
Fair and Equitable Distribution - Arrivals

Prepared for the 5th meeting of the NMB

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SYNOPSIS

The Fair and Equitable Distribution (FED) of aircraft was considered in the Independent Arrivals Review, which concluded that the longer-term recommendation Aspire 21 for carefully designed P-RNAV routes to the ILS is required. This option is not currently expected to be available for widespread use at Gatwick before 2022, because of related airspace changes at other London airports.

Without a P-RNAV solution, it is not possible to achieve such an aspirational level of consistency and predictability of dispersal of arrival tracks into London's largest airports, including at Gatwick. Flights today are directed using the professional judgment of NATS approach radar controllers, who separate aircraft using radar vectors, together with speed and altitude instructions. The challenge of the FED objective is to identify and agree solutions and procedures respecting CAA regulations, that can be implemented at Gatwick in the relatively near-term prior to the longer term and widespread use of P-RNAV.

Discussion of the perspectives on actual versus desired distribution of aircraft in the so called 'arrivals swathe' is a core and complex priority of continuing NMB work. During NMB/3, an action was taken by GAL to 'convene a NMB working group to continue the work to refine the description of Fair and Equitable Dispersal, taking into account objectives for the monitoring and reporting of aircraft distribution across arrivals swathes both east and west of Gatwick'. Since NMB/3, GAL has facilitated several meetings to further refine and agree the description of Fair and Equitable Distribution and what measures that might be used to achieve such desired traffic distribution.

Although both arrivals and departures are inherently linked in within the definition of FED, to simplify the complex problem, the definition of FED for arrivals and departures was separated into two corresponding sequential work-streams, with departure work to follow.

This paper considers the progress made by the NMB FED working group on arrivals and provides background on the process, the outcomes from meetings and the next steps.

The paper also includes details of a Night Noise Arrivals Respite Trial that was developed in 2013 which could usefully provide a basis to develop a near term FED arrivals P-RNAV initiative for Gatwick.

The NMB is invited to agree in principle with the contents of this paper and to endorse as a priority the further work identified.

Note: Departures - A report similar to this will be provided to NMB/6 when the departures FED definition is likely to be more mature.

1. Background

The Independent Arrivals Review (IAR) was required as a part of its work to: give particular attention to assessing the feasibility and implications of adopting a policy of "*fair and equitable dispersal*", which a number of campaign groups have expressed as a priority.

As a result, the report of the IAR discussed Community Perspectives on Concentration and Dispersal, and the introduction of air route design criteria to facilitate Respite, this led to Recommendation Imm-09 (CAA Publication CAP1378)¹.

The report of the IAR findings with particular respect to Fair and Equitable Dispersal are included as an Appendix to Section 4 of this paper.

¹ <https://publicapps.caa.co.uk/docs/33/CAP%201378%20APR16.pdf>

In addition to Imm-09, the IAR made three further recommendations intended to serve the objective of delivery of a fairer and more equitable distribution of noise. Specifically:

- Imm-10: the reduction to ILS minimum joining point (Implemented in August 2016 and subject to NMB/5 WP-05)
- Imm-11: the development, publication and implementation by GAL of a Runway Protocol for noise reasons (subject to NMB/5 WP-06)
- Aspire-21: the adoption of carefully designed routes from the approach holding fixes used for Gatwick to the ILS final approach tracks, provides real opportunity to reduce noise, to disturb fewer people, to deliver fair and equitable dispersal of noise and to deliver well defined respite measures. (NMB/5 WP-07)

Although Aspire-21 recommends mechanisms to deliver both a fair and equitable distribution of noise, and the scope to deliver predictable respite, according to the IAR, the associated wider airspace changes needed for London are not expected to permit this option before 2022 at the earliest.

Moreover, while use of P-RNAV routes for London's airports are envisioned in the CAA Future Airspace Strategy Deployment Plan of 2012, more up-to-date plans on precisely how and when this is to be achieved have yet to be developed. The DfT consultation on the reform of policy for the design and use of UK airspace as well as the subsequent consultation on aviation strategy, may very well have an impact on the originally indicated target implementation dates.

The evaluation of the implementation of the IAR Imm-10 recommendations has shown improvements in the distribution of aircraft as measured across the ILS joining points, reductions in the peak concentration apparent since 2013, have been consistently achieved.

The NMB at its first meeting, acknowledging that the concepts of concentration, respite and the fair and equitable dispersal of noise are highly subjective, accepted the proposal of the chairman to develop for NMB/2 in context of aircraft noise disturbance, a proposed view on the meaning of the term "fair and equitable" dispersal.

For some communities, the distribution of aircraft arriving at Gatwick has not yet resulted in the dispersal of flights that, based on their experience prior to 2013, they had expected from the change to the ILS minimum joining point implemented in 2016. It is also evident that more requirement work is needed to specify the fair and equitable dispersal for arriving aircraft before they reach the ILS.

To undertake the requirement objective set by the NMB in June, a Community Noise Group Sub-Committee was established to develop proposals. The group sought support from NATS, the CAA and To70, the group were able to develop and agree a preliminary view on the requirements for Fair and Equitable Dispersal for consideration at NMB/2 in September. This work evolved for NMB/3, with objectives developed for FED to more closely emulate the dispersal seen prior to 2013. Until now, there has been no agreed basis on which to consistently measure, analyse and report this historical dispersal data.

Later, specific dispersal objectives were proposed for aircraft joining the ILS east of Gatwick. The need for more detailed discussion of options with NATS in particular was identified, to quantify pre-P-RNAV solutions that are potentially deliverable in the near term to serve the FED objectives now set out in Sections 2 & 3 of this paper.

To meet this industry consultation objective, GAL convened a NMB FED working group meeting which took place on the 13th December 2016. This meeting which also included GAL, NATS, CAA and Helios, sought to provide additional guidance to further refine the FED definition. This included consideration of a number of different scenarios and which quantifiable data could be used to track dispersal, whether pre or post 2013, and for future dispersal planning,

A further meeting of the NMB FED working group was conducted in January 2017 at which the FED proposal was discussed alongside the industry feedback. The outcomes of this discussion included the requirement for development of the definition of FED high-level principles, (such as minimise newly overflown etc.), the development of a quantifiable definition to allow effective measurement and reporting and, the development of suitable measurement metrics to track performance trends.

The working group met again on the 2nd March 2017 when the various data analysis processes and options were discussed. To allow for the refinement of a quantifiable FED definition, GAL (Helios) has undertaken flight data analysis - using community provided analysis gates, as well as the proposed ILS join point distribution for runway 26 - evaluating the actual arrivals distribution achieved at those locations in previous years and in particular quantifying on a consistent basis the actual distributions seen prior to and post 2013 at specific locations. The results of these analyses provide both a heatmap and gate based histograms onto which communities can indicate their ideal distribution, for review with NATS and the CAA. The outcomes are reported to NMB/5. (IP13)

A number of the FED implementation issues identified in Section 4 are not easily addressed, underscoring the desirability of identifying preliminary mechanisms for delivery of arrivals FED to further inform planning. A mechanism is suggested at the conclusion of this paper and is proposed as a priority in the 2017/2018 NMB workplan.

2. Preliminary Community View of FED

A Community Noise Group Sub-Committee was established to develop a definition, this sub-group was supported through inputs with NATS and the CAA. This group developed and agreed a definition to support discussions at NMB/2 and was evolved for NMB/3. This definition, which is outlined below, is seen as an initial proposal which will require additional input from industry.

Outcomes Sought by Community Group Members of the Noise Management Board²

Arrivals³

In relation to the period prior to any introduction of PRNAV⁴, aircraft arriving at Gatwick should be managed in a way that minimises their concentration at all times and disperses their impact so as to more closely emulate the circumstances prior to 2013. Arriving aircraft should also be kept as high as possible for as long as possible. Dispersal should apply both in relation to the ILS joining point and on approach to the ILS. The aviation industry should apply all practicable procedures and technologies that are available, and become available, to achieve such dispersal.

Departures

Noise Preferential Routes must be maintained. NPR swathes should be kept at the current width of 3kms and flight paths should be within them. There should be significant dispersion around the centre line of the NPR swathe, the distribution of which should not be skewed to one side or the other. Exactly how much dispersal could be route specific and based on local circumstances. There may also be dependencies between departure routes or between departure routes and arrival routes that will need to be considered.

Measurement and reporting of dispersal should be carried out on a basis agreed with communities. In relation to arrivals it should include both the ILS joining point and the approach to the ILS.

²This language has been agreed by all community group members of the Noise Management Board.

³This arrivals statement addresses the current, vectored, arrival ATC arrangements only and not future PRNAV routing possibilities.

⁴ The Reorganisation of London Airspace to permit PRNAV arrivals for Gatwick is not expected before 2022 (IAR 2.4)

3. Community Proposal for ILS Joining Point Distribution Runway 26 Only⁵

**ILS JOINING POINT DISTRIBUTION ANALYSIS
WESTERLY OPERATIONS, DAY PERIOD, PREPRNAV ONLY**

NM	Summary				
	1	2	3	4	5
	Summer 2008	Pre 2013	2013-2016 Aug 2016	Sep 2016 Dec 2016	Potential target
	%	%	%	%	%
6-8	22	15	0	0	0
8-10	33	40	5	12	33
10-12	29	33	50	39	35
12-14	16	10	31	35	20
14-16	0	2	12	12	10
16+	0	0	2	2	2
	100	100	100	100	100

Notes:

- 1 This analysis and potential targets for the ILS only. We would need to undertake equivalent analysis of other gates
- 2 The potential target is for day periods only, pending a potential review of the night period minimum joining point of 10nm
- 3 Column 1 is from GACC's February 2011 paper "Approach noise at Gatwick"
- 4 Columns 2, 3 and 4 are estimates based on data provided by GAL
- 5 Column 5 is potential target for NATS to be tasked to assess

⁵ No such proposal has yet been made for runway 08

4. Industry feedback on the preliminary community description of FED

Whilst the initial FED definition is welcome, it was agreed that further industry input was required. This input was needed to deliver a FED description which considered a wider range of situations and provided quantifiable baseline onto which performance could be tracked and dispersal options reliably planned.

To guide this process, a GAL-led industry meeting (including NATS, CAA and Helios) to review the draft FED definition provided by the communities was held on 13th December 2016. This meeting aimed to review the definition and develop guidance which could be used to inform further refinement.

The outputs from this meeting are outlined below:

Background

The aim of the document is to provide a framework for guiding discussions and decisions regarding future Gatwick Airport airspace and operational procedure changes. There is also the possibility that the principles outlined under FED could be used to inform government consultations on airspace and noise and possibly the CAA consultation on the airspace change process.

Generic Industry Observations and Considerations

- Generally it was agreed that aiming to revert to a baseline date (ie 2013) with an expectation of recreating undefined traffic patterns was unrealistic.
- Dimensionless terms allow too much flexibility in interpretation. Definition of tangible baselines are essential for the establishment of clear objectives and to effectively measure improvements or declines in performance.
- The period and frequency of measurement (ie day/month/year) should also be considered taking into account necessary interpretation of data and reporting frequency. (Seasonal differences may have an impact).
 - It may be useful to consider how simple proxies might be used.
 - It may be useful to explicitly identify constraints (ie the elements of the airspace that cannot change).
 - Airspace solutions can only take advantage of finite airspace available (including 2 fixed holds) and a minimum joining point.
 - The Airports Commission considered three noise mitigation scenarios which could be used to help shape FED thinking.
 - minimise the total number of people affected;
 - minimise the total number of newly affected people overflown;
 - maximise respite from overflying aircraft.
 - Perhaps thought around the CAA definition of intrusion and other CAA guidance on tranquillity should be considered and whether there are relevant contributions or factors that may be included in the FED.
 - There is no specific mention of environment or emissions.
 - Has the Campaign to Protect Rural England (CPRE) developed any research or principles that may provide relevant input?
 - There is an absence of any specific considerations regarding night respite.

Specific Industry Questions on the draft FED Principles

Arrivals

- What is the arrivals swathe? (geographically, laterally, vertically, the same for runway 26 and 08)
- How can dispersal across the arrivals swathe be effectively measured? (ie through gates or heat maps or alternative)
 - If 'gates' define the series of fixed interdependent gates as measures a supporting rationale for each gate should be agreed.
- Aiming for 'as high as possible for as long as possible' conforms with current thinking about continuous descent approaches (CDA) but does not take into account low power low drag (LPLD) and some of the work streams that may come from the CDA workshop. Rather should it be 'to make the approach as quiet as possible through compliance with Gatwick noise abatement procedures' which could encompass CDA and LPLD?
- 'by dispersing this impact' – what does this actually mean? Is this the dispersal of noise (noise is not mentioned) or aircraft? Could this relate to the number of tracks?

- Regarding noise versus aircraft tracks: this could differentiate between heavy and medium aircraft types.
- 'In relation to the period prior to any introduction of PRNAV' and 'The aviation industry should apply all practicable procedures and technologies that are available, and become available, to achieve such dispersal' Technology available is around PRNAV. Is this considered covered? Operational solutions are the likely to offer near term solutions but PRNAV in the medium to longer term. Consideration of both should form part of any future programme.
- What is meant by 'The aviation industry should apply all practicable procedures and technologies that are available'? Is there anything more definitive that can be taken from this statement?

Departures (*note this paper only considers arrivals*)

- 'Noise Preferential Routes must be maintained. NPR swathes should be kept at the current width of 3kms and flight paths should be within them.' Currently responsibility for NPRs rests with DfT. But will this change following the DfT consultation. This may restrict the use of technology to offer a variety of solutions. What about alternatives to NPRs rather than removal without an alternative.
- The definition of compliance should be clarified. ie does the current interpretation which focusses on alignment with the nominal centre-line of the NPR support the community view?
- Should something be included about using design to create dispersion, for example through radius of turn? (Is randomised or systemised dispersal preferable and/or achievable)
- Should the optimum configuration of aircraft be defined/included?
- Is it necessary to be more specific about altitudes, minimum gates and continuous climb?
- Is it the expectation that the airport, ANSPs and operators should fly/operate aircraft as quietly as possible? (this may also address the nuances around CDA)
- Is the NPR must be maintained in its current form up to 4,000ft and the end stop point as currently defined? (there are significant numbers of noise complaints about vectored aircraft above and beyond the lateral extents of NPRs)
- The NPR is largely flown in a compliant way today.
- Are the communities content with the extant noise abatement areas?
- Is respite an option to be considered rather than dispersion?
- Dispersal could be used for specific routes and based on local circumstances
- Mention fixed points on deps as well ie no vectoring below 4,000ft/000ft/other airport routes/VORs
- What should be used to baseline and measure departure impacts? (ie noise, tracks, traffic density)
- How can we achieve quick noise wins through the airspace change proposal process?
- As well as a FED statement, it would be useful to secure agreement on how to create new operational methods and the process for engagement around such proposals. Would it be beneficial for the FED statement be used to frame other aspects beyond formal airspace changes?

Appendix: Independent Arrivals Review Findings January 2016:

“Fair and Equitable Dispersal”

For the purposes of this Review, the Terms of Reference make clear that, in considering the concerns raised by local residents, the review team will give particular attention to assessing the feasibility and implications of adopting a policy of “fair and equitable dispersal” which a number of campaign groups have expressed as a priority.

Dispersion, dispersal or dispersed aircraft tracks, refer to aircraft that are instructed to follow the same routing, for example from a holding stack to a landing, yet fly a variety of different tracks when measured over the ground. Dispersion is the consequence of aircraft performance, pilot or air traffic control tactical decision, air traffic conditions, weather and time of the day. The combination of these often variable, factors includes; the arrival procedure's design criteria, weather including wind and visibility, aircraft type, performance characteristics and actual aircraft weight.

All of these factors can influence the horizontal track and vertical profile actually flown. Concentration of aircraft is effectively the opposite of dispersion. It takes place when aircraft instructed to follow the same routing thereby consistently follow very similar tracks over the ground and even similar vertical profiles. For most UK airports including Gatwick, departing aircraft have clearly set routes, the Noise Preferential Routes, to

follow during the initial stages of flight. For arriving aircraft, the subject of this review, there are currently no such clearly defined routes leading to the final approach track, except in the exceptional circumstances when radar is not available.

NATS use the arrival route flexibility within the Gatwick Radar Manoeuvring Area to vector and sequence aircraft in as safe and efficient manner as possible. Aircraft on final approach use an Instrument Landing Systems (ILS) for precision approach guidance. The ILS is essentially a pair of radio beams which provide precise lateral and vertical guidance for the aircraft along a straight-line extension to the landing runway with a descent profile set at 3 degrees, which equates to approximately 310 feet per nautical mile (nm). Hence an aircraft at 10nm from touchdown will be about 3100 feet above the runway.

The approach stabilisation initiative of 2013 extended the daytime ILS joining point from 7nm to 10nm, it has been at 10nm at night (23:30-06:00 local time) since 2004. One effect of the 2013 change was to concentrate all daytime arrivals (prior to 23:30) into a narrower swathe, increasing the number of aircraft over those areas, creating the impression within the swathe that more aircraft are using Gatwick.

An analysis of residents' requests to the review team shows overall that either a concentration of aircraft routes away from the location of the correspondent was requested or have indicated that the random nature of radar vectors to the ILS both east and west of Gatwick prior to 2013 was an acceptable means of fairly and equitably dispersing aircraft noise. The minimum ILS joining point at that time was 7nm.

Proposals to establish exclusion zones around individual towns and villages were also received by the review. These have not been selected as deliverable options. There is no rational and fair basis on which to select one community for exclusion over another, and in the unlikely event that such a zone could be made operationally possible, because of vertical constraints, it is unlikely that it could deliver a meaningful noise relief.

When considering the community reaction to the relative concentration of flights that has occurred for Gatwick arrivals and which has been reported to this review, it is difficult to envision a situation where any community faced with the prospect of a concentration of all arriving flights, with no procedures for fair and equitable dispersal of noise, and no defined respite periods, would do anything other than protest in the strongest terms.

For this reason, when developing PBN routes to the ILS, or full RNAV arrivals routes for Gatwick, which are a feature of FAS and discussed later in this report, it is the opinion of the review that airspace planners will be expected to ensure a fair and equitable dispersal to deliver respite to residents and, to minimise the effect of any concentration.

The Government policy caveat is that this should not lead to significant numbers of people newly affected by noise, a trade off which seems to be intractable. The review has found that the term 'significant numbers' is highly subjective and hence open to widely varying interpretations."

5. Latest Developments

A further meeting took place on the 2nd March 2017. GAL (Helios) presented the data analysis options available and it was agreed that analysis will be undertaken based upon the community provided gates. This analysis will form the next step in the development of a quantifiable definition of FED. This analysis will be presented in a NMB/5 Information Paper (IP13).

The outcomes from the 2nd March meeting are summarised in the notes below:

Arrivals FED Runway 26. Charles Lloyd, on behalf of CNG has provided data sets for candidate distribution for the runway 26 ILS joining point. An agreement on distribution across the entire swathe is expected to be necessary to inform potential operational solutions.

- GAL will provide a soft copy of the FED data pack to show what sort of analysis is possible and will produce additional density plots, beyond those shown in the meeting, for runway 26.
- The community provided data will need to be validated prior to its use in the development of a FED definition.
- GAL will provide community groups with a data pack for runway 26 including traffic density plots with the overlaid gates requested by communities.
- Using the validated data, communities can suggest an 'ideal' swathe distribution using the GAL data pack for runway 26.

Arrivals FED Runway 08. Chair of CAGNE has provided candidate gates distribution for the runway 08 ILS joining point. As with runway 26, an agreement on distribution across the entire swathe would be necessary to inform any operational solutions. Not all community groups were agreed on the proposed gates west of Gatwick and thus more time to form consensus would be necessary for the arrivals swathe to runway 08.

- GAL will provide a soft copy of the FED data pack to show what sort of analysis is possible and will produce additional density plots, beyond those shown in the meeting, for runway 08.
- Community groups to discuss and agree the arrivals swathe gates for runway 08 as a matter of urgency.
- GAL will create a validated data set (in the same format to that created for runway 26) showing the percentage distribution across the swathe for runway 08.
- GAL will provide community groups with a data pack for runway 08 including traffic density plots with the overlaid gates requested by communities.
- Using the validated data, communities can suggest an 'ideal' swathe distribution using the gates agreed by community groups for runway 08.

Next steps

- Review and endorsement of the communities on the FED distribution identified for runways 26 and 08.
- GAL analysis of the distributions to understand potential options for further development.
- GAL to submit to NATS the community distributions and GAL analysis of options for discussion.

6. Summary and conclusions

- A preliminary view of FED objectives is now available from communities;
- Of the four IAR recommendations intended to serve a FED objective;
 - Imm-09 and Imm-10 have been implemented,
 - Imm-10 has reached the end of its evaluation and is proposed for permanent adoption,
 - Imm-11 is proposed as an evaluation to provide real data to validate actual performance,
 - Aspire-21 remains a distant aspiration subject to comprehensive airspace change.
- More information is needed from DfT, CAA and NATS outlining a schedule for the London Airspace Changes that is expected to permit P-RNAV arrival routes to the ILS at Gatwick to be implemented;
- There is now a need to quantify, with NATS and CAA, any interim dispersal options could be deliverable in the near term;
- It is proposed that a review the outcomes of the 2013 night respite trial to determine whether the benefits and principles then identified can be leveraged to improve opportunities for near term arrivals dispersal and respite, through use of an arrivals P-RNAV evaluation as part of the 2017/18 NMB Work Plan.

7. Recommendation

The NMB is invited to agree in principle with the contents of this paper and to endorse as a priority the further work identified.