)	Fulham, Hurlingham Park	Money Row Green
10 (11.50)	Sands End, Battersea	Braywoodside
11 (12.65)	Battersea Park	Open farmland
12 (13.80)	Nine Elms, Stockwell	Shurlock Row
13 (14.96)	Camberwell	Open farmland
14 (16.11)	Peckham	Hurst
15 (17.26)	New Cross Gate	Charvil Country Park
16 (18.41)	Deptford	Sonning
17 (19.56)	Blackheath, Greenwich	Reading East
18 (20.71)	Kidbrooke Playing Fields	Reading
19 (21.86)	Castlewood	Caversham, Reading
20 (23.01)	Shooters Hill GC	West Reading
21 (24.16)	Welling	Tilehurst
22 (25.31)	Bexleyheath	Denefield School
23 (26.46)	Erith	Tidmarsh
24 (27.61)	Crayford Marshes	Open farmland
25 (28.76)	Crayford Marshes	Open farmland
26 (29.92)	Purfleet	Open farmland

Distribution by year

The average Joining Point value in 2017 was 13.9NM. This compares against the average value of 13.2NM for the whole period between 2001 and 2016. The table below shows that the annual variation exceeds the long term average by 0.7NM.

Over 95% of all arrivals have a Joining Point value inside 17.6NM.

The variation is smaller than previous distributions with a standard deviation of 2.4NM.

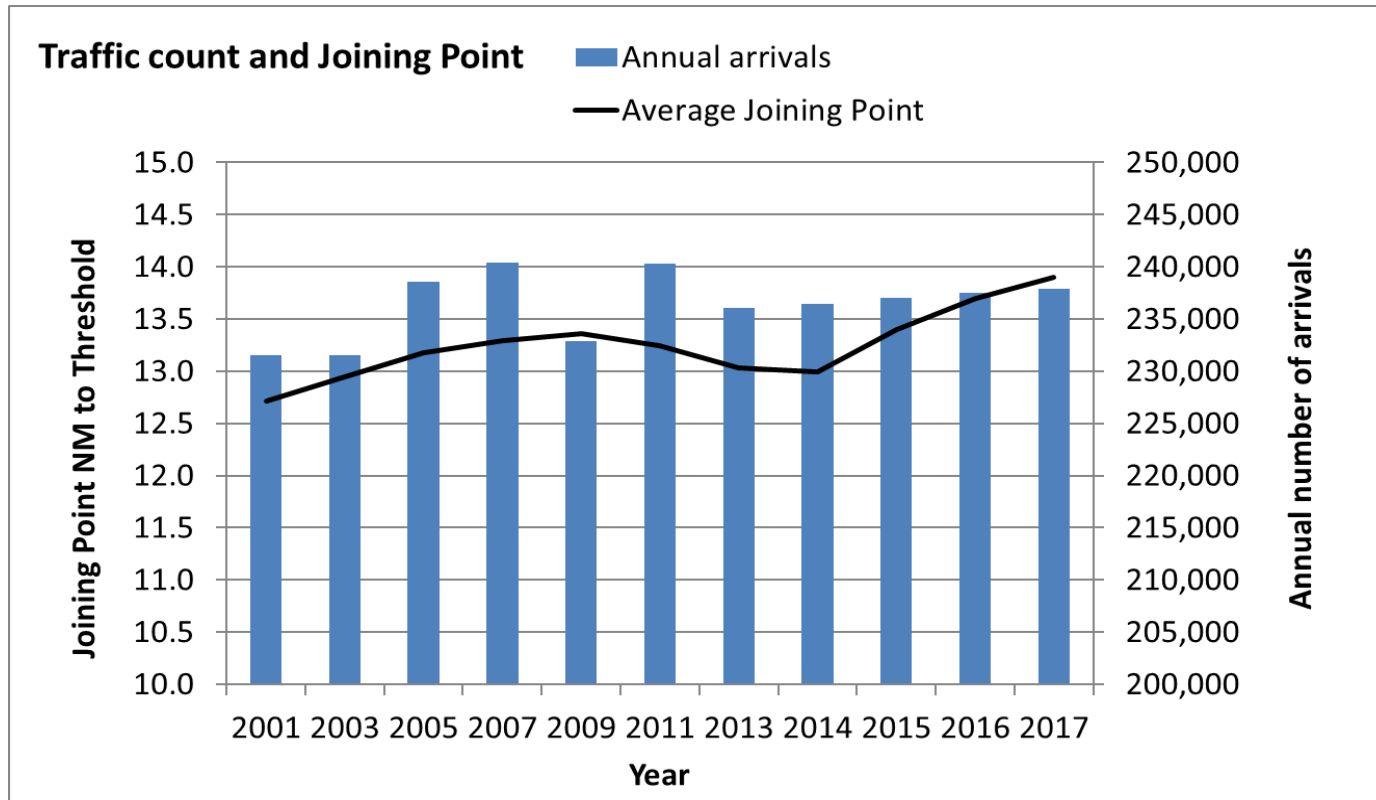


Year	Average Joining Point (NM)	Standard Deviation (NM)
2001	12.7	2.6
2003	12.9	2.6
2005	13.2	2.7
2007	13.3	2.6
2009	13.4	2.7
2011	13.2	2.7
2013	13.0	2.7
2014	13.0	2.7
2015	13.4	2.6
2016	13.7	2.4
2017	13.9	2.4
Average	13.3	2.6

Variation by year

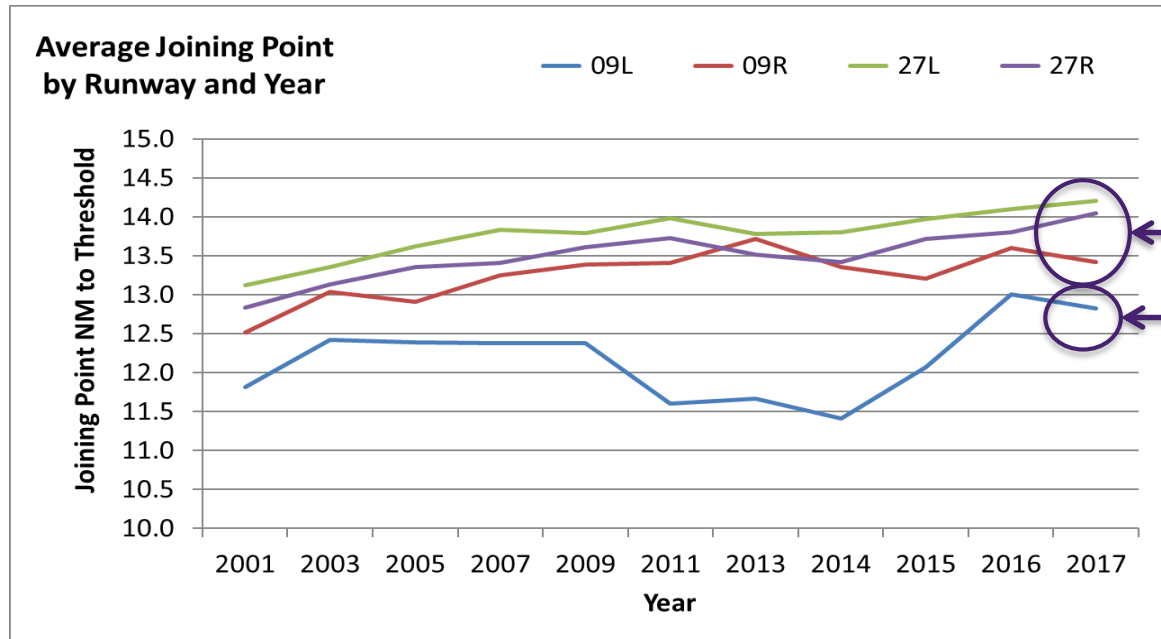
The chart below shows how the average Joining Point values have varied in time along with changes in the annual number of arrivals.

An increase in the average Joining Point value coincided with increases in the annual number of arrivals up to 2009 but reduced in 2011, 2013 and 2014. Subsequently, 2015 and 2016 saw an increase in the average Joining Point with increase in the annual number of arrivals. However, despite the increase in JP value, 2017 did not see a significant increase in the annual number of arrivals.



Variation by year and runway

The chart and table below show the variation in average Joining Point distance and utilisation for each runway by year.



The average Joining Point distance for both 27R and 27L increased above 14.0NM, the highest they have been so far.

The average Joining Point for 09R distance decreased to level observed in 2014.

The average Joining Point distance for 09L is typically closer to the runway threshold.

The average Joining Point distance for 09L decreased in 2017 after increasing since 2014.

Arrival Runway Utilisation											
RWY	2001	2003	2005	2007	2009	2011	2013	2014	2015	2016	2017
09L	23%	36%	27%	26%	25%	26%	31%	28%	26%	28%	18%
09R	2%	2%	1%	1%	2%	2%	2%	3%	2%	2%	1%
27L	42%	31%	36%	36%	37%	36%	34%	35%	36%	35%	40%
27R	33%	31%	36%	37%	36%	36%	33%	34%	36%	35%	40%

Variation by year and runway: 09L

Joining Point NM to Threshold	% Arrival Operations Runway 09L										
	2001	2003	2005	2007	2009	2011	2013	2014	2015	2016	2017
5	1%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%
6	2%	1%	1%	1%	1%	2%	2%	2%	1%	0%	0%
7	5%	3%	3%	3%	3%	6%	5%	6%	4%	1%	2%
8	8%	6%	6%	6%	6%	10%	11%	12%	8%	3%	4%
9	11%	9%	9%	9%	9%	14%	15%	16%	11%	6%	8%
10	13%	12%	12%	12%	12%	14%	14%	14%	14%	10%	11%
11	14%	13%	13%	14%	14%	13%	12%	13%	14%	13%	14%
12	13%	13%	14%	14%	14%	11%	10%	9%	12%	16%	16%
13	12%	13%	13%	13%	13%	8%	9%	8%	11%	16%	15%
14	9%	11%	11%	11%	11%	7%	8%	7%	10%	13%	12%
15	6%	8%	8%	7%	8%	6%	6%	6%	7%	9%	9%
16	3%	5%	5%	5%	5%	4%	4%	4%	4%	6%	5%
17	2%	3%	3%	2%	2%	2%	2%	2%	2%	3%	3%
18	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
19	0%	1%	1%	1%	1%	0%	0%	0%	0%	1%	1%
20	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
23	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
24	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
25	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
26	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average Joining Point NM to Threshold	11.8	12.4	12.4	12.4	12.4	11.6	11.7	11.4	12.1	13.0	12.8
Standard Deviation	2.7	2.8	2.8	2.7	2.7	2.9	2.8	2.8	2.7	2.4	2.5
95th Percentile	16.2	16.9	16.8	16.7	16.7	16.6	16.6	16.5	16.7	17.1	17.1

The average Joining Point distance for 09L has decreased compared to 2016. In 2017 the highest proportion of arrivals joined between 12 and 13NM.

The average Joining Point distance and the most frequent Joining Point band shifted closer to the 09L threshold than in 2016, and resemble profiles observed prior to 2011.

Variation by year and runway: 09R

% Arrival Operations Runway 09R											
Joining Point NM to Threshold	2001	2003	2005	2007	2009	2011	2013	2014	2015	2016	2017
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	1%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
7	2%	1%	2%	1%	1%	1%	0%	0%	0%	0%	0%
8	4%	3%	4%	2%	2%	2%	1%	2%	2%	1%	2%
9	7%	5%	7%	5%	5%	5%	4%	5%	5%	4%	4%
10	11%	9%	10%	8%	10%	8%	8%	9%	11%	9%	9%
11	18%	16%	16%	15%	14%	12%	12%	13%	14%	12%	14%
12	19%	18%	17%	20%	15%	18%	15%	18%	17%	17%	18%
13	12%	14%	13%	15%	14%	16%	15%	17%	16%	17%	16%
14	9%	11%	11%	10%	12%	13%	14%	13%	13%	14%	14%
15	6%	8%	7%	8%	10%	9%	11%	9%	9%	10%	9%
16	4%	6%	5%	6%	7%	7%	8%	6%	6%	7%	6%
17	2%	4%	3%	3%	4%	4%	5%	4%	3%	4%	4%
18	2%	2%	2%	2%	3%	2%	3%	2%	2%	2%	2%
19	1%	1%	1%	1%	1%	1%	2%	1%	1%	1%	1%
20	1%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%
21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
23	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
24	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
25	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
26	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average Joining Point NM to Threshold	12.5	13.0	12.9	13.3	13.4	13.4	13.7	13.4	13.2	13.6	13.4
Standard Deviation	2.7	2.6	2.9	2.8	2.8	2.6	2.5	2.5	2.4	2.5	2.5
95th Percentile	17.2	17.5	17.7	18.0	18.1	17.6	17.9	17.5	17.3	17.8	17.7

The average Joining Point distance and the most frequent Joining Point band for 09R have slightly decreased compared to 2016. The highest proportion of arrivals joined between 12 and 13NM.

Variation by year and runway: 27L

% Arrival Operations Runway 27L											
Joining Point NM to Threshold	2001	2003	2005	2007	2009	2011	2013	2014	2015	2016	2017
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%
8	3%	2%	2%	1%	1%	1%	1%	1%	1%	1%	0%
9	5%	4%	4%	3%	3%	2%	3%	3%	2%	2%	2%
10	9%	8%	7%	6%	6%	6%	6%	7%	6%	5%	5%
11	13%	12%	11%	11%	11%	10%	11%	11%	10%	10%	8%
12	16%	16%	15%	15%	15%	15%	16%	16%	15%	14%	14%
13	16%	18%	17%	17%	18%	18%	19%	18%	18%	18%	18%
14	14%	16%	16%	17%	17%	18%	17%	17%	18%	18%	18%
15	9%	11%	12%	13%	13%	14%	13%	13%	14%	14%	16%
16	5%	7%	7%	8%	8%	8%	7%	7%	8%	9%	10%
17	3%	3%	3%	4%	4%	4%	4%	4%	4%	5%	5%
18	2%	1%	1%	2%	2%	2%	1%	2%	2%	2%	2%
19	1%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%
20	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
23	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
24	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
25	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
26	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average Joining Point NM to Threshold	13.1	13.4	13.6	13.8	13.8	14.0	13.8	13.8	14.0	14.1	14.2
Standard Deviation	2.6	2.4	2.5	2.6	2.5	2.4	2.3	2.4	2.3	2.3	2.2
95th Percentile	17.3	16.9	17.3	17.5	17.4	17.5	17.2	17.4	17.6	17.6	17.7

The average Joining Point distance for 27L increased slightly in 2017 to the highest level so far. The highest proportion of aircraft joined between 13 and 14NM, which is in line with previous years.

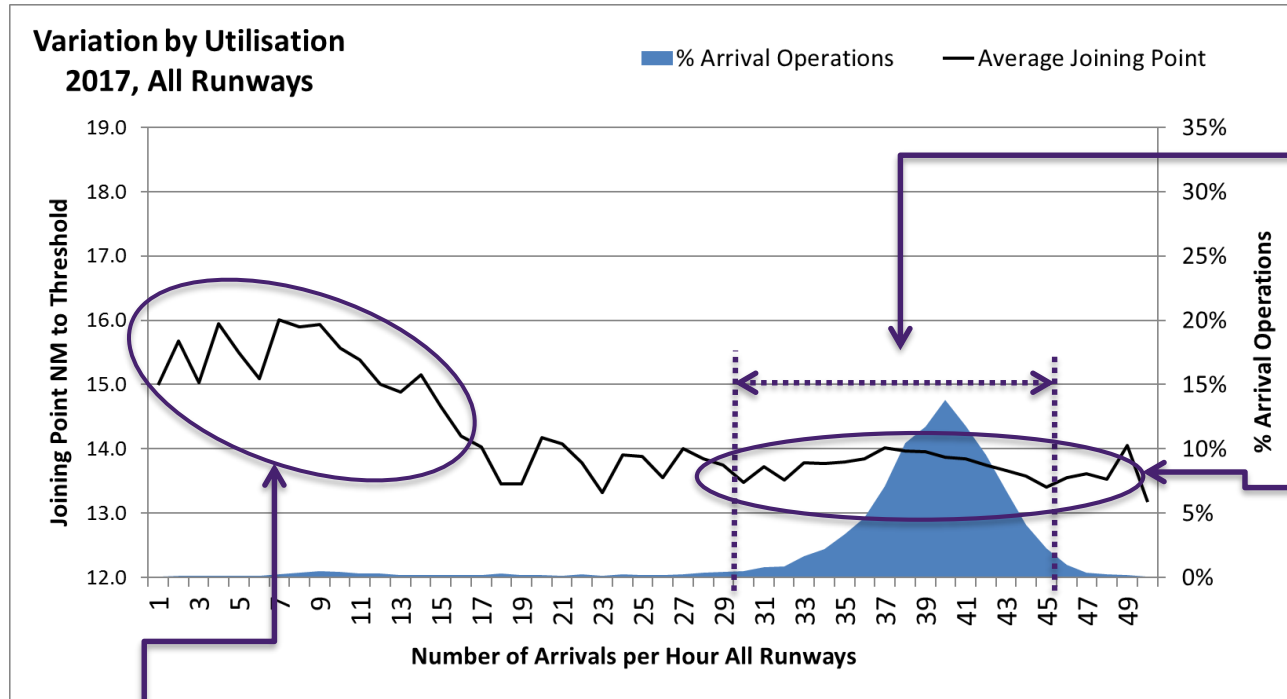
Variation by year and runway: 27R

% Arrival Operations Runway 27R											
Joining Point NM to Threshold	2001	2003	2005	2007	2009	2011	2013	2014	2015	2016	2017
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
8	3%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
9	6%	5%	5%	4%	4%	3%	4%	4%	3%	2%	2%
10	10%	9%	8%	8%	8%	7%	8%	8%	7%	6%	5%
11	14%	13%	13%	12%	12%	11%	13%	13%	11%	11%	9%
12	17%	16%	16%	16%	16%	16%	16%	17%	16%	16%	15%
13	16%	17%	17%	17%	17%	18%	18%	18%	18%	18%	18%
14	13%	15%	15%	15%	16%	17%	15%	16%	17%	18%	18%
15	9%	10%	11%	11%	12%	12%	11%	11%	12%	13%	14%
16	5%	6%	6%	6%	7%	7%	6%	6%	7%	8%	9%
17	2%	3%	3%	3%	4%	4%	3%	3%	4%	4%	5%
18	1%	1%	1%	1%	2%	2%	1%	1%	2%	2%	2%
19	0%	0%	0%	1%	1%	1%	1%	0%	1%	1%	1%
20	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
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23	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
24	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
25	0%	0%	1%	1%	1%	0%	1%	0%	0%	0%	0%
26	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average Joining Point NM to Threshold	12.8	13.1	13.3	13.4	13.6	13.7	13.5	13.4	13.7	13.8	14.0
Standard Deviation	2.4	2.4	2.6	2.5	2.6	2.4	2.5	2.4	2.4	2.2	2.2
95th Percentile	16.5	16.8	17.1	17.1	17.4	17.3	17.2	17.0	17.4	17.3	17.6

The average Joining Point distance for 27R increased slightly in 2017 and is the highest compared to previous years. The highest proportion of aircraft joined between 13 and 15NM, which is mostly in line with previous years.

Variation by runway utilisation

The chart below tracks the average Joining Point distance for all runways based on the number of arrivals in the clock hour (0-59 minutes in the hour) in 2017.



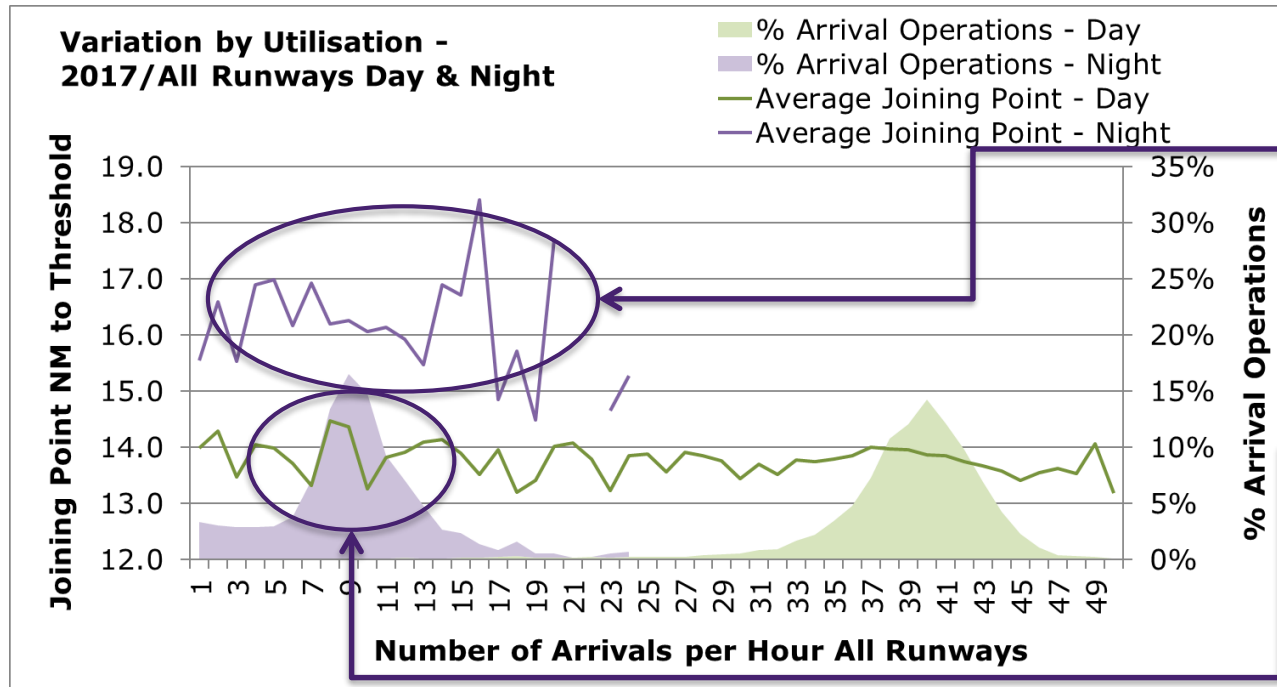
For majority of operations (>92%) runway utilisation was between 30 and 46 arrivals per hour.

The Joining Point distance fluctuated around the 13.7NM value during busier periods with hourly movement count between 30 and 48 arrivals. This is higher compared to 2016 (13.5NM).

The average Joining Point value has been consistently higher during periods of low intensity traffic (less than 17 arrivals per hour) than the annual average. The annual average for 2017 is 13.9NM.

Variation by utilisation and time of day

Hours were categorised into Night (23:30 – 05:59 local) and Day (06:00 – 23:29 local) operations.



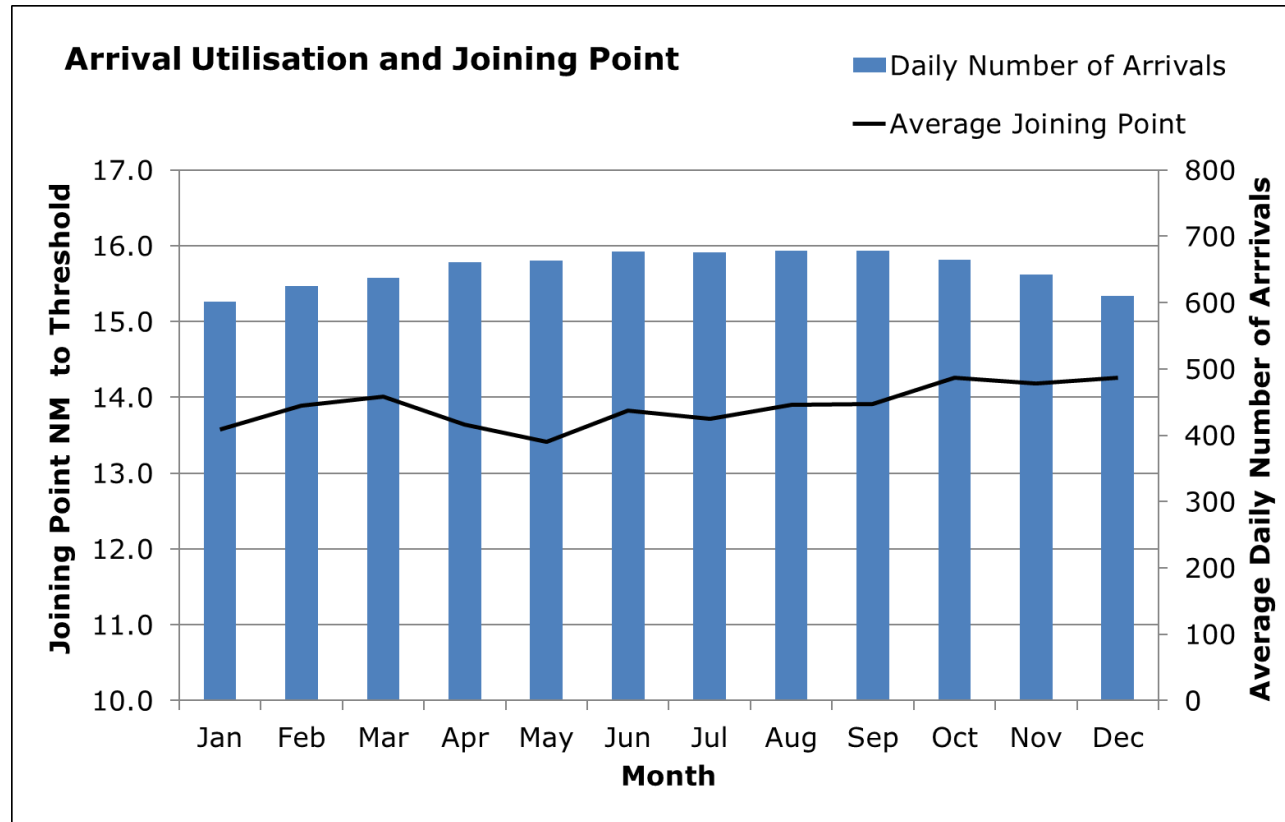
The higher average Joining Point distance for low levels of hourly traffic utilisation coincides with Night operations.

Night operations accounted for 60% of all hours where utilisation is below 24 arrivals per hour.

ATC Viewpoint: During Night operations aircraft are more likely to receive a “straight in approach”. This allows aircraft to become established on the ILS sooner and perform a more efficient decent. This coupled with the requirement that Westerly operations should not become established before 10.0NM during Night operations will contribute to the increased Joining Point value.

Variation by season

In 2017 the Joining Point had a spread of almost 1NM during the year, ranging from 13.4NM to 14.3NM.



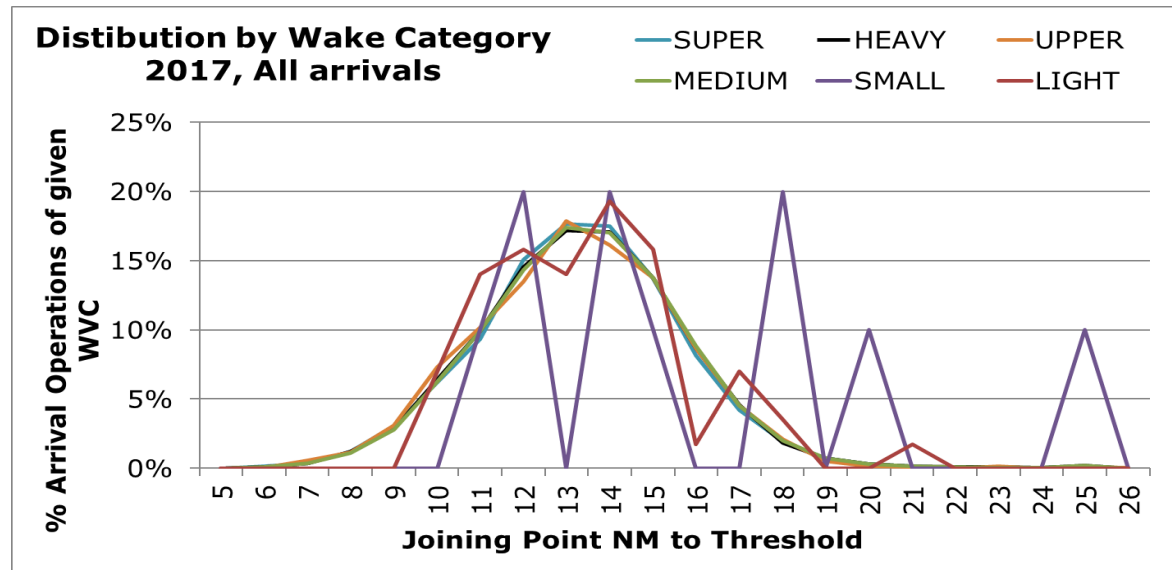
The highest average Joining Point distance occurred during the winter period (October - December), with the peak in October at 14.3NM.

The lowest average Joining Point distance occurred during the summer period (March-June). The lowest was in May at 13.4NM.

Average Joining Point distance of 14.0NM was reached or exceeded during 4 months.

Variation by aircraft wake category

The chart and table show how the Joining Point distance has varied by aircraft wake category.



The average Joining Point distance show that arrivals classed as Super and Upper join closer to the runway threshold. Arrivals classed as Small and Light typically joined further away from the threshold.

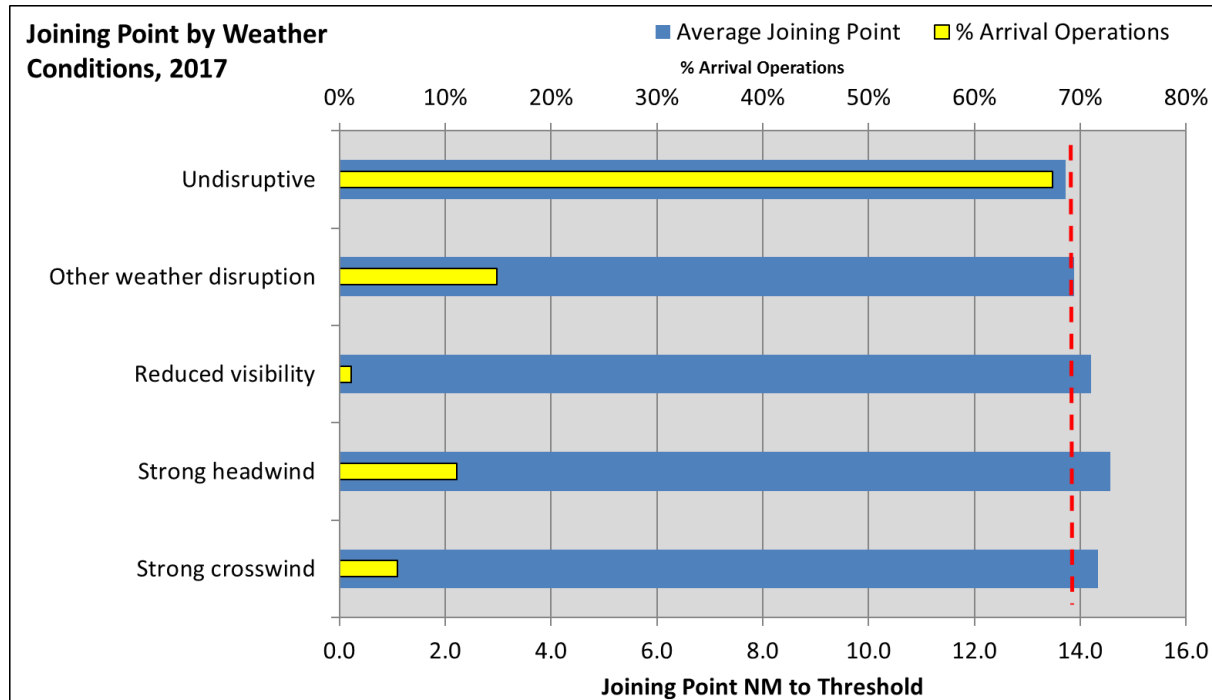
Arrivals categorised as Small or Light accounted for less than 0.1% of all arrivals. Arrivals classed as Super accounted for almost 4% of all arrivals.

Average Joining Point by Wake Category (NM)						
Year	Super	Heavy	Upper	Medium	Small	Light
2001		12.9	12.2	12.8	12.8	12.8
2003		13.1	12.4	12.9	12.8	13.2
2005		13.3	12.5	13.2	13.0	13.5
2007		13.4	12.7	13.3	12.9	13.6
2009	14.1	13.6	12.9	13.3	13.1	13.9
2011	14.1	13.5	13.1	13.1	12.7	13.9
2013	13.7	13.4	12.8	12.8	13.1	14.0
2014	13.6	13.3	12.7	12.8	12.9	13.9
2015	13.6	13.6	13.1	13.2	15.0	14.5
2016	13.8	13.9	13.4	13.6	11.1	14.3
2017	13.8	13.9	13.8	13.9	16.6	14.0

Variation by weather conditions

The chart below shows the average Joining Point distance for the different weather conditions for 2017.

Weather scenario name	Definition
Undisruptive	Headwind ≤ 10 kts, crosswind ≤ 10 kts, visibility ≥ 5000 m and cloud base ≤ 1000 ft
Strong headwind	Headwind ≥ 10 kts, crosswind ≤ 10 kts, visibility ≥ 5000 m and cloud base ≤ 1000 ft
Strong crosswind	Headwind ≤ 10 kts, crosswind ≥ 10 kts, visibility ≥ 5000 m and cloud base ≤ 1000 ft
Reduced visibility	Visibility < 1000 m
Other weather disruption	Any other set of parameters that does not fit the definitions above



The average Joining Point distance was highest and in excess of 14.0NM during headwind conditions.

The Joining Point distance was typically higher during disruptive weather conditions.

What is the reason for 2017 increase in Joining Point?

In theory there are several possible explanations

- Higher number of flights (proportion to all traffic) during night time? – The Joining Point is higher during night time (which is an AIP requirement)
- Higher proportion of A380s in the traffic mix? – the Joining Point is higher for Super WVC which is due to their different speed profiles
- Higher number of 09L arrivals during the respective night and shoulder period? – The Joining Point has different time requirements on easterly and westerly operations. On westerly operations this is the higher, at 10NM, and is between 0600-2330; on easterly operations this is 0700-2330
- Higher occurrence of such events (i.e. higher number of arrivals impacted by such conditions)? – The Joining Point is typically higher during disruptive weather conditions, especially crosswind conditions which are not mitigated by time based separation (TBS)

More than one explanation is very likely

Early morning Westerly arrivals and disruptive conditions as primary drivers behind the Joining Point increase in 2017

- Early morning arrivals are predominantly from Far and Middle East origins. Combined with the night time Joining Point requirement and the higher likelihood of receiving a 'straight in' approach due to lower demand at the given time period, this leads to a notably higher average Joining Point for westerly arrivals
- Table below (left): 2017 Joining Point for night time arrivals, by runway
- Table below (right): The night time traffic trends confirm that 2017 by far exceeded previous highest numbers in westerly count of arrivals. The spread of arrivals among the runways was almost even

Alt in 1500-8500ft and JP>5NM? Yes
Day/Night? Night

Hour 0000-0559LT
Aircraft Type (All)

Row Labels	Average of JP distance [NM]
09L	13.38
09R	13.59
27L	16.85
27R	17.05
Grand Total	16.22

Count of Flight Number									
Row Labels	2009	2010	2011	2012	2013	2014	2015	2016	2017
27L	1736	1816	1732	1737	1223	2097	2038	1960	2145
27R	2128	1715	2037	2006	2301	1413	1823	1670	2120
Grand Total	3864	3531	3769	3743	3524	3510	3861	3630	4265

- NB: The percentage proportion of total night time arrivals is relatively constant across the range of years and is around 2% of the annual count of arrivals
- NB: In relation to the point above, more westerly arrivals during night time in turn means less easterly arrivals in the same period

Early morning Westerly arrivals and disruptive conditions as primary drivers behind the Joining Point increase in 2017

- Headwind conditions are the most impactful in terms of Joining Point distance extension (see slide 18), even though time based separation (TBS) should mitigate this to a large extent
- The table below shows the percentage of time between 0600 and 2359LT with the given conditions. It shows that overall 2017 was more disrupted than any of the previous years
- Influence of weather disruption is also consistent with the Joining Point by aircraft type shown in slide 17: Uppers and Mediums (i.e. wake vortex categories that constitute the bulk of LHR traffic) are all up 0.3-0.4NM in 2017 as compared to 2016, while Heavies remained on 2016 levels (up by 0.3NM against 2015)

Hour	0600-2359LT										
Row Labels	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total
Other disrupted conditions	4%	4%	4%	6%	4%	5%	4%	3%	14%	15%	6%
reduced vis	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%
strong HW	18%	15%	9%	18%	15%	14%	12%	17%	9%	11%	14%
strong XW	11%	9%	5%	7%	7%	8%	10%	10%	5%	6%	8%
undisrupted	67%	71%	81%	69%	73%	72%	73%	69%	70%	67%	71%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Data source: METAR info in ANOMS

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