



# 3R Heathrow – Fleet 2030/2040

A summary

March 2014

**Heathrow**  
Making every journey better

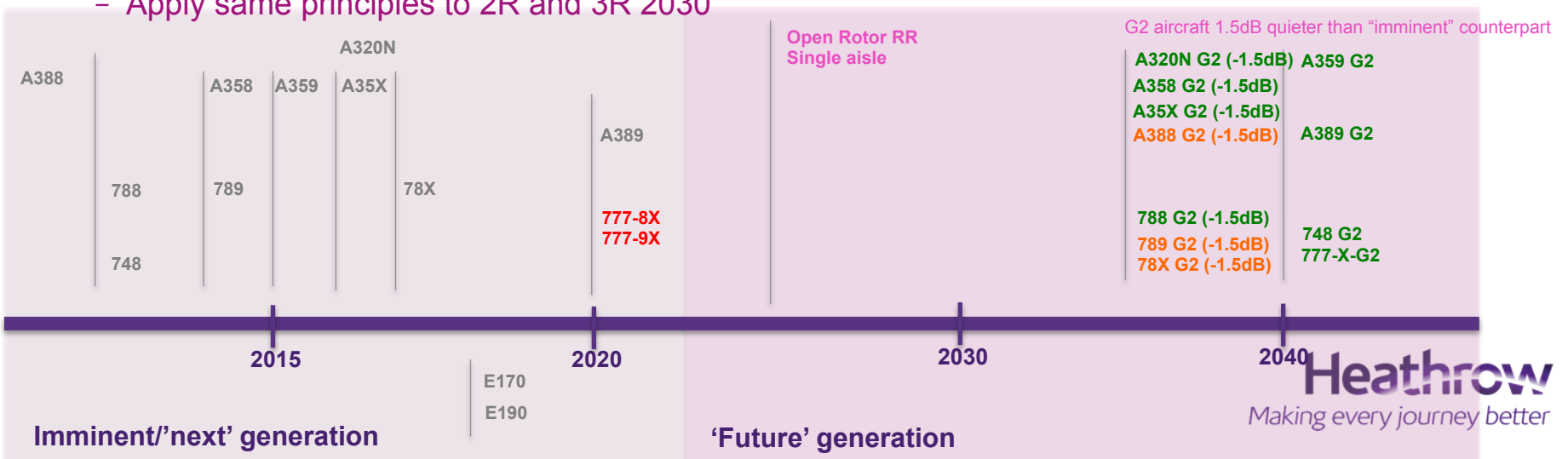
# DfT Fleet Forecast 2R LHR 2030



# Fleet noise levels

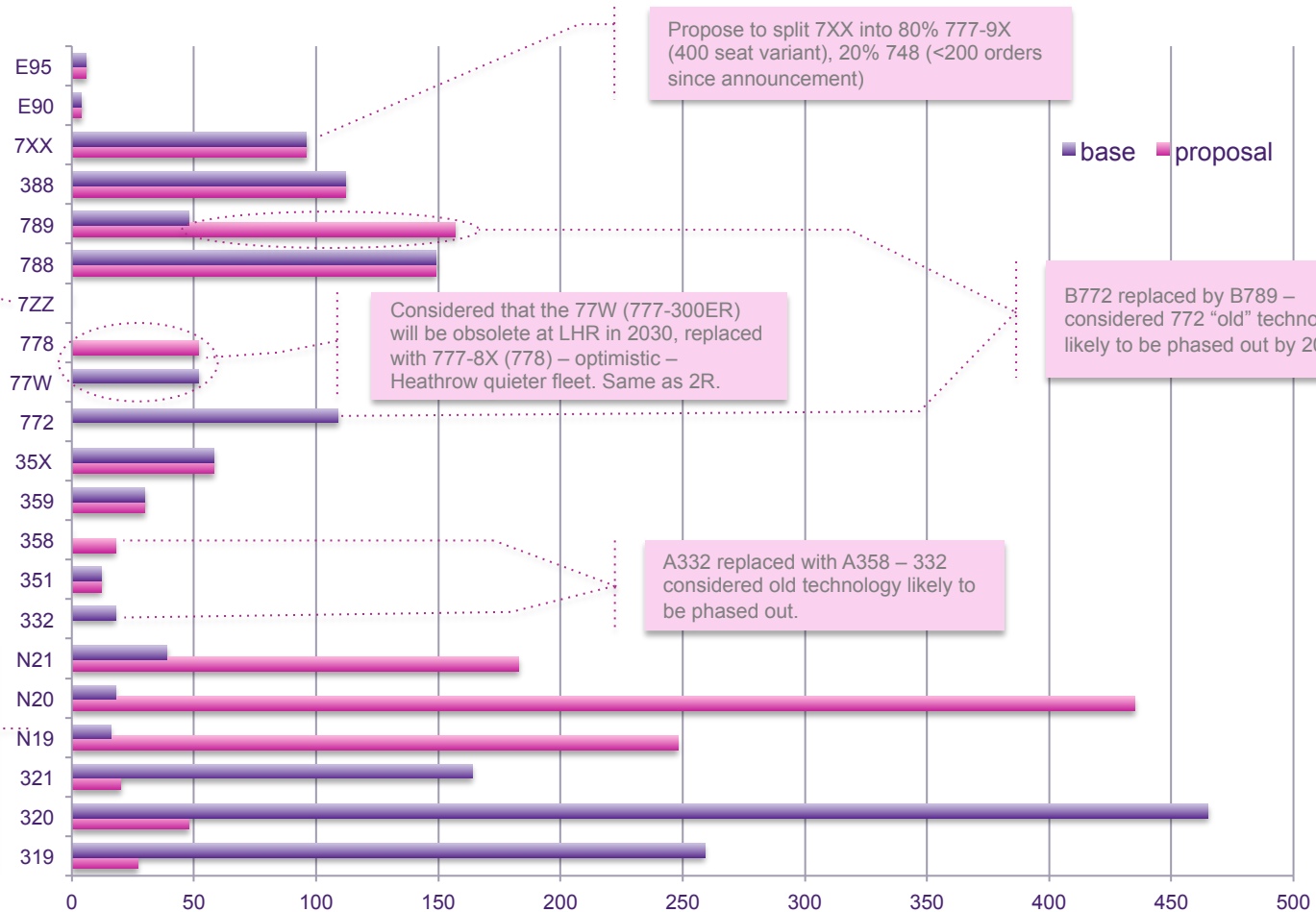
- Aligning with Sustainable Aviation – a reasonable approach
  - Open rotor (OR) technology for “single aisle” – “at least as quiet as the imminent”.
  - Baseline noise level reduction 0.1 dB/year; low noise/low CO2 scenario is 0.3 dB/year
  - New technology introduced in steps – not a gradual reduction
  - In terms of Heathrow (Tier 1) – imminent today could be fully replaced around 2040, many current replaced by 2030.
  - Apply same principles to 2R and 3R 2030

- Fleet 2R 2030
  - DfT – single-aisle 80% NEO types, LHR – no less than 3R
- Fleet 3R 2030
  - Either, current or imminent technology
    - Zero “future” types
    - 90% of A320 family are NEO,
    - OR starting – “no noisier than NEO” approach
- 3R 2040
  - LHR attracts “the best and quietest technology”
  - G2 c.2035, 20% adoption in 5 years – technology c1.5dB quieter (c.15-20 yrs)



# 3R 2030 570K movements (1,665 busy day)

– 100% current (but latest) or imminent technology.



# 2030 Noise Assumptions - discussion

## Sustainable Aviation Noise Roadmap

Noise reduction target of 0.1 dB per year / 1 dB per decade to 0.3 dB per year / 3 dB per decade.

### A35n

Previous work used the A330-343 as the substitution for the A35n series aircraft with no adjustment (FAA recommendation for the A350).

ERCD use -4.1/-4.2 and -0.1/-0.4 for the adjustment from the A330 to the 358 and 359 respectively and then -1.8 and + 1.6 for the 351 (based on their noise database).

Consider a conservative approach adopting the lowest approach from the SA Noise roadmap of 0.1dB per/year for the 358, 359 and 351/X.

So, across the 20 years from the 330 to the 35n gives an improvement of 2 dB cumulatively across the certification points This is slightly less in general than the ERCD figures.

Given a trend towards there being less benefit on approach suggest:

**358/359 to use 330-436 substitution with an adjustment of -1.5, -0.5**

**351/35X to use 330-436 substitution with an adjustment of -2.0, 0.0**

### 7XX

This is a generic Code F replacement. There is some debate over whether this should be a 748 or 777-9X (400 seat variant). There are less than 200 orders (globally) currently for the 748 (wikipedia.org).

Consider that it is unlikely that there will be zero 748 in 2030, but think it will be the minority of movements of this size of aircraft.

Evidence today suggests that 747-400 replacements are largely being taken up by 777-300ER. This would suggest that the future might see 777-X taking this 400 seat ground. A380 aircraft would be left at the 450-500+ sector.

Proposal – split the 7XX 20% 748, 80% 777-9X (see 77W for noise level assumptions.)

### 77W

The current technology 777 variant left in the schedule is the 777-300ER (the 772 has been replaced with the 788). BA have recently ordered some of these aircraft which could be expected to fly for the next 20 years (And other carriers have orders in place). However, whilst optimistic, Heathrow attracts a quieter fleet and it is considered reasonable to replace the 777-8X variation.

Consider it reasonable to apply the SA noise roadmap (0.1 dB/year) to the 777-300ER over the 15 years between coming into service in 2004 and the planned service of 777-X variants in 2020. Therefore a reduction of 1.5 dB re the 777-300ER seems sensibly conservative. Considered that reductions will come on the departure side mostly.

**77W to be replaced with 777-8x with a noise reduction of -1, -0.5 (relative to the 777-300ER).**

**777-9X (Code F size aircraft) to be same as 777-300ER (note none in the schedule).**

### Flyover, Lateral or Approach

Review of noise certification data for 332, 333, 772, 773, 77W from the HAL AUWR indicates that, in particular with reference to 772 and 788 and when comparing the 330 series with the 788 that benefits are in the Flyover and Lateral, little benefit, on approach.

For surrogate types the assumption is to focus noise reductions in the Flyover and Lateral area, with some nominal benefit to Approach noise.

# Some average certification data

## Heathrow All-UP Weight Return Feb 2014

Row Labels	Average of Flyover	Average of Lateral	Average of Approach
319	82.9	91.7	93.9
320	84.5	93.0	95.3
321	86.4	95.5	95.9
332	91.2	98.2	97.6
333	91.1	98.0	97.5
342	94.9	95.7	98.1
343	95.0	96.1	97.0
345	95.2	95.8	99.8
346	94.7	95.8	99.9
380	94.2	94.5	97.7
744	98.3	98.2	102.9
772	92.3	97.1	98.9
773	94.0	97.1	100.3
788	88.3	91.3	98.1
77A	91.5	97.2	99.1
77L	92.2	98.2	99.7
77W	92.2	98.9	100.4

## EASA February 2014

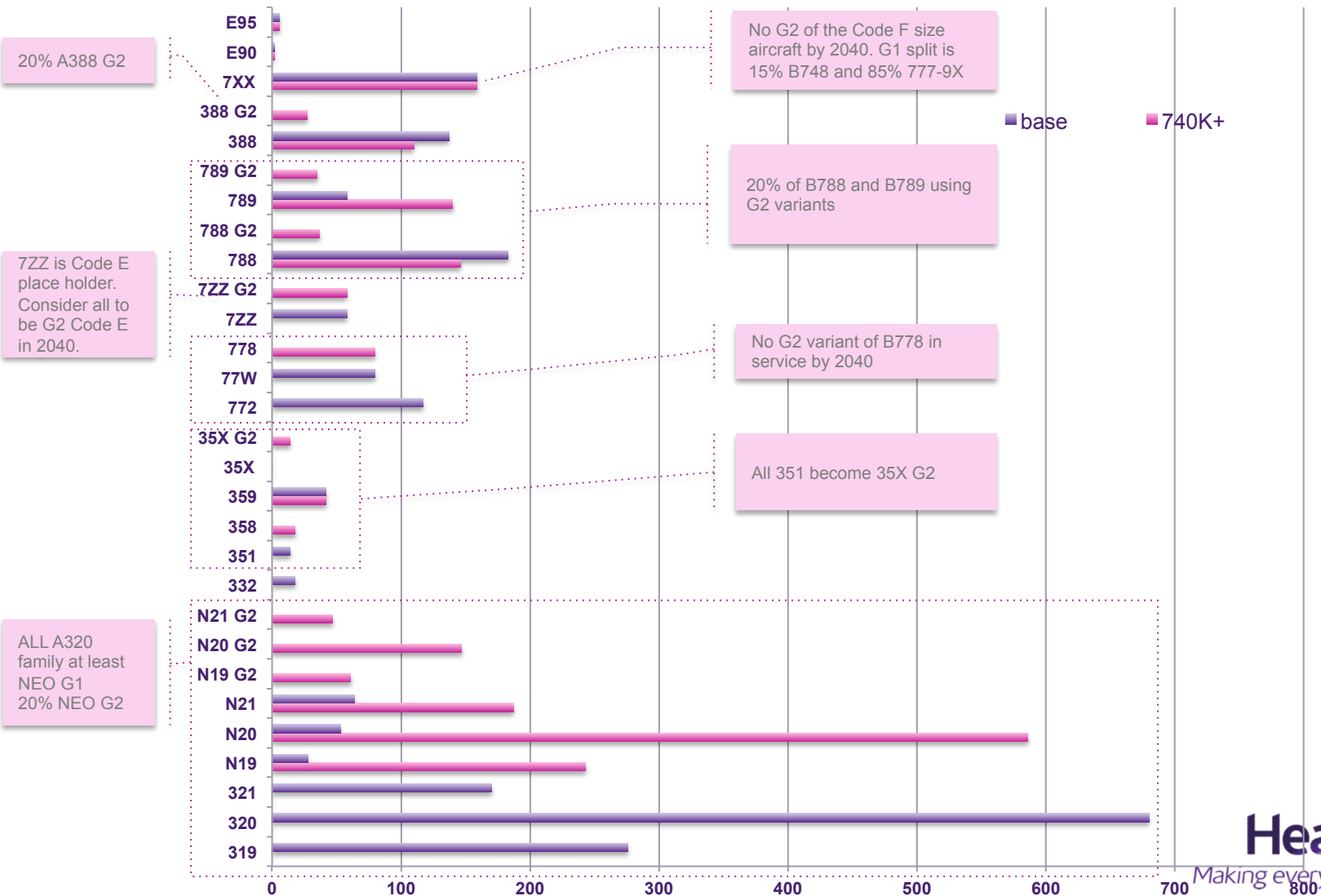
Row Labels	Values		
	Average of LAT-dB	Average of FLY-dB	Average of APP-dB
▶ 737-600	90.8	83.0	95.6
▶ 737-700	93.3	83.2	95.8
▶ 737-800	93.8	85.3	96.2
▶ 737-900	93.6	85.8	96.2
▶ 737-900ER	93.8	86.8	96.3
▶ 747-4	98.7	97.6	103.1
▶ 747-8	94.2	90.9	100.2
▶ 777-200	96.2	89.7	99.0
▶ 777-200LR	98.8	90.6	99.9
▶ 777-300	97.6	90.7	99.8
▶ 777-300ER	99.2	90.2	100.5
▶ 777-F	98.8	90.6	99.9
▶ 787-8	91.4	85.1	97.0
▶ A300	97.2	90.3	101.4
▶ A310	95.9	89.2	99.7
▶ A319	92.3	83.4	93.8
▶ A320	92.7	84.6	95.4
▶ A321	96.1	86.8	96.6
▶ A330	98.4	91.2	98.5
▶ A340	95.8	94.3	97.6
▶ A380	94.6	93.8	97.7

No data as yet for the A350.

788 mostly benefits in the departures and lateral, rather than the approach, where it nominally the same sound level.

# 3R 2040 740K movements (2,145 busy day)

— imminent or future (G2) technology only, no current.





# 2040 Noise Assumptions - discussion

## Sustainable Aviation Noise Roadmap

Noise reduction target of 0.1 dB per year / 1 dB per decade to 0.3 dB per year / 3 dB per decade. Have considered Generation 2 (G2) aircraft at 15 years after imminent. In all cases therefore a sound level reduction of cumulative 1.5 dB has been applied. As with 2030 assumptions it is considered that most of the sound level reductions will accrue at Flyover rather than Approach.

## A320 Family Generation 2 (G2)

Consider each variant to be introduced approximately 15 years after the G1 NEO, an overall improvement of approximately 1.5 dB could be expected.

**N20 G2 to use N20 G1 with an adjustment of -1.0, -0.5**

## A35n Generation 2 (G2)

The different sizes are likely to benefit differently. The 358/359 variant, being slightly smaller may be overall experience a 1.5 dB reduction (15 years after imminent), but consider that the 351/35X G2 would only be 1.5 dB reduced.

**A358 G2 to use 358 /359 with an adjustment of -1.0, -0.5**

**351/35X G2 to use 351/35X with adjustment of -1.0, -0.5**

## A380 Generation 2 (G2)

A 388 G2 would only be 1.5 dB reduced relative to current variant.

**A388 G2 to use A388 with an adjustment of -1.0, -0.5**

## 7ZZ and 7ZZ G2

The 7ZZ is a generic placeholder for a twin aisle Code E size aircraft.

Given the aircraft type splits the proposal is to adopt the A35X as the surrogate for this aircraft with assumptions as previously detailed for the for the G2 variant. This will balance the 778 and 350 variant movements.

## 7XX G2

This is a generic Code F replacement. Considered unlikely to be a G2 variant of the 7XX family by **2040 but assume split of B748:777-9X changes from 20/80 to 15/85**, reflecting move towards twin engine fleet.

## 787 G2

It is considered that there would be a generation 2 variant of the 787 operating by 2040 with an overall sound level reduction of 1.5 dB.

**787 G2 to use 788 with an adjustment of -1.0, -0.5.**

## 777-X

We do not consider that there will be G2 version of the 777-X operating in sufficient numbers by 2040 to warrant attention.

## Rate of adoption

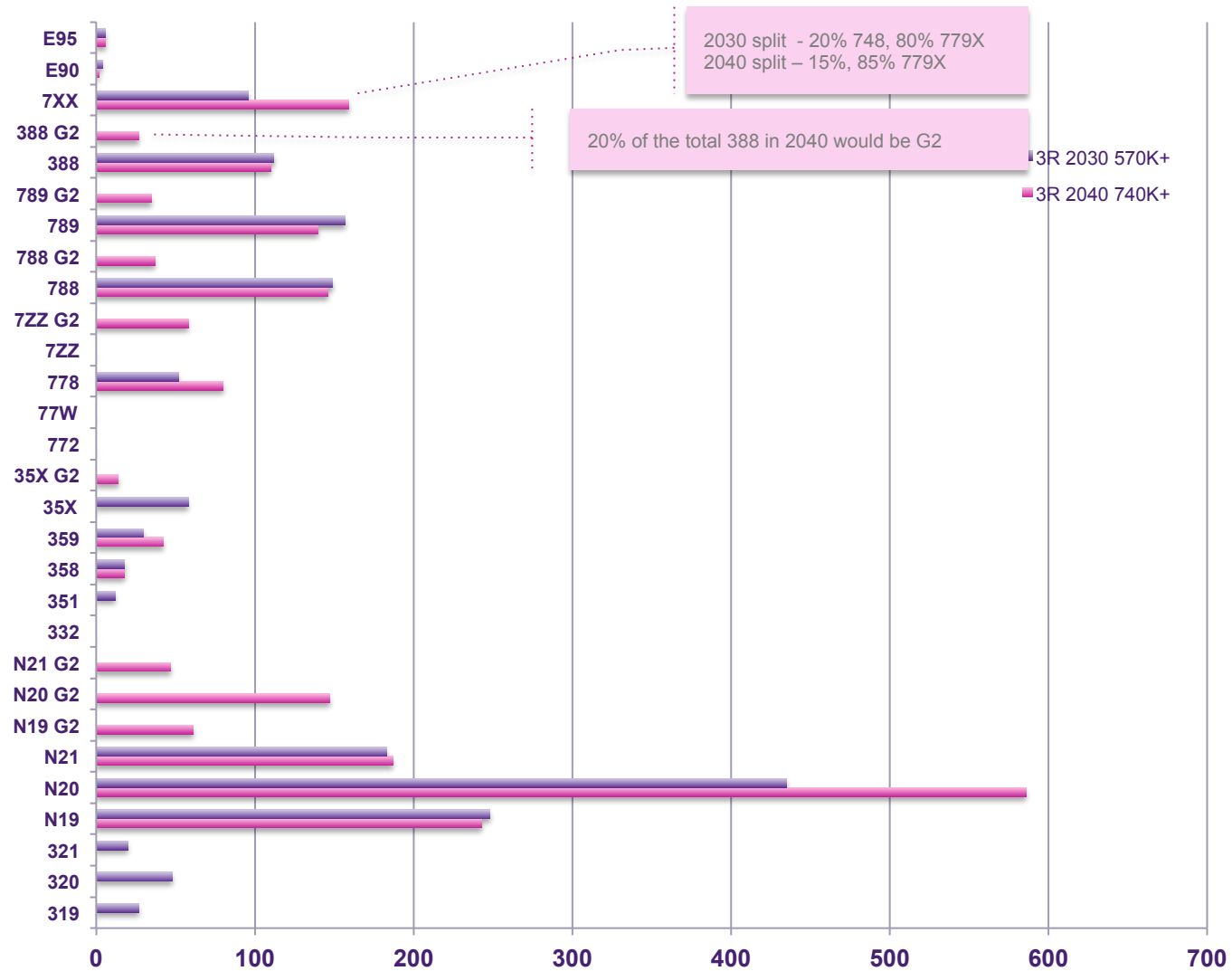
It is considered that these G2 aircraft types are likely to be introduced around 2035 and that adoption into the fleet would be at around 20% by 2040

Count of A/C Type	
LOCAL TIME	Total
N19	304
N20	733
N21	234
351	14
359	42
358	18
388	137
778	80
788	183
789	175
7ZZ	58
7XX	159
E90	2
E95	6
<b>Grand Total</b>	<b>2145</b>

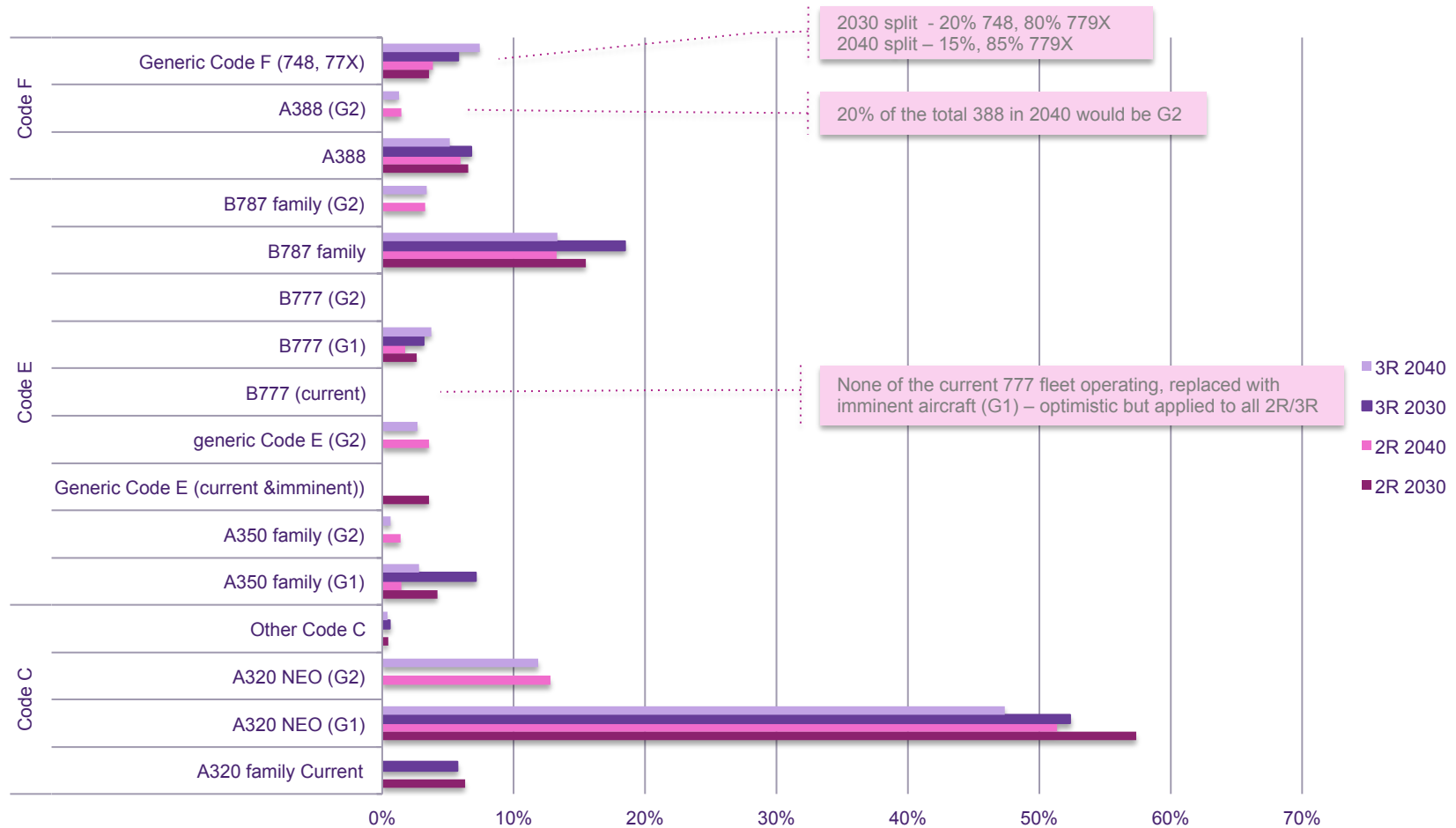
Count of Arr/Dep	
LOCAL TIME	Total
N19	86
N20	284
N21	516
351	19
359	20
388	102
778	24
788	71
789	157
7ZZ	49
7XX	53
<b>Grand Total</b>	<b>1381</b>



# 3R 2030 & 2040



# 2R and 3R fleet breakdown for 2030 & 2040



# 2R and 3R fleet breakdown for 2030 & 2040