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# Report of the Voluntary Industry Resilience Group

Version 1.0

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## 1 Executive Summary

- 1.1 The UK system of open air transport competition operates without central control or coordination. This has served passengers and industry well to date and remains the industry's preferred environment. However, as demand approaches current network capacity in the south east of the UK, the performance and resilience of the air transport network is increasingly challenging.
- 1.2 This results in reduced punctuality or significant flight disruption in peak traffic periods, adverse weather or in the event of a failure of any element of the network. There is often the need to apply tactical (i.e. on the day) ATC regulations or local measures, to manage congestion, local weather, or factors external to the UK network.
- 1.3 Many studies have recommended strategic redesign of UK airspace and additional strategic infrastructure, especially in the UK south east. However, strategic change has faced pressures from local communities and political challenges.
- 1.4 The Voluntary Industry Resilience Group (VIRG) consists of senior leaders in the CAA, NATS, Airports Coordination Limited (ACL), airlines and airports. It is led by an independent chairman, Garry Copeland, and supported by the CEOs of those companies. Opportunities for improvement have been identified and recommendations are made in this report that are within the control of industry to implement. To ensure these recommendations progress forward and to address new resilience challenges as they emerge, the VIRG will continue in existence, known simply as the Industry Resilience Group (IRG).
- 1.5 The recommendations are grouped into '**Realistic Planning**', '**Flying to Plan**', '**Serving the Plan**', '**Policing the Plan**' and '**Network Coordination**'. They include:
  - The establishment of an ongoing senior industry body focused on network resilience;
  - The development of an integrated network planning process to ensure seasonal schedules are robust and resilient, including considerations of airspace capacity;
  - The development of integrated network business continuity/contingency planning for network disruption causes;
  - The development of a common analytical framework, and continuous improvement processes (e.g. shared situational awareness, network performance visibility, shared tools/processes);
  - The development of a 'baseline' training standard based on a review of culture and behaviour across the industry that underpins operational staff collaborative working, to enable full use of the tools and processes of the common analytical framework;
  - A CAA and industry commitment to fully exploit available technologies to improve resilience amongst other government priorities; and
  - A commitment from government and the CAA to provide clarity and operationally viable processes for alleviation of restrictions in the event of network disruption.

- 1.6 The VIRG, with the support of the Oversight Group (OG)<sup>1</sup>, has initiated some of these recommendations, including the formation of an Operations Director Liaison Group (ODLG) as the on-going senior industry body that is to focus on resilience. The VIRG has also initiated network contingency planning for the NATS ExCDS project (which is introducing new electronic flight strip technology into the south east terminal control environment in 2017 and 2018) and an integrated planning process for network schedules. Further details on VIRG and OG participants, along with the Terms of Reference, can be found in Appendix 1 (section 8)
- 1.7 It is considered by the VIRG that the recommendations would not require a significant investment from stakeholders<sup>2</sup>. However, they require a strong commitment and active participation from industry representatives at a senior level to deliver the expected results.

## 2 Introduction

### 2.1 General

- 2.2 The UK system of open air transport competition has served passengers and industry well to date and remains the industry's preferred environment. However, as demand approaches current network capacity in the south east of the UK, the performance and resilience of the air transport network is becoming increasingly challenging.
- 2.3 The UK's airport and airspace capacity is constrained, with no new significant airport runway capacity expected until at least 2025. In 2016, NATS predicted a further 9 per cent increase in aircraft movements at the five major London airports between then and 2022<sup>3</sup>. EuroControl Network Manager<sup>4</sup> also reported that traffic in October 2017 increased by 5 per cent compared with October 2016, as demonstrated in Figure 1, and was above the high forecast.

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<sup>1</sup> Sponsoring group of CEOs

<sup>2</sup> With the exception of airports that have not already implemented A-CDM, since to achieve this, there are often links to other investment needs such as automation.

<sup>3</sup> <http://nats.aero/blog/2016/02/record-demand-will-put-pressure-on-airspace-capacity10605/>

<sup>4</sup> EuroControl Monthly Network Operations Report, Overview – October 2017, Network Manager

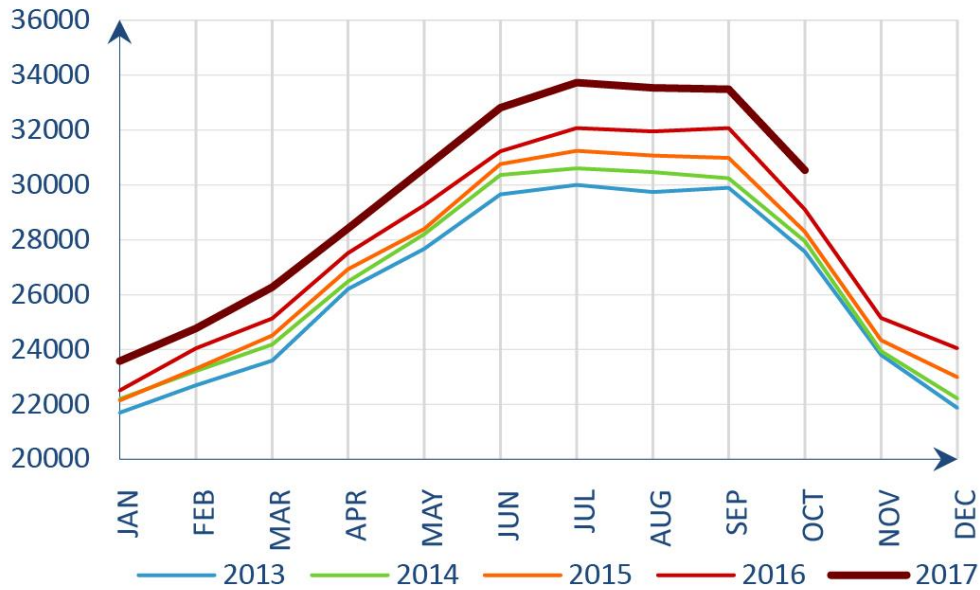


Figure 1: Average Network Manager traffic for last 5 years, October 2017<sup>4</sup>

- 2.4 Such capacity constraints manifest in the need for tactical ATC regulations or local measures being applied to manage:
- Peak traffic periods;
  - Congestion in arrival or departure sectors or routes;
  - Local weather events;
  - Failure of any element of the UK network;
  - Factors external to the UK network, such as European industrial action or weather.
- 2.5 The tactical regulations or local measures are usually applied during the operating day, giving little notice to allow airlines and airports to minimise impact to passengers. This can result in reduced punctuality or significant flight disruption to the extent of cancellations having to be made.
- 2.6 Strategic developments have been identified by previous studies, such as infrastructure and airspace design. However, these have proven to be very difficult to implement due to pressures from local community and political challenges.
- 2.7 Many previous recommendations have been implemented where they have been within the control of specific entities, such as airports, and have delivered useful improvements. Although primarily aimed at individual companies and entities, many of these recommendations could offer greater benefits when applied at network level, and are consistent with the findings of this study.
- 2.2 Objective of the Voluntary Industry Resilience Group**
- 2.8 For the purposes of the VIRG work, resilience is considered to be the ‘ the ability of the UK South East air transport system to operate broadly to plan despite variances



that arise during the operational day, to effectively handle disruptive forces when they arise, and to recover rapidly and robustly in the event of disruption'<sup>5</sup>.

- 2.9 It is noted that resilience is sometimes taken to mean the ability to recover efficiently from a significant disruptive incident, such as a runway closure. However, for the avoidance of doubt, this has not been the focus of the VIRG work.
- 2.10 The Voluntary Industry Resilience Group (VIRG) was set up, at the request of the CAA Chief Executive Officer (CEO), to investigate ways of maintaining and improving network resilience. The Group's objective is therefore to **improve in a systemised manner the way in which the UK's aviation network is planned and operated to enhance its day-to-day operating resilience, reduce delays and reduce the associated costs to both industry and passengers.**
- 2.11 It should be noted that the CAA and industry groups remain determined to improve resilience through the delivery of existing airspace developments, which should still be pursued.

### 2.3 Objectives of this report

- 2.12 The VIRG consists of senior leaders in the participating companies listed in Appendix 1 (section 8). It is led by an independent chairman, Garry Copeland, and supported by the CEOs of those companies. The objective of the report is to make recommendations that will improve resilience and are within the control of industry to implement voluntarily. To ensure these recommendations progress forward and to address new resilience challenges as they emerge, the VIRG will continue in existence, known simply as the Industry Resilience Group (IRG).
- 2.13 To this end, the VIRG has undertaken the following activities to form the **recommendations** in this report:
- Reviewed previous studies and recommendations dating back to 2008, including their implementation success;
  - Reviewed economic impacts and drivers associated with improved resilience;
  - Reviewed planning and operational control processes of participating companies and wider industry;
  - Engaged with EuroControl Network Manager to understand their developments on network resilience;
  - Engaged with the EuroControl Central Office for Delay Analysis (CODA) to understand their data gathering and analysis activities and the potential for information sharing applications;
  - Engaged with the FAA Air Traffic Control Command Center, Washington, to understand their well-established collaborative air traffic management and communications process; and
  - Engaged with UK Network Rail to explore lessons and developments on resilience external to the air transport industry.

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<sup>5</sup> Industry Resilience Group brainstorming RC v4, 26 April 2017

2.14 The report starts by providing details of the group's findings and observations (section 3) before detailing the high-level recommendations (section 4) and more detailed recommendations (roadmap) for implementation (section 5). Details on wider industry activities can be found in Appendix 2 (section 9), Appendix 3 (section 10) and Appendix 4 (section 11).

## 2.4 Responding to traffic growth

2.15 A lack of available capacity (both infrastructure and resources) and prolonged high utilisation leads to increasing delays, reduced punctuality<sup>6</sup> and difficulties in recovery.

2.16 Between 2012 and 2016, there has been a general reduction in punctuality performance at the UK's busiest airports (Heathrow, Gatwick, Stansted, Manchester, Luton, London City), with delays increasing<sup>7</sup>. With the exception of Heathrow and Manchester, all the listed airports have experienced significant increases in traffic over that period.

2.17 UK traffic is now at record levels, with NATS reporting a near 10 per cent increase over the two years up to 2017, which is above the expected level. The 2017 network performance has been better than previous years due to a number of factors, including:

- Relatively benign weather;
- Minimal major system changes;
- Relatively stable European industrial relations environments;
- Benefits of industry investment and focus on resilience measures; and
- ATC procedural changes, such as Time Based Separation (TBS) at Heathrow.

2.18 However, large shifts in the distribution of flights have occurred recently, causing congestion on certain routes and revealing the disparities between schedule coordination of airlines, airports and NATS.

## 2.5 Existing improvements to address resilience

2.19 The following airports and airlines are already investing in improvements:

### Heathrow

2.20 Heathrow is currently investing £37 million in resilience related projects. The 'Strive For Five' programme, which is focused on delivering a 5 per cent improvement in punctuality, is investing in a series of activities including:

- Wake vortex spacing efficiencies;
- Demand-capacity balancing;
- Aircraft turnaround effectiveness;

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<sup>6</sup> The proportion of flights considered to be no more than 15 minutes later than their scheduled on/off stand time

<sup>7</sup> CAA CAP 1515: Operating Resilience of the UK's aviation infrastructure and the consumer interest, July 2017

- Airport Collaborative Decision Making (A-CDM) optimisation; and
- Other airline and airport efficiency projects.

2.21 As a result, departure punctuality at Heathrow to date in 2017 is 81 per cent, which is 2 per cent higher than the same period in 2016<sup>8</sup>.

#### Gatwick

2.22 Gatwick has continued to invest heavily in seeking to deliver improved resilience. This summer, initiatives have included:

- The introduction of various turn incentive schemes for airlines and ground handlers with a total potential pay-out of £19 million;
- Investment in a dedicated airline performance team to support ground handling activities, including the recovery of late inbound aircraft; and
- Operational initiatives, such as the planned use of alternating SIDs to improve departure flow rates.

2.23 These initiatives, together with the measures taken by airline customers, have helped to deliver a 6 per cent increase in departure punctuality performance in summer 2017<sup>8</sup>.

#### Stansted

2.24 Stansted Airport does not have the capacity constraints experienced at Heathrow and Gatwick. However, at peak times, forecasting indicates that this will be an increasing factor. In anticipation of this, a series of four new remote holding stands are to be constructed by Summer 2020 at a cost of £12 million.

#### Airlines

2.25 BA, easyJet, Ryanair and Virgin Atlantic have reported significant investment in resilience measures, including additional spare aircraft capacity and crews, schedule adjustments, improved gate technology and ground handling activity improvements. Airlines are also continuously monitoring block times and, where slot constraints permit, seeking to make adjustments (including within the season). However, networked carriers report this is very difficult to correct in-season due to the large percentage of connecting customers affected.

#### Overall improvements

2.26 Figure 2 provides an overview of year-on-year departure punctuality performance for Heathrow, Gatwick and Stansted based on summer 2016 and 2017 movements<sup>9</sup>. The improvements highlighted above provide the background for a 3 per cent overall improvement in 'on time performance', as observed for the three airports.

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<sup>8</sup> Statistics from LHR and LGW based on commercial passenger flights and 'on time' criteria of AOBT ≤ SOBT + 15:59

<sup>9</sup> Statistics from LHR, LGW and STN based on commercial passenger flights and 'on time' criteria of AOBT ≤ SOBT + 15:59

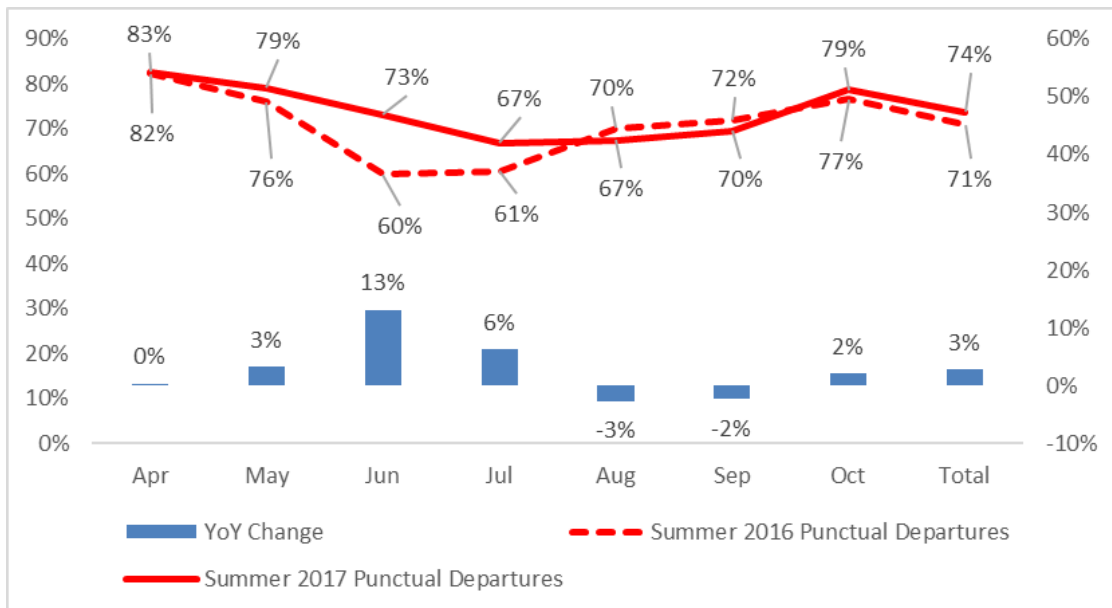


Figure 2: Year-on-Year Headline Departure Punctuality Performance: total Heathrow, Gatwick, Stansted

## 2.6 Economic and consumer drivers to improve resilience

2.27 Delays and cancellations associated with increasing congestion and inefficiencies impacts the industry through increased fuel costs, crew costs, airport charges and passenger care and compensation costs. Whilst passengers may be financially compensated for delays, airlines may choose to increase ticket prices to remain profitable and avoid detrimental cost-cutting measures. In addition, delays and cancellations cost passengers in time, which can be converted into an equivalent monetary value.

2.28 Data from EuroControl<sup>10</sup> has been analysed to estimate the scale of the costs associated with delays and cancellations at the six main London airports<sup>11</sup>. The 'average' cost of delays, cancellations, diversions etc has been determined by EuroControl based on a study of European airlines. Passenger values of time have been taken from the Airports Commission appraisal methodology<sup>12</sup>. Such costs have been adjusted to 2016 prices.

### Delays – all causes

2.29 Average delay is currently measured by the CAA<sup>13</sup> as the expected time versus actual time on/off runway using an assumption for taxi times. It also considers flights that arrived early to be on time (i.e. they had zero delay).

2.30 Based on the EuroControl and Airports Commission data, the additional cost of these delays (i.e. above that which was already planned for in airline schedules) to airlines and passengers operating to/from the six London airports is estimated at around £1.8 billion per annum.

<sup>10</sup> EUROCONTROL: standard input data for cost benefit analyses V7.0 November 2015

<sup>11</sup> Heathrow, Gatwick, Stansted, Luton, London City and Southend

<sup>12</sup> AIRPORTS COMMISSION: Economy: Delay Impacts Assessment Methodology Paper November 2014

<sup>13</sup> Source: CAA punctuality statistics

- 2.31 Not all delay minutes are within the UK industry control. For example, delays originating at the other end of routes or due to ATC strikes on the European continent. Nonetheless, where such delays have knock-on effects to other flights, the *size* and *significance* of such effects may still be within UK industry control, either wholly or partially.
- 2.32 Delays that are within UK industry control can occur due to different root causes, depending on the circumstances or the airport / airline business model. Contributing causes include:
- Inaccurate block times;
  - Inadequate resourcing;
  - Airfield congestion;
  - Airport flow regulations due to congestion / weather etc.

#### Delays – air traffic control

- 2.33 NATS En-Route Limited (NERL) reports its attributable delays<sup>14</sup> as part of its licence conditions. Incentives and penalties are determined based on this performance. NERL's en-route attributable delay due to capacity/staff and en-route weather is approximately 250,000 minutes per annum<sup>15</sup>. This delay figure is significantly below the Reporting Period 2 (RP2) penalty levels set in 2014.
- 2.34 This equates to approximately £13.4 million in airline costs per annum<sup>16</sup>, excluding the reduced en-route ATC charges agreed as part of the NATS RP2 settlement. This also equates to a passenger value of time cost of about £10 million per annum assuming an average load factor of 150 passengers per aircraft. This may not necessarily manifest itself in aircraft delay compared to the schedule (as per 'Delays – all causes' above), but is nonetheless a delay and an opportunity cost.
- 2.35 There may be opportunities to improve the balance between demand and capacity for different airspace sectors. For example, if ground delays are expected it may be more beneficial for an airline to plan for a re-route option, flying additional track miles. EuroControl data suggests that it may be more beneficial for an airline operator to fly an additional 80 track miles than incur a ground delay of more than 5 minutes. However, the ultimate decision on whether to incur additional cost in flying longer routes versus accepting delays on the ground should be taken by the airline that incurs the cost.

#### Cancellations

- 2.36 EuroControl<sup>17</sup> estimates that the average cancellation rate for European carriers is 1.5 per cent, with a peak of 8 per cent during significant events. BA, easyJet and

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<sup>14</sup> NERL attributable delays are extra calculated as avoidable delays suffered by aircraft due to NERL's operation. Such flights may or may not be delayed in terms of their scheduled take-off and landing times.

<sup>15</sup> Estimate based on 2015 figures from CAP 1578 Investigation Under Section 34 of the Transport Act 2000: Project Oberon, Final Report

<sup>16</sup> Assuming a EuroControl average cost of euros €59 per minute

<sup>17</sup> EuroControl: standard input data for cost benefit analyses V7.0 November 2015

Ryanair<sup>18</sup> have lower average cancellation rates of 1 per cent, 0.6 per cent and 0.5 per cent respectively.

- 2.37 At the six main London airports, departure cancellations would equate to approximately 5,865 per annum based on a 1 per cent cancellation rate, costing<sup>17</sup> between £103m and £400m per annum<sup>19</sup>.
- 2.38 Not all cancellations are avoidable in the context of network resilience, for example due to aircraft damage or crew shortage. However, BA and easyJet estimate that approximately 20 per cent of cancellations could be classed as unavoidable.
- 2.39 In the case of BA and easyJet, there is an opportunity to consider better planning and/or operational procedures to reduce the 80 per cent of cancellations that are potentially avoidable, depending on the circumstances. For example, at Heathrow, TBS procedures have improved arrival rates by around 2 movements per hour during high wind conditions and 1 movement per hour during low wind conditions, which equates to protecting approximately 30 movements on a windy day.
- 2.40 There may be similar opportunities to consider for departures that could reduce delays and cancellations. A 10 per cent improvement in potentially avoidable cancellations could benefit airlines between £8m-£32m per annum.

### 3 Group findings and observations

#### 3.1 Realistic Planning

##### Schedule realism

- 3.2 Many parameters are used to plan airline schedules and to integrate them into airport capacity limitations. NATS also has a planning process to support schedules in the local airspace. However, experience indicates that the airline, airport and NATS processes are not integrated, affecting the extent to which processes are effective at a network level for continued resilient and optimised operations.
- 3.3 At the schedule planning stage, history indicates that network or system forecasts are consistently inaccurate. Figure 3 provides an example of this situation, whereby actual traffic has far exceeded predicted traffic levels at NATS centres. EuroControl Network Manager<sup>20</sup> also reported that traffic in October 2017 compared with the same month in 2016 was above the high forecast.

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<sup>18</sup> Ryanair's cancellation rate prior to the 2017 rostering issue was consistently below 0.5%

<sup>19</sup> Based on EuroControl costs of €18,400 for low cost carriers 189 seats and €78,400 network carriers 250 seats. Prices uplifted from 2014 and assuming a Euro : Pound exchange rate of 1.1 : 1.

<sup>20</sup> EuroControl Monthly Network Operations Report, Overview – October 2017, Network Manager

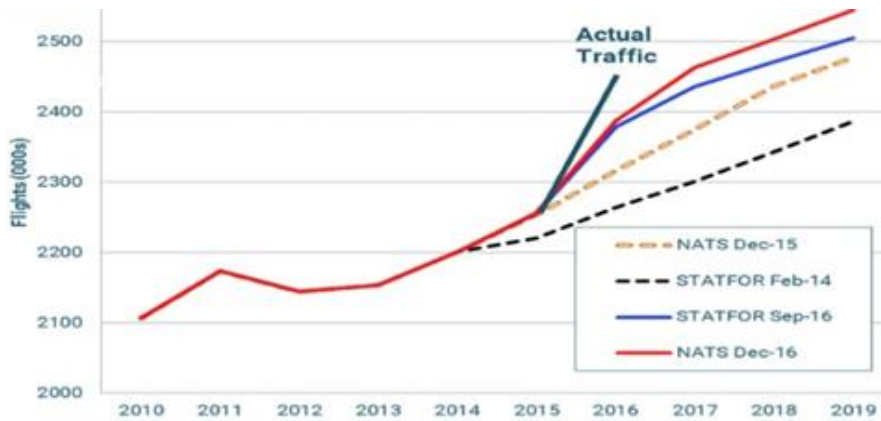


Figure 3: Actual versus forecast air traffic (source: NATS)

- 3.4 Seasonal schedules are designed and proposed by individual airlines. Airports declare their capacity depending on critical points in their business, including (but not limited to) runway capacity. Capacity is based on a set of business rules, which typically specify that on a busy day<sup>21</sup> the expected average delay generated by the airline schedule should not exceed a set limit.
- 3.5 Airports Coordination Limited (ACL) coordinates airline slots for UK slot-controlled airports as follows:
- ACL receives slot requests from individual airlines;
  - It checks the requests against historic slot rights, the capacity of the runway, terminal and other local infrastructure; and
  - Integrates the slots for the specific airport to confirm the total number of movements against the declared capacity of that airport.
- 3.6 There follows an iterative process to match the demand to capacity for that airport. The final schedule for the airport is not published by ACL at the start of the semi-annual IATA slot conference, after which some slots may be handed back by the airlines. Further details on the process are provided in Appendix 6 (section 13).
- 3.7 The ability to deliver the coordinated schedule published by ACL is critically dependent on the design parameters used by the airlines, such as block times, turnaround times, taxi times, etc. While these parameters are embedded in the airline schedules presented to ACL for its allocation process, they are not explicitly stated. ACL's visibility is often limited to one end of the route (unless also responsible for slot coordination at the other end of the route). This significantly limits ACL's ability to assess the robustness of the proposed schedule at a key stage in the planning process.
- 3.8 Block times and turnaround times are generally based on averages without consideration of the wider network). Block times are often adjusted to assist punctuality and allow for typical delays, such as longer taxi-times or to absorb longer turnarounds later in the day. This can have a detrimental effect on the performance of the wider network.

<sup>21</sup> Assuming no external disruption

- 3.9 Turnaround times have a powerful influence on an airline's schedule and on the airport's performance. The combination of tight turnaround times, the pressure on ground handling agents to deliver the contracted level of performance and airlines having to balance other issues (such as slot availability, weekly/seasonal variance) has contributed to significant difficulties at several airports, absorbing considerable management attention to improve in 2017.
- 3.10 There are concerns about the accuracy of planning parameters and the 'deliverability' of airline schedules. The schedules provided to ACL are expected to be based on realistic planning parameters and deliver flight punctuality (to within +/-15 minutes for short-haul flights). However, based on ACL's monitoring of flight completion and punctuality, the planning parameters used by airlines are generally best-fit/seasonal variation on long-haul flights, and there is limited available evidence of effective monitoring of the actual performance versus the plan.
- 3.11 ACL's powers to address airlines' inaccurate planning or unrealistic schedules are limited to revealing those that are demonstrably 'repeated and intentional', and are used only infrequently. This can lead to punctuality impacts being unresolved throughout a full operating season. The nature of ACL's powers is such that it tends to focus on retrospective slot performance reviews, requiring a portion of the scheduling season to have taken place before it can identify slot performance issues. Due to the lead time associated with implementing schedule changes (e.g. notifying passengers, changes to crew rosters), there is limited scope to resolve slot performance issues within the scheduling season.
- 3.12 The schedules for individual airports are produced to great detail and should provide airport schedules that are compliant with the airport capacity declaration. However, the runway scheduling process for future seasons is based on the performance of the previous season where performance may have been sub-optimal. The modelling supporting the capacity declaration is often based on an assumption that runway demand will be delivered in line with the schedule, with limited consideration given to the impact of a material shift in the schedule on resilience.
- 3.13 Overall, there is limited evidence of cyclical continuous improvement across a range of planning parameters.

#### Building on existing improvements

- 3.14 As demand approaches capacity, some airlines are reacting to reduce trends in poor performance. Airlines, including BA, easyJet, Ryanair and Virgin Atlantic, are adjusting planning parameters to improve schedule realism. They are also investing in additional aircraft capacity, crews and resources to provide contingency arrangements to improve punctuality, prevent cancellation and therefore improve overall resilience (for example where an aircraft has a technical fault or a schedule is disrupted).
- 3.15 Similarly, some airports have introduced active processes to monitor and improve schedules. All airports represented at the VIRG have active methods of monitoring slot performance as a means of supporting adherence to slot allocations, and Gatwick has invested in operational supervision to improve schedule adherence. However, there is no provision of a similar arrangement at the network level.



- 3.16 There is a need and scope for individual airlines and airports to more consistently verify and adjust planning parameters subject to runway slots constraints, based on their operational performance. Agreeing a consistent set of operating metrics and monitoring them at a network level would facilitate a continuous improvement cycle and should help to support a significantly improved planning process.

*Integrating schedules and verifying airspace capacity*

- 3.17 At the airspace network level, there is no formal process to integrate the schedules of airports in the region and to check or validate them against the local London TMA airspace constraints. There is therefore no mechanism to include airspace capacity parameters into the planning process and evaluate the impact of the season's schedule on the airspace network.
- 3.18 Similarly, there is no structured process to use network operational performance data to monitor the network performance. This in turn significantly reduces the ability to make planning parameter adjustments or otherwise apply continuous improvement processes to the network.
- 3.19 NATS does not have a formal process to take account of changes in the schedule details in its resource planning. Instead, it relies on adjusted STATFOR predictions, network intelligence and historical data. Detailed data on city pairs, preferred Standard Instrument Departures (SIDs), routeing, etc is available at the seasonal planning stage, but currently none of this data is used to predict and mitigate any issues arising in advance.
- 3.20 By default, therefore, any network capacity conflicts on routes or through sectors are resolved by reactive tactical on-the-day regulation or local measures. The existing process does not allow proactive adjustments based on integration at the network level and instead relies on airline adjustments in real time, with few options to limit disrupted flights and passengers.
- 3.21 While NATS' reliance on historic performance data ensures that the schedule shift typically experienced is incorporated within its planning process, it would be beneficial for this data to be supplemented with an assessment of the proposed airport schedules on the airspace network. This would allow improved planning and allow conflict resolution in the planning stages.
- 3.22 Similarly, airports and airlines now have sophisticated processes to predict peak demand days, such as school holidays, major sporting or cultural events. Bi-lateral planning has also improved in recent years. Although there are examples where integrated planning has proven successful for individual events, such as the London Olympics in 2012, there remains no effective process for evaluating the impact of predictable events at network level.
- 3.23 The VIRG agreed the need for objective measurement and feedback of schedule planning parameters. The group also recognised that more effective integrated processes are required to monitor and encourage accurate planning, scheduling and operational performance delivery. The group also notes that it is essential for the industry to work together to share and interpret schedule data in a collaborative manner to accommodate growth of airports, airlines and route connections by identifying and managing hotspots at the strategic planning phase rather than the tactical phase.

#### Shared business continuity and contingency planning

- 3.24 Individual air transport entities generally have strong contingency plans in place, though recent experience of virtually all VIRG companies indicates that there is no room for complacency in planning for and managing disruption. Furthermore, society and political expectations, reduced tolerance of poor performance, and the rising cost of recovery and compensation after disruptive events demand that planning processes are continuously reviewed and improved.
- 3.25 In recent years, the scale and cost of potential disruption events has encouraged adjacent businesses to share contingency planning. Bi-lateral contingency planning continues to be developed between airports and the airlines operating there. However, there is very little shared and coordinated UK south east network-wide contingency planning. The network performance during disruptive scenarios largely depends on the working mechanisms of individual company contingency plans and on the experience of individuals in key operational control roles. The results are often incomplete or inconsistent from event to event, or even day to day.
- 3.26 This inconsistency is also evident during 'routine' events, such as inconsistency in tactical regulation during traffic congestion. This is even more evident during more significant disruption, whereby the situation can rapidly deteriorate in the absence of good plans and firm control.
- 3.27 Opportunities to develop shared contingency planning have been identified by the VIRG, which could mitigate disruption or improve recovery. These include industry-wide planning for the NATS ExCDS programme (which is introducing new electronic flight strip technology into the south east terminal control environment in 2017 and 2018) and sharing of data on thunderstorms and other scenarios within the London TMA. Lessons from the approach adopted by the FAA (see section 3.2) should also be considered.
- 3.28 A draft roadmap of actions has been drafted and included in Appendix 5 (section 12).

#### Other industry practices (Network Rail)

- 3.29 The VIRG engaged with Network Rail to understand and compare the planning and control processes used by another complex, high density, safety critical network industry.
- 3.30 It was observed that the railway industry has a very different regulatory and ownership environment compared with the air transport industry. Network Rail is the sole entity that 'owns' most of the operating rail network in the UK, which centrally controls the network. Operators wishing to operate on the network must contract to a strict 'network code' and 'rail operating code', which govern their access and operating procedures.
- 3.31 Like the air transport industry, operators do bid for their schedules on a seasonal basis, but within the bounds of the network code and rail operating code. Network Rail must also confirm that the schedules are compatible and within the capabilities of the infrastructure capacity.
- 3.32 Competition for scheduled passenger operations takes place at the franchise bidding stage, rather than at the seasonal or daily level. Franchise requirements dictate the services that are to be operated, often specify the schedule to be adopted, and maintain stable seasonal schedules.

- 3.33 While there are differences in the regulatory basis for the two industries, there is relevance to understand the operational planning processes further. There is also scope to understand the benefits of visibility and coordination over both ends of a service route and integration with other routes.
- 3.34 It is recommended that the rail industry's lessons on schedule planning, operational control and coordination are considered as part of the development of UK network-wide planning, control and coordination processes.

## 3.2 Flying to plan

### Consistent metrics

- 3.35 The VIRG reviewed the metrics used by industry, such as IATA data, to characterise, monitor and report on operations. While the aviation industry generates an extensive range of data, there can be different interpretations. In addition, some significant operational performance indicators are not monitored consistently or at all. There needs to be an improved understanding of the drivers of punctuality performance and consistency in the data used and monitored.
- 3.36 NATS experience indicates that aircraft arriving earlier than the airlines' published schedule times are potentially disruptive, generating congestion and causing on-schedule traffic to hold. More commonly associated with long-haul routes, this impacts punctuality and can involve substantial variation in landing time. This also impacts on airport stand planning and congestion, which can be a challenge for airline and ground handler resources. However, few entities measure early arrivals as a prompt to investigate the causes (e.g. where schedules are adjusted for delay) to reduce this impact. It is of note that CAA and other statistics include early arrivals in the 'on time' category.
- 3.37 The VIRG recognises that a common analytical framework would improve the industry ability to comprehensively determine and monitor network behavior. This would facilitate continuous improvement by collaboratively focusing attention on those issues that could improve network performance and resilience.
- 3.38 A review of data systems used at each participating VIRG company indicates similar metrics and data used at a high level. This may provide a good basis to develop a shared set of data systems and common metrics.

### Shared visibility of operational performance and situational awareness

- 3.39 Most participants in the air transport network, including each of the VIRG participants, have tools to monitor the performance and provide overall situational awareness of their individual operations. The sophistication of such tools varies widely to enable monitoring and awareness for maximised operational performance.
- 3.40 However, there is no agreed shared visibility of performance or situational awareness for the UK south east network. Information about on-the-day performance and any early warning of developing disruption is therefore held in company-specific systems, such as the NATS radar system or airport and airline operations control systems. There are few agreed and consistent processes that would allow network participants to comprehensively detect a developing disruption, exchange information and provide an industry response to maximise operational resilience.

#### Readily available operational data

- 3.41 Vast quantities of shared data are available to all network participants, but experience suggests that little is used collaboratively to enhance network performance or resilience.
- 3.42 Each company provides operational information to various entities, some of whom repackage the information to sell to consumers or other companies. For example, airlines provide operations data to airports, which contribute to Flight Information Display System (FIDS) screens (arrivals and departures information). FIDS data is either distributed or screen-scraped by various commercial companies, then repackaged and sold, etc. Other companies, such as those providing web-based flight tracking service, gather information from ATC communications systems and sell that data to app consumers. The VIRG noted that FlightRadar24, FlightAware, Flight Track and other data aggregators provide extensive industry data to the public, often enabling passengers to be better informed than the air transport network.
- 3.43 Increasingly, these data-providing apps are now used by airlines and airports to supplement their situational awareness. In some cases, the apps effectively provide the most comprehensive network situational awareness available. It is noteworthy that of the ten companies participating in the VIRG, seven reported that they use FlightRadar24 or FlightSentry systems as situational awareness tools.
- 3.44 The following EuroControl data could also provide an available source of operational data across Europe:
- The EuroControl Central Office for Delay Allocation (CODA) has collected airline data since 2003 and airport data since 2007, covering around 170 airlines and capturing approximately 80 per cent of commercial operations<sup>22</sup>;
  - EuroControl is developing Fleetwatch, which can:
    - visualise schedules;
    - visualise the operating lines of individual aircraft;
    - provide a measure of the quality of planning parameters; and
    - help to assess the impact of schedule shift on airspace flows.
- 3.45 The EuroControl database and visualisation products are understood by the VIRG participants to provide opportunities to improve the availability and quality of planning data and schedules. They may also provide opportunities to develop collaborative situational awareness tools that could assist tactical management in congested and disrupted traffic situations.

#### Airport Collaborative Decision Making (A-CDM)

- 3.46 A-CDM is a EuroControl sponsored process to gather and share flight departure information, improve situational awareness across the European network and provide operationally critical movement data for airlines, ANS Providers (ANSPs) and airports. It was initially specified for the exchange of data, but to date has been

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<sup>22</sup> CODA has published several reports that have been reviewed during the VIRG review.

implemented independently at European airports and airport groups to allow industry maximum flexibility.

- 3.47 A-CDM is also an enabler for the Single European Sky ATM Research (SESAR) deployment of the collaborative Airport Operations Plan (AOP) and Network Operations Plan (NOP). In turn, NOP deployment is an enabler for operational stakeholders and the European Network Manager to operate Network Collaborative Management (NCM) by 1 Jan 2022. A-CDM implementation for airports identified by the European Commission falls under the SESAR Deployment Manager (SDM) Pilot Common Project (PCP) ATM Function (AF) 4 (NCM) requirements. This affects 4 UK airports: Heathrow, Gatwick, Stansted and Manchester.
- 3.48 In the meantime, there is no 'standard' A-CDM implementation or stable end-to-end testing platform, which has resulted in fragmented or incomplete implementations across Europe. This situation continues to place pressure on airports, airlines and ground handlers to deliver real time information on departures for the anticipated performance benefits, but independent of the wider network.
- 3.49 Heathrow airport was an early adopter of A-CDM in the UK. Heathrow learning centred around the challenge that cultural/behavioural change was on a par with the challenge of system connectivity into the Network Manager. Accurate A-CDM data input is critically dependent on local ground handlers, and its use is critically dependent on the behaviours of pilots and local air traffic controllers. However, the Heathrow community persevered so that the benefits of an accurate and shared flow of information are now proving invaluable.
- 3.50 Other London area airports are yet to fully implement A-CDM, along with NATS for its ability to use CDM messaging for its current systems. Both Gatwick and Stansted have committed to implementing A-CDM and Heathrow has shared its experiences through expert workshops.
- 3.51 Gatwick achieved EuroControl accreditation in Dec 2014, but the pre-production environment set-up by EuroControl for system testing did not reflect the live operational environment. As a result, Gatwick is currently operating in local mode, but committed to re-enter network mode pending completed satisfactory testing.
- 3.52 Stansted is at the start of the journey, but committed to implementing A-CDM..
- 3.53 A fully functioning and harmonised A-CDM platform across the major airports in the south east and wider UK could present a fundamental opportunity for improved situational awareness and collaborative planning.
- 3.54 At the tactical level, the following inaccuracies can occur:
- Inaccurate 'Off-block' times;
  - 'Ghost' flight plans; and
  - Flights that do not turn up in a sector at the expected times.
- 3.55 Network Manager has suggested that such inaccuracies can result in up to 20 per cent<sup>23</sup> of unused available network capacity as a result of aircraft not operating in a sector when they were indicated to be there. Indeed a sector could indicate 'over

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<sup>23</sup> Data from EuroControl Network Manager (sector capacity versus actual utilisation)

demand', based on inaccurate data, that triggers a regulation when the aircraft were not intending to operate there. This unnecessary 'on the day' regulation challenges the consistency and accuracy of various elements of air traffic management. The slow and uneven implementation of A-CDM has in turn resulted in a slow progression to the expected improvements for stable and accurate data flow. Improvements in off-block time information would result in a significant improvement in airspace management.

FAA Collaborative Decision Making processes.

- 3.56 The VIRG engaged with the FAA Air Traffic Control System Command Centre (ATCSCC) to understand the well-developed US air transport collaborative process for integrating network control and dealing with operational disruption.
- 3.57 The US National Airspace System is large and complex, with over 5000 paved airports, of which more than 500 are tower controlled. The FAA is both the regulator and the ANS provider. The FAA system prioritises the top 30 airports in times of disruption for recovery management.
- 3.58 The FAA has a long-established process for working with industry to develop the network schedule and control continent-wide operations, with parts often subject to extreme weather. Although US airspace is not uniformly congested, it contains regions of extreme congestion, especially in the following areas:
  - Washington, New York, Boston;
  - Northern Midwest; and
  - South west.
- 3.59 Similar to the UK, the USA is characterised by an open air transport market. However, some of the FAA principles and tools to manage network congestion and disruption are different to the UK/European context. In conjunction with the industry network, it has developed a 'playbook' of air traffic management contingency plans, which is constantly evolved. The playbook is publicly available on the FAA website and contains plans for various weather scenarios, peak travel periods and other foreseeable events.
- 3.60 Most of the system management plans in the playbook address domestic traffic and therefore largely US airlines, though the FAA report a strong collaborative relationship with Canada and Caribbean ANSPs and carriers.
- 3.61 The Command Center uses a well-established schedule of conference calls with FAA regional units (airports, airlines) and industry bodies to consider factors affecting the National Airspace System, define system management plans for the following day and then tactical calls through the day to review and adjust progress. The playbook is a key resource for these calls. There is also a daily review process (completed before 1100 eastern time) to review the previous day's operation and consider any lessons learned.
- 3.62 The FAA allows sharing of information and industry input through the calls where appropriate, whilst retaining the deciding vote on final operational decisions. However, the FAA reports that it is rarely necessary to use the deciding vote, as the processes are widely understood and valued for their transparency by airspace users and service providers.

- 3.63 Following the industry calls (and at other times as necessary), the FAA issues advisories to communicate the decisions. The advisories can be classified as follows:
- ‘Information’;
  - ‘Recommended’; and
  - ‘Required’.
- 3.64 Unlike UK Notices to Airmen (NOTAMs) for capacity management in disruption, compliance with ‘Required’ advisories are mandatory.
- 3.65 The FAA continues to evolve processes for network control and coordination. In the last year it has evolved a formal closed-loop process for collaborative tactical management of the National Airspace System (NAS). It is developing an effective process for system management through the PERTI process (i.e. Plan, Execute, Review, Train and Improve). The process sets daily and monthly goals to drive performance improvements and set expectations.
- 3.66 The VIRG observed that a similar information-sharing and review process could be appropriate for the UK environment. Based on an adapted PERTI process for the UK environment and hosted by NATS, it would be a useful contribution to stability and resilience.

### 3.3 Serving the plan

#### Contemporary technology and operating practices

- 3.67 The current network is supported by varying levels of technology and processes that could enhance performance and resilience, including:
- High performance navigation and communications on all modern transport aircraft;
  - Ground communication capabilities; and
  - Situational awareness and decision support tools.
- 3.68 Full use of installed navigation and communications technology on contemporary aircraft can be enabled through operating principles, practices and safety interpretation changes. If used to the full extent possible in terms of aircraft navigation capability and communications within the network, the technology would contribute to improved resilience.
- 3.69 As demonstrated through the introduction of TBS at Heathrow, a relatively modest change in operating process can provide significant benefits in capacity and resilience. Heathrow Airport Limited (HAL) reports that TBS protects an average of one movement per hour on normal days, and over 2 movements per hour on windy days. This is a significant improvement in resilience.
- 3.70 Some examples of technology and operating principal opportunities include:
- **Full use of current aircraft navigation and control systems** to give precise control in four dimensions (4D trajectory sharing), including speed and time. This would require a review of NATS processes, CAA safety assessment guidance and the flexibility to make operating changes within the existing Noise

Preferential Routeing (NPR) structure. 4D trajectory sharing may facilitate a reduction in current Time Based Departure Separations and should be investigated. This implementation in Europe aligns with the SESAR Deployment Manager PCP AF 6 requirements.

- **Full implementation of A-CDM** and the continued refinement of departure sequencing algorithms could deliver Runway and Network efficiency. A-CDM implementation in Europe falls under the SESAR Deployment Manager PCP AF 2 and 4 requirements.
- **Enhanced arrival efficiency** could be enhanced by using 'required time of arrival' instructions. This will require development of the current 'first come, first served' ATC principles and industry behaviours. The UK industry should quickly adopt these principles and behaviours, interfacing appropriately with the supporting SESAR deployment (implementation in Europe falls under the SESAR PCP AF 4 requirements).
- **Controller-pilot data link communications (CPDLC)** is a data-based communication technology, which is used for oceanic air traffic management and by Maastricht for some European operations. Departure Clearances via Data link (CDL) is also available at Heathrow and Gatwick for clearance delivery. Data link significantly reduces VHF frequency voice communications and reduces human errors, and supports more efficient departure clearances. The EC has mandated airlines to equip all aircraft flying above 28,500 feet in European airspace by February 2020 and for States to implement the ground equipment by February 2018.

#### Behaviours and training

- 3.71 With the increased use of sophisticated tools and growing volumes of data to manage operations, it is increasingly important to ensure that operational staff are supported by appropriate training.
- 3.72 In some cases, the competitive environment has encouraged individuals to seek outcomes that are successful for their own organisations, but without consideration of the interface with the overall network performance outcome.
- 3.73 Many organisations have competent and experienced personnel to support their functions. Often levels of capability are achieved through experience rather than competency based training focused on necessary skills, such as decision-making or workload management. A common qualification and training standard is required to achieve the following:
- Capability and currency of people engaged in scheduling and operational control processes;
  - Ability to effectively use the increasingly complex and sophisticated tools on which the densely packed operation now relies; and
  - Working in multi company teams.
- 3.74 In the UK, airports can propose capacity reductions to protect overall performance in poor forecast weather. Several airports, including Heathrow and Gatwick, have developed capable processes for this, advising the reductions via NOTAMs, but



compliance is voluntary. Frequently, capacity freed through based carrier cancellations is taken by non-based carriers that do not cancel their flights, in turn exposing the based carriers to public criticism.

- 3.75 Several other factors point to the need for increased focus on training and behaviours in managing a congested network. The inconsistent responses by different operational leaders in similar circumstances may be a consequence of the lack of a consistent approach to training. It is also often evident in disruption events, which can be compounded by poor communications, confusion about management and recovery options, and inefficient use of available resources. These issues are manifested both within a company and between companies.
- 3.76 It's worthwhile to note that similar concerns in flight operations prompted the development of Cockpit Resource Management (CRM) philosophies and training. Many CRM concepts and benefits are equally applicable to the operational control environment.

### 3.4 Policing the plan

Authority to manage demand

- 3.77 As described in section 3.2, in the US the FAA uses 'Required' advisories to mandate any required capacity reductions. In France, national law empowers airports to issue mandatory NOTAMs. In the UK, the authority to manage capacity, either in normal or disrupted operations, is less clear. Airport NOTAMs can only 'request' capacity reductions, rather than 'require' or 'mandate' them.
- 3.78 Without the authority to reduce capacity (when required), short-term tactical management and regulation may be required where airlines do not respond to a NOTAM. Regulation during the operational day leaves little time for airlines and airports to manage operations for minimum passenger impact.
- 3.79 The US experience, based on the long existing FAA coordination processes, suggests that the air transport community recognises that occasional reductions and other measures are necessary to mitigate disruption and expedite recovery. They also recognise that a transparent, robust process, which can be enforced if necessary, encourages all operators to participate fairly.
- 3.80 Despite the FAA's ability to enforce a deciding vote in their coordination calls, the FAA report that they need to rarely use that vote.
- 3.81 A similar demand versus capacity management process for the UK, with the ability to mandate compliance when required, could significantly improve resilience on forecast disruption days. Such a process should be collaborative, with a focused review and improve element. It should also maintain choice for operators to retain responsibility for their own operation.
- 3.82 Appendix 4 (section 11) provides further background information on the HAL voluntary capacity process and the French, UK and EuroControl Network Manager legislation differences.

#### Authority and processes for alleviation of restrictions in disruption

- 3.83 Airport operations are bounded by many constraints beyond their physical capacities. These constraints can include curfews, night jet ban measures, noise preferred routes, and many more.
- 3.84 In a capacity constrained environment, coupled with these restrictions, there is often little or no capacity for recovery after even brief disruptions. For example, weather in the middle of the day or a brief runway blockage by an aircraft with a technical issue can require a flow-rate restriction. On a peak day at Heathrow or Gatwick, this can severely restrict the departure of all scheduled flights by the end of the day, with a high probability of flight cancellations. Both airports can operate at 40 to 55<sup>24</sup> movements per hour, so even short disruptions can affect large numbers of flights and passengers.
- 3.85 During peak travel periods at Heathrow and Gatwick, a minor disruption in the operation can result in a major disruption for passengers, airlines and airports. There can be very few options to re-book passengers of cancelled flights onto subsequent flights.
- 3.86 In these circumstances, clarity on the options available to potentially alleviate normal constraints is necessary at the earliest possible opportunity. Clear and early knowledge about the options available to complete the schedule within the operational day (or not) is critical to maximise resilience. During such periods, it would be helpful if EuroControl/NATS could:
- Offer greater volume of route alternatives during periods of high regulation; and
  - Simplify the transaction process for airlines to accept and file revised flight plans, in the event they wish to accept alternative routings.
- 3.87 The ability to fly beyond the normal curfew of 2330L at Heathrow can be granted by the Airport Operations Duty Manager, who will make the decision after assessing the specific disruption conditions. However, granting of this alleviation can sometimes only be confirmed late in the operational day, which can lead to additional stress on the operation. All dispensations are granted after the event, when appropriate evidence is available, and then submitted to the Department for Transport (DfT) for their records. Consistent and timely processes for approving operational alleviations is required.

### 3.5 Network coordination

- 3.88 As demand approaches capacity, the consequences of over demand appear only during the operational day, and are then managed by ad-hoc regulation or local measures on the day. Improved planning at a network level could identify issues at a much earlier stage, thereby offering more options for alleviation. There needs to be a mechanism to integrate the airport schedules and evaluate demand versus capacity for SIDs, routes or sectors, and resolve conflicts. Similarly, in case of disruption on the day, airport capacity limitations may be necessary.
- 3.89 The voluntary mechanisms for integrating the network schedule, as recommended by this report, are necessary to deliver the necessary capacity, stability and predictability

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<sup>24</sup> Stansted can operate up 50 movements per hour.

in the network. If such mechanisms are not adopted throughout the network, then further solutions may be necessary to resolve conflicts.

- 3.90 In all cases, VIRG participants prefer to avoid imposed solutions and maintain as much freedom as possible for individual entities to make the best possible business decisions. Improved voluntary coordination, situational awareness, and cooperative problem resolution would minimise the need for imposed limitations.
- 3.91 However, as demand approaches capacity limits, the responsibilities, process and scope of powers for making final decisions need to be transparent and well-understood by all stakeholders<sup>25</sup>.

## 4 High-level recommendations

### 4.1 Overview

- 4.1 Recommendations are made to reflect the opportunities identified in this report and which are within the control of industry to implement voluntarily. The recommendations are grouped into '**Realistic Planning**', '**Flying to Plan**', '**Serving the Plan**', '**Policing the Plan**' and '**Network Coordination**'. These high-level recommendations therefore act as a link between the opportunities identified in section 3 and the more detailed recommendations described in section 5 for the working groups' progression.

### 4.2 Operations Director Liaison Group

- 4.2 Industry and the CAA should establish a high-level voluntary forum, to be known as the Operations Director Liaison Group, to drive timely and effective operational resilience improvements based on the detailed recommendations of this report. Other emerging operational resilience issues and their resolutions should also be tracked. The set-up should be modelled on the successful Flight Ops Liaison Group process.
- 4.3 The IRG will continue to request practical on-going support and sponsorship from the Operations Directors or Chief Operating Officers of the IRG companies, including to progress the recommendations and address new resilience challenges as they emerge.

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<sup>25</sup> Ryanair fully supports initiatives to improve cooperation and collaboration with industry partners to resolve conflicts in the event of disruption in the UK SE transport system. However, Ryanair is opposed to any recommendations that impose limitations on its decision to operate flights. As a last resort, if voluntary actions do not resolve over-demand, Ryanair considers that the current use of ATFCM regulations provides a transparent and equitable process to restrict traffic into airspace. It is then the airline's decision to cancel or delay.

### 4.3 Realistic planning

4.4 Industry (NATS, ACL, airlines and airports) should work together to achieve considerably improved 'network level' coordination to enable enhanced planning, enable timely conflict resolution and support continuous improvement reviews including:

- A complete evaluation of proposed seasonal schedules, including their impact on airspace management;
- Developing network level business continuity/contingency planning for network disruption (including proactive mitigation of disruption causes and recovery management); and
- Developing shared operational policies to mitigate disruption, such as non-emergency diversions.

### 4.4 Flying to plan: Shared situational awareness and collaboration processes

4.5 Industry should develop shared situational awareness and collaborative decision-making processes:

- To share operational information on season, including pre-tactical and tactical operations as necessary for resilient operations, within both the 'letter' and 'spirit' of competition law;
- To use a common analytical framework to inform and improve operations;
- To develop collaborative processes between airport, airline and NATS control centres as necessary to support resilient network operations; and
- To develop network operational information sharing processes (between NATS and industry) similar to the FAA ATCSCC PERTI model, appropriate for the UK environment

### 4.5 Serving the plan: Contemporary technology

4.6 DfT, CAA, NATS and industry should establish a joint and timely commitment to maximise and exploit contemporary technologies and related processes to maximise resilience, including:

- Latest aircraft precision navigation technology and supporting ground systems;
- Shared data sources;
- Coordinated operational control;
- Full use of existing airspace; and
- Responsive safety regulation based on contemporary aircraft and systems.

### 4.6 Serving the plan: Behaviours and training

4.7 Industry should address behaviour and culture change required for collaborative working, establishing a consistent level of training and capability to use and, where

appropriate, enhance advanced operations control and network coordination information tools.

#### 4.7 Policing the plan: Clarity on current requirements

- 4.8 Industry, CAA and DfT should achieve clarity on rules to manage demand during limited capacity and disruption.

#### 4.8 Network coordination

- 4.9 Network resilience performance should be monitored by the ODLG and reviewed annually to confirm that voluntary industry coordination remains sufficient to protect network performance.
- 4.10 As network demand approaches or exceeds capacity, experience in other regions and industries indicates that central coordination or control becomes necessary. However, the industry prefers to use all possible voluntary processes before then. The DfT and CAA should consider the level to which reduction in resilience performance would require the establishment of a centralised network coordination.

### 5 Detailed recommendations

#### 5.1 Overview and ODLG roadmap

- 5.2 Where possible, the VIRG has sought to advance thinking on the high-level recommendations to ensure timely implementation. This section expands on those recommendations in further detail, which will allow tangible actions associated with planned and existing workstreams.
- 5.3 The recommendations may need further progression within the ODLG/IRG framework to design and agree next steps and actions.
- 5.4 **The VIRG provides the following general recommendation:**
- Recommendation 1: Develop, with the ODLG, a roadmap of the detailed recommendations, recognising that the continued rapid growth in the European Network will require ongoing focus and industry innovation to maintain and improve resilience:
    - Develop a one-page summary for industrywide circulation that will articulate the UK NAS Collaborative Decision Making (CDM) recommendations delivery plan and roadmap, including a set of common themes/activities, ensuring consistent language across the industry.
    - Ensure engagement with the DfT, so that the recommendations align with the development of the Aviation Strategy.
    - Establish a means by which industry partners that do not meet the membership criteria for IRG/ODLG remain informed of and engaged with the resilience activity. For example, interface with other industry activities to develop a communication relationship with the organisations identified.

## 5.2 Realistic planning: Contingency planning

- 5.5 Opportunities to develop shared contingency planning have been identified, particularly to address inconsistency in shared and coordinated UK south east network-wide contingency planning and inconsistent tactical regulation during traffic congestion.
- 5.6 To this end, **the VIRG provides the following recommendation:**
- Recommendation 2: Establish a contingency taskforce to specifically focus on how effective scenario planning could be implemented within existing industry structures, as follows:
    - Initially focus on the disruption causal factors relating to technology upgrade/implementation (ExCDS in ATC as example), weather disruption, non-emergency diversion management, Danger Area use/management and general contingency planning.
    - Define key taskforce outputs to progress effective network delivery of the ATM service and industry communication plans (e.g. ATICCC trigger conditions). Outputs to consist of agreed baseline 'playbooks' that include clear measures for addressing disruption (planned and recovery) and ensure cohesive and transparent actions in the event of disruptive events.
- 5.7 A draft roadmap of actions has been drafted and included in Appendix 5 (section 12).

## 5.3 Flying to plan: Industry communications

- 5.8 Following the VIRG industry research and visit to the US FAA National Airspace Command Centre, the key theme that underpins the US system is one of Collaborative Decision Making (CDM). Embedded in the CDM system is a joint Government/Industry initiative aimed at improving Air Traffic Flow Management (ATFM) through increased information exchange between aviation community stakeholders.
- 5.9 The US CDM is comprised of representatives from Government, GA, airlines, private industry and academia. They work together to create technological and procedural solutions to the ATFM challenges faced by the National Airspace System (NAS).
- 5.10 CDM is an operating paradigm where ATFM decisions are based on a shared, common view of the NAS and an awareness of the consequences such decisions may have on the system and its stakeholders. There are two central elements to CDM:
- That improved information will lead to improved decision-making; and
  - Tools and procedures need to be in place to enable ANSPs and the flight operators to more easily respond to changing conditions.
- 5.11 By sharing information, values and preferences, stakeholders learn from each other and build a common pool of knowledge, resulting in ATM decisions and actions that are most valuable to the system. CDM therefore plays an integral part in ATM and is instrumental to network harmonisation.

5.12 The VIRG recognises that the US model is very different to the UK/European Network (Figure 4 provides an overview of the Network Management structure in Europe). However, the core principles of collaboration and operating to plan are aligned to with the SESAR A-CDM model<sup>26</sup>. Consideration must be given to suitably scaled and designed collaborative processes that could be implemented in the UK, using mainly existing processes and without significant financial investment.

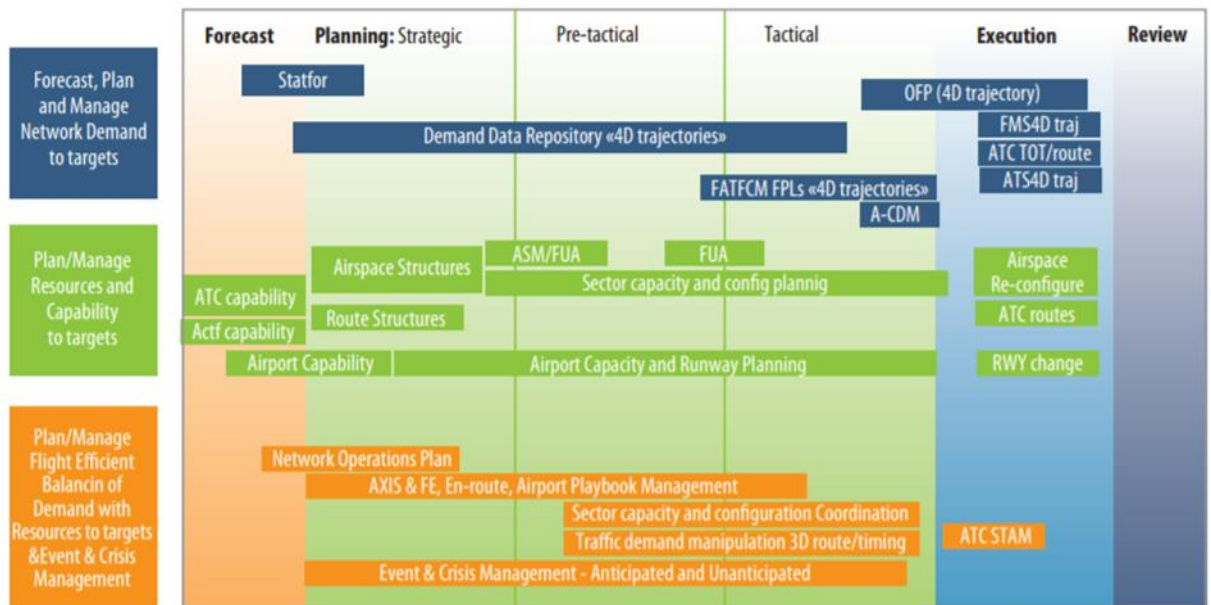


Figure 4: Overview of European Network Management structure

5.13 To this end, **the VIRG provides the following recommendations:**

- Recommendation 3: Design the **UK network communication structure** as follows:
  - Undertake a detailed study of the FAA NAS CDM model to further understand those elements that could be adopted and adapted into the UK operation.
  - Develop and execute a deployment plan, along with stakeholder engagement, to adapt the existing NATS Airport Capacity Management (ACM) model to a UK NAS CDM. Include a comprehensive review of the NATS Air Traffic Incident Coordination and Communication Cell (ATICCC) process to develop and deliver a Network Operations Cell (Command Centre) concept, with NATS taking the lead on embedding FAA NAS principles into a UK NAS model.
  - Include a comprehensive closed loop review cycle that will support a Daily/Monthly/Seasonal PERTI Plan (Plan, Execute, Review, Train, Improve) with supporting stakeholder communications/engagement aligned with the proven FAA model and ensuring the structure enables lesson-learning.
  - Expedite initially the deployment of A-CDM across South East Airports via a UK A-CDM working Group.

<sup>26</sup> SESAR DM PCP AF4 requirements

- Develop the Network Communications cell operating methodology that prioritises a 5-airports South East network, engaging with the DfT and CAA to underpin the activity.
- Interface with the Network Manager and representatives of the SDM PCP AF4 to ensure that the developing UK NAS CDM process influences and is influenced by SESAR Network Management and the development of airport operations centre (APOC) / operations control (OCC) communication protocols.

## 5.4 Flying the Plan: Common Analytical Framework

5.14 While the aviation industry generates an extensive range of data, a key finding of the VIRG is that more could and should be done with the data that is available to better understand the drivers of punctuality performance. The key challenges that the industry has faced to date include:

- Difficulties in establishing a common data set, including a reluctance to share insightful performance data across stakeholder groups;
- A lack of consistency in how performance is measured and interpreted; and
- The absence of an established forum to support a continuous improvement cycle, particularly at the network level.

5.15 These challenges are not new to the industry, as demonstrated by the following industry outcomes:

UK CAA Runway Resilience Study – Final Report, XPX Consulting and SH&E Limited, December 2008

*‘The quickest form of performance improvement may come from extension of CDM and the data measurement and “Dashboard” opportunities which come from it. Although not directly influencing capacity or demand, the improved knowledge and ability to track more granular levels of process adherence may both improve discipline and lead to better quantification of root cause problems.’*

Delays to air transport in Europe: Methods of measuring, reporting and analysing – European Observatory on Airport Capacity & Quality – Final Report of TASK FORCE, May 2015

*‘Availability of high quality data on the delays from all causes is an important contributor to overall network performance. Europe is already well served with delay data reported by airlines and airports, though the framework for analysing understanding and responding is not fully harmonised, hindering the ability to fully exploit its value, in particular the ability to evaluate the true causes of delay in detail.’*

Gatwick Delay Root Cause Analysis – Final Report, PA Consulting, 21 May 2017

*‘It was the foremost challenge of the study to obtain an agreed common data set which has resulted in the absence of data from airlines and the wider system (e.g. Eurocontrol) as well as the restriction of its use and publication within the final report. This has been the rate limiting step in reaching stronger and statistically robust insights on root causes and advancing beyond the initial signals from the exploratory analysis undertaken.’*



- 5.16 The objective of developing a common analytical framework is therefore to ensure that there is an agreed set of performance metrics that support an understanding of network punctuality performance at both the strategic and tactical levels. The framework is not intended to replace but rather to supplement the detailed performance monitoring and root cause analysis undertaken by individual organisations.
- 5.17 The development of a common analytical framework may also help to enhance the punctuality performance reporting currently published by the CAA.
- 5.18 The key principles that have been adopted by the VIRG in developing an analytical framework are as follows:
- A simple but informative set of metrics;
  - Clear, unambiguous definitions and criteria;
  - Readily available and repeatable data sets / analysis; and
  - Representative set of performance metrics covering key performance drivers (scheduling, airspace regulation and ground performance) across key stakeholder groups (airlines, airports and ANSPs).
- 5.19 A key aspect of the approach has been to focus on objective outcomes rather than subjective delay reporting. While a substantial body of delay reporting exists, the industry has struggled in the past to agree on the accuracy and meaningfulness of this data.
- 5.20 The following approach was adopted in developing the analytical framework:
- Review the performance metrics currently used across the industry including within the various VIRG organisations and by recognised industry organisations such as EuroControl's CODA unit;
  - Develop a shortlist of metrics for consideration by industry experts across all stakeholder groups represented on VIRG and engage with those experts to ensure that the framework adequately covers key performance drivers; and
  - Seek formal support from the VIRG representatives for the proposed framework and a willingness to share the data necessary to develop performance reports under this framework.
- 5.21 15 metrics are proposed, covering a range of key performance drivers. These include overall punctuality performance, airspace and aerodrome regulation, turn performance, block performance and airfield performance as shown in Table 1.

Category	Primary Stakeholder(s)	Metric(s)
<b>Punctuality Performance</b>	<b>All</b>	1. Headline Punctuality Performance 2. Punctuality Range 3. Operational Cancellations
<b>Airspace &amp; Aerodrome Regulation</b>	<b>Network Manager &amp; NATS</b>	4. Exposure to Regulation /STAM 5. Impact of Regulation / STAM
<b>Turn Performance</b>	<b>Airlines</b>	6. Headline Turn Performance 7. Distribution & Turn Success by Turn Category 8. Distribution & Turn Success by Turn Time
<b>Block Performance</b>	<b>Airlines</b>	9. Block Time Overshoot 10. Block Time Performance Range 11. Delay Difference Indicator
<b>Airfield Performance</b>	<b>Airports &amp; Local ANSPs</b>	12. Arrival Sequencing and Metering Area Additional Time 13. Additional Taxi In Time 14. Start Approval Holding Time 15. Additional Taxi Out Time

Table 1: Key performance drivers of the common analytical framework

- 5.22 Appendix 7 (section 14) proposes the methodology and examples for a common analytical framework, to be pursued by the IRG and ODLG.
- 5.23 The implementation of a common analytical framework should be prioritised to ensure that all stakeholders have a common understanding of key performance drivers at the earliest opportunity. Appendix 7 (section 14) considers each metric in detail and provides an illustrative reporting of outputs.
- 5.24 A programme of work has been developed with the aim of ensuring that the first full iteration of reporting under this framework can commence from **April 2018**. Table 2 summarises the key milestones and associated activities to ensure delivery in line with this timetable.

Milestone	Date	Activities
<b>EuroControl Meeting</b>	<b>Nov-17 &amp; Dec-17</b>	<ul style="list-style-type: none"> <li>Initial review of data requirements and available tools.</li> <li>Identification of data gaps.</li> <li>Agreement on next steps.</li> <li>Allocation of responsibilities (IRG / Eurocontrol).</li> </ul>
<b>Ops Director Liaison Group Meeting</b>	<b>Jan-18</b>	<ul style="list-style-type: none"> <li>Sign-off of reporting framework.</li> <li>Commitment to data sharing.</li> </ul>
<b>Working Group Meeting</b>	<b>Feb-18</b>	<ul style="list-style-type: none"> <li>Review prior year performance data.</li> <li>Identify any final refinements.</li> </ul>
<b>First Full Iteration of Reporting</b>	<b>Apr-18</b>	<ul style="list-style-type: none"> <li>Monthly reporting cycle to commence.</li> <li>Launch of real-time data feed?</li> </ul>

Table 2: Key milestones and activities to deliver the common analytical framework

- 5.25 To this end, **the VIRG provides the following recommendation:**
- Recommendation 4: IRG to adopt the programme of work to ensure the first full iteration of reporting under the common analytical framework can commence from **April 2018**. Through this programme, a consistent set of operating metrics

can be developed and monitored at a network level to facilitate a continuous improvement cycle and improved planning process.

## 5.5 Serving the plan: Ensuring full use of existing technologies (aircraft, planning and ground processes)

5.26 Opportunities exist to exploit available technologies to improve capacity and deliver greater resilience. These exist at:

- The airline schedule planning phase, to more collaboratively and dynamically utilise the current SID structure, and on the day of operation to improve efficiency through pre-tactical and tactical SID-balancing.
- An airport level, where A-CDM technology can be utilised to enhance the coordination of aircraft and manage data flow prior to departure to optimise runway capacity.
- At an airport level, introduced GPS-guided performance based navigation (PBN) approaches, along with improved control of departure routes and aircraft speeds, can safely introduce closer spacing through predictability of aircraft navigation once airborne.

5.27 NATS and airlines explored the ideas generated by the VIRG to identify specific workstreams that will address the fundamental issue of congested airspace through existing technologies. The workstreams are defined based on those areas that will provide the greatest efficiency gain or require ease of deliverability. Recommendations are made that, if progressed in a coordinated manner, the sum of incremental gains will deliver a significant improvement in network resilience.

### Optimisation of departure routeings

5.28 The selection of the Standard Instrument Departure (SID) to be flown by an aircraft is made by flight planners based on the principle of minimum track miles to be flown, thereby minimising fuel burn and emissions per aircraft. There is a concentration of routes that are flown to destinations south of the UK during peak summer months, leading to a disproportionate loading in the related sectors and the consequent application of flow controls. Mitigations have partially addressed this issue through the use of alternative, longer SID routes to provide pre-planned alleviation to those sectors, thereby avoiding the imposition of flow controls. However, this process requires further measures to formalise the approach between airlines and NATS.

5.29 To this end, **the VIRG provides the following recommendations:**

- Recommendation 5: The Industry Resilience Group to consider pre-tactical and tactical opportunities for sector offloads via alternative SID routes within set windows prior to departure, enabling safe and efficient fuel planning. The subsequent network wide benefit of such intervention would reduce both ground and air delays, offsetting any increased fuel burn due to track extensions to individual aircraft.
- Recommendation 6: With reference to the SDM PCP AF2 and AF4 respectively, the IRG to consider how Airports can ensure flights are presented to the holding area in an optimised sequence, supporting the optimum split of departure SIDs. An efficient departure sequence could increase the departure rate, enable a

quicker recovery from disruption and minimise the risk of night jet movements. For example, the Departure Manager tool (DMAN) and A-CDM can manipulate Target Start-up Approval Time (TSAT) algorithms to drive a more efficient delivery at the runway holding area. A review should be conducted at each of the 5 large London Airports, with A-CDM best practice identified and then delivered across the industry.

#### Consistent speed control on departures and arrivals

- 5.30 At present the variability of aircraft speed and acceleration profiles on departure and arrival is accommodated through larger gaps between traffic. The separation of arrivals based on 'time' rather than 'distance' has delivered proven benefits.
- 5.31 Control of aircraft separation by 'time' during windy conditions is already a proven method for increasing resilience. For example, the introduction of TBS at London Heathrow (LHR) in 2015 has resulted in an increase of 13 movements per day in all wind conditions, rising to 44 per day in strong winds. LHR is currently working on the optimisation of wake turbulence separation through utilisation of European Wake Turbulence Categorisation (RECAT-EU), Optimised Runway Delivery (ORD) and TBS Pair Wise.
- 5.32 To this end, **the VIRG provides the following recommendations:**
- Recommendation 7: The IRG to liaise with LHR and NATS and explore how the use of TBS procedures at other UK airports could benefit the network through improved resilience.
  - Recommendation 8: The IRG to explore with NATS the implementation of tighter measures and controls within current SID routes to reduce the time interval between departing aircraft on similar SIDs and deliver a predictable rate of aircraft to area controllers. The group should be cognisant of noise abatement departure procedure (NADP) guidance, common aircraft capability and the effects on CO<sub>2</sub> emissions.

#### Reduce radar separation to 2.5nm on approach to all airports

- 5.33 Reducing the minimum separation on final approach could be used in suitable weather to increase the tactically declared landing rate. This will minimise the adverse effect of strong final approach headwinds on runway capacity and reduce delays. Experience and procedures at airfields in the UK that currently utilise this procedure will be invaluable in providing confidence and accelerating the introduction.
- 5.34 To this end, **the VIRG provides the following recommendation:**
- Recommendation 9: The IRG to liaise with airfields that have already implemented reduced final approach separation to consider how reducing the minimum separation on final approach across all UK airfields would improve runway throughput.

#### Runway inspections

- 5.35 Cognisant of the published guidance in the European Action Plan for the Prevention of Runway Incursions, a review should consider the timing of inspections and how technology should support the inspection process, potentially reducing the need to enter the runway on every occasion. This could deliver a predictable inspection

regime that minimises the impact to service delivery whilst managing runway safety risk.

5.36 To this end, **the VIRG provides the following recommendation:**

- Recommendation 10: The IRG to support a review of Runway Inspection procedures at each of the 5 London airports. This to include how practices and technology in use at non-UK airports – e.g. foreign object debris (FOD) radar or drone technology – could be applied to safely improve the timing of inspections for minimising disruption of arrivals and departures.

## 5.6 Serving the plan: Behavioural and cultural change

5.37 Individual organisations should continue to support and enhance use of advanced operations and network coordination information tools through changes to behaviours and collaborative working.

5.38 To this end, **the VIRG provides the following recommendation:**

- Recommendation 11: Plan and execute the support required to deliver the behavioural and cultural change across the industry that underpins collaborative working:
  - Ensure a comprehensive review of current operational communications to understand the activities that remain relevant and will be required within a refreshed UK NAS CDM structure.
  - Ensure CDM training on the UK NAS CDM, aligned with the FAA model;

## 5.7 Policing the plan: A new set of rules

5.39 A new set of rules is required to manage demand in a fair, transparent and equitable manner during limited capacity and disruption.

5.40 To this end, **the VIRG provides the following recommendation:**

- Recommendation 12: Establish a new set of rules that enhance the delivery of current policy in Demand versus Capacity planning and management of disruption, including:
  - Authority to manage demand (route, sector, airport) during limited capacity conditions or disruption;
  - Triggering conditions for operational restriction alleviations during disruption;
  - The flexibility available to make changes to operational procedures within 'planned and permanent' limitation; and
  - Clear rules that treat operational stakeholders in a fair, transparent and equitable manner.

## 6 Summary and next steps

- 6.1 The VIRG was formed to make practical recommendations that could be implemented voluntarily by industry to improve and maintain resilience of the UK south east air transport network.
- 6.2 This report summarises the group's work, observations and recommendations. The group has also, with the encouragement of the Oversight Group (OG), begun to implement some of the recommendations to prove their validity and to address urgent issues. These include industry planning for the execution of the NATS ExCDS programme and other network contingencies.
- 6.3 To ensure these recommendations progress forward and to address new resilience challenges as they emerge, the VIRG will continue in existence, known simply as the Industry Resilience Group (IRG). The IRG will continue to request practical on-going support and sponsorship from the Operations Directors or Chief Operating Officers of the VIRG companies.
- 6.4 With the encouragement from the OG, this Ops Directors Group has already convened, demonstrating industry's commitment to operational resilience. Known as the Ops Directors Liaison Group (ODLG) and modelled on the long-standing and successful Flight Operations Liaison Group (FOLG), the group has endorsed the VIRG recommendations and committed to support their implementation.
- 6.5 Both the ODLG and IRG will be resourced and chaired by industry. The CAA have also agreed to co-chair the ODLG, following the FOLG model.
- 6.6 The VIRG has developed detailed workplans for some of the recommendations, to provide early benefits. It has also laid the groundwork for developing the design and implementation plans for the rest of the recommendations.
- 6.7 The VIRG's engagement with the FAA and EuroControl Network Manager and CODA has already established links that will allow the development of the VIRG recommendations to integrate with similar initiatives in those areas. The recommendations will also initiate links with the SESAR Deployment Manager, particularly PCP AF4 Network Collaborative Management (specifically A-CDM) and PCP AF2 Airport Integration and Throughput (specifically DMAN and TBS).
- 6.8 The VIRG finishes the initial recommendation phase of its work confident that there is scope, and industry commitment, to maintain and improve resilience by voluntary means. However, it is also very clear that this voluntary effort does not eliminate the need for urgent strategic development of airspace and infrastructure to support the growth and long-term resilience of the vital UK South East air transport network.

## 7 Acknowledgements

7.1 The VIRG members wish to acknowledge:

- The support and guidance of CAA CEO, Andrew Haines, and other members of the Oversight Group.
- The support of the leadership of the VIRG participating companies.

7.2 They wish to also acknowledge the expert input and advice of the following presenters to the VIRG:

- ACL: Peter Robinson
- American Airlines: Tobin Miller
- BA: Neil Cottrell
- DfT: Ian Elston, Nishan Shah
- EuroControl: Joe Sultana, Kazan Bucuroiu, Yves de Wandeler, David Marsh
- FAA: Greg Byus, Tom Nielson, Jim Linney
- GAL: Neil Harvey, Liz Townsend, Goran Jovanovic
- HAL: Alison Bates
- MAG: Louis Chemont, Andy Wright
- NATS: Wendy Howard-Allen

7.3 The VIRG team wishes to thank Glen Smith and Chris Barnes of Trax International for their assistance in compiling this final report.

7.4 The chairman wishes to thank the VIRG members for their enthusiastic participation, spirit of openness and robust debate.

## 8 Appendix 1: VIRG participants, OG participants and Terms of Reference

### 8.1 VIRG participants

Name	Organisation	Role in organisation	Email
<b>Garry Copeland</b>		Independent chairman, VIRG	<a href="mailto:copelg@me.com">copelg@me.com</a>
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## 8.2 Oversight Group (OG) participants

Name	Organisation	Role in organisation
<b>David McMillan</b> <b>Colin Matthews</b>		
<b>Chris Bosworth</b>	ACL	Managing Director
<b>Martin Rolfe</b> <b>Juliet Kennedy</b>	NATS	Chief Executive Officer Operations Director
<b>Chris Hope</b>	easyJet	Head of Gatwick
<b>Stephen Riley</b>	BA	Director of Flight Operations
<b>John Holland-Kaye</b>	Heathrow	Chief Executive Officer
<b>Tim Hawkins</b>	MAG	Corporate Affairs Director
<b>Andrew Haines</b> <b>Tim Johnson</b> <b>Mark Swan</b>	CAA	Chief Executive Head of Policy Group Director, Safety & Airspace Regulation Group
<b>Stewart Wingate</b>	Gatwick	Chief Executive
<b>Michael Hickey</b>	Ryanair	Chief Operations Officer
<b>Phil Maher</b>	Virgin Atlantic	Executive Vice President Operations
<b>Dan Micklethwaite</b>	DfT	Director Aviation

## 8.3 Terms of Reference

<b>Problem</b>	In general, the UK relies on having a highly liberalised and competitive approach to aviation which has worked well in producing good results for passengers, without UK aviation as a whole being planned and operated as a single network. However, as runway and airspace capacity constraints bite, as is likely to happen increasingly in the South East, industry incentives and mechanisms are not aligned sufficiently for the network as a whole to deliver reliable and high levels of operating performance. This will inevitably lead, to increased delays and poor resilience that is neither in the interests of passengers nor the industry.
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<b>Objective</b>	To improve in a systemised manner, the way in which the UK's aviation network is planned and operated to enhance its day to day operating resilience, reduce delays and the associated costs to both industry and passengers.
<b>Group Purpose</b>	<p>To identify and develop a package of short and longer term changes to the way in which the aviation system is planned and operated as a whole and that are not otherwise being addressed by individual airports, their airlines, NERL, ACL, or FAS.</p> <p>Consideration should be given to the following themes, in order to provide overall system benefits:</p> <ul style="list-style-type: none"> <li>• A realistic plan – ensuring that capacity declaration, slot allocation, operational scheduling and airspace planning are all aligned to improve levels of system-wide efficiency and resilience.</li> <li>• Flying to plan (airlines, groundhandlers) – ensuring that all operators in the industry are incentivised to operate in line with the plan that has been set, and not place a short term advantage over the efficiency of the network.</li> <li>• Serving to plan (infrastructure operators) – ensuring that the operation of the network incentivises adherence to the plan and encourages the most efficient responses from all actors to recover from any disruption.</li> <li>• Policing the plan – ensuring that any behaviours which drive inefficiency or decreased resilience into the system can be identified and remedial action taken to address them.</li> </ul> <p>In the first instance, this work should focus on the aviation network in the South East of England, where day to day resilience issues are most acute, but should highlight those changes that are necessary to and would also benefit the whole of the UK. It should also review best practice in other sectors and countries.</p> <p>The package should be designed to be coherent, robust, evidence based and prioritised. The group will not have powers to implement the package of measures, but will make recommendations to Government (potentially including proposals for changes to legislation), the regulator, the slot coordinator, air traffic service providers, airport, airlines or others as appropriate. In particular, its recommendations should form a compelling contribution to the DfT sponsored review of the UK's Aviation Strategy.</p>

<p><b>Working Group</b></p>	<p>The Working Group will be established by the Oversight Board (see below) on the following basis:</p> <ul style="list-style-type: none"> <li>• Strong and experienced Resilience Programme Director, preferably someone with extensive strategic and operational experience from the aviation sector.</li> <li>• Capabilities: resourcing through high calibre, half to full time secondments from representative airports, airlines, air traffic service providers, slot coordinator and regulatory expertise. Appointments will be approved by the Resilience Programme Director. For the group to be successful it should include, from each of the categories below, half-time secondees with appropriate skills and experience, with a preferred complement equivalent to around 6 FTEs <ul style="list-style-type: none"> <li>• airline industry</li> <li>• airport industry</li> <li>• NATS</li> <li>• ACL</li> <li>• CAA</li> </ul> </li> </ul> <p>Secondees should have broad experience of the UK aviation network, as well as significant expertise in their own area. They should be able to bring experiences and knowledge of current structures, practices and issues concerning their part of the aviation network; be open minded and innovative about potential solutions; and be willing to work cooperatively and intensively to produce analysis, insights and recommendations.</p> <ul style="list-style-type: none"> <li>• Able to access existing research and knowledge in the industry, and so able to build on and report on relevant issues.</li> <li>• In the first seven month phase, the Working Group shall focus on identifying a series of proposals to improve outcomes for consumers with respect to the planning and operation of the UK aviation sector, with an initial focus on the South East.</li> <li>• Contributions from Working Group members shall not be aimed at the pursuit of commercial interests of their companies.</li> </ul>
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<p><b>Oversight</b></p>	<p>An Oversight Board, which the CAA, DfT or an independent 3<sup>rd</sup> party would chair, and with CEO level membership drawn from a number of airlines, airports, air traffic service providers, the slot coordinator, CAA, the DfT and some independent 3<sup>rd</sup> parties.</p> <p>The Oversight Board will establish a Working Group under the leadership of a Resilience Programme Director, and then meet quarterly to review the progress of the Working Group and assess how best to implement its recommendations.</p> <p>Oversight Board membership will be no more than 13, who will be drawn from those organisations that provide secondees to the Working Group as well as two to three non-executive advisors.</p> <p>Funding of the Working Group arrangements will be agreed by the Oversight Board (consultancy and legal advice where required, not yet estimated but could require a budget of between £250k - £750k depending on level of active industry participation). The CAA will fund the appointment of the Programme Director and provide some office accommodation for the Working Group.</p> <p>The Oversight Board will facilitate access to existing research and knowledge across the industry.</p> <p>Recognising the wider stakeholder interest, the Oversight Board will establish communications with a wider stakeholder group of airlines serving the UK, airports, air traffic service providers, trade associations, etc. in order to share progress.</p>
<p><b>Deliverables</b></p>	<p>By 31 November 2017: Working Group to deliver to Oversight Board a recommended package of changes to deliver improved overall operating resilience for the aviation network in the South East as a <u>whole</u>. The recommendations shall be evidence based, highlight trade-off decisions required and shall be prioritised based on positive resilience impact, and the cost and ease of implementation. This may include submitting relevant recommendations into the DfT's review of the UK's Aviation Strategy.</p> <p>From 1 December 2017: Oversight Board to assess how to proceed given the recommendations of the Working Group. Subsequent phases of work are scoped, which may include direct implementation, engagement in the Government Aviation Strategy, or the re-establishment of the Working Group.</p> <p>Subsequent phases of work will be agreed by the Oversight Board.</p>

<b>Inputs</b>	<p>The Working Group will be able to draw on a number of previous pieces of work on delay and resilience, as well as information from the members of the Oversight Board:</p> <ul style="list-style-type: none"><li>• The CAA's current study on resilience (expected to be published in April 2017)</li><li>• The CAA commissioned consultancy report on delay at Gatwick Airport (expected to be completed in March 2017)</li><li>• The 2011 Begg report on snow disruption at LHR, and the 2014 McMillan report on flooding at Gatwick</li><li>• The 2011 reports of the Punctuality, Delay and Resilience subgroup of the South East Airports Taskforce</li><li>• The 2008 UK CAA Runway Resilience Report (prepared by Helios, XPX Consulting and SH&amp;E Ltd).</li><li>• Data from members of the Working Group on, for example, planning assumptions, processes and procedures, actual operational data, supplier relationships and resourcing, and performance incentives.</li></ul> <p>The Oversight Board and Working Group shall protect commercially sensitive information where required. Furthermore it is for each individual participant in the Resilience Group to ensure that it is complying with competition law (where appropriate seeking specialist advice).</p>
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## 9 Appendix 2: References

### 9.1 Previous studies and recommendations

1. Report of the Heathrow Winter Resilience Enquiry (Begg report), March 2011
2. Airport Performance Facilitation Group, November 2012
3. CAA runway resilience final report, 2008
4. South East Airports Taskforce (SEAT) report, April 2011
5. 2014 airports commission operational efficiency, airspace
6. 2014 SDG for CAA – workstream 3 Final Report – Resilience at LHR and LGW
7. DfT Transport Resilience Report. July 2014
8. 2015 NATS for Airports Commission, operational risk, airspace resilience
9. CAA CAP 1515: Operating Resilience and the consumer interest
10. CAA CAP 1516: Gatwick delay causation study
11. CAA CAP 1420: CAP1420: Operating resilience of the UK's aviation infrastructure: A request for information
12. The Recommendations of the South East Airports Task Force (2017 01 05 SEAT recommendations – Action 24)
13. House of Commons briefing paper on airport slots, 12 June 2017

### 9.2 FAA documents

14. NextGen Operator and Airport Enablers, Supplement to NextGen Investment for Operators and Airports, FAA's NextGen Implementation Plan, March 2012
15. FAA ATO Operational Contingency to NATS UK, Sept 2017
16. FAA TFM in the NAS booklet, 20 Sept 2017

### 9.3 EuroControl documents

17. EuroControl Trends in Air Traffic Volume 7 - Planning for Delay: influence of flight scheduling on airline punctuality
18. EuroControl: standard input data for cost benefit analyses V7.0 November 2015
19. A-CDM impact assessment, 2016
20. CODA network performance – VIRG meeting 06 Jul 2017 -11-09
21. Demand Data Repository (DDR) 2 Strategic Forecast
22. Airport Operator Data Flow - IR390 Performance Data Specification for CODA, Edition 00-11 (04-09-2014)

## 9.4 VIRG member presentations

23. ACL presentation to CAA Resilience Group, June 2017
24. BA schedule planning presentation, 2017
25. easyJet operational Performance management
26. HAL Beyond the Horizon, October 2017
27. MAG Operations performance for VIRG, 19 July 2017
28. NATS data brief for VIRG, 19 June 2017
29. NATS presentation for Swanwick Industry Resilience meeting, 14/06/2017
30. RYR CODA report, Ryanair, 01 02 2017
31. VIRG GAL presentation, 6 July 2017
32. Schedule Balancing Act presentation, Ryanair, 9 August 2017
33. VIRG presentation, Virgin Atlantic, October 2017

## 9.5 Network Rail documents

34. The Network Code
35. Rail Operators Code – Section 3: adverse and extreme weather

## 9.6 Third party presentations

36. ACI presentation, Network Directors of Operations (NDOP) – 16, Nicosia, 2017-03-23
37. NDOP-16 Airport Integration NM strategy v1, 2017-03-23
38. VIRG presentation of Munich Airport (EDDM) adverse weather, DFS
39. IATA LCAM sub group, EAPM, March 2017
40. USA Comms, Tobin Miller, 26 July 2017

## 10 Appendix 3: Other industry activities

- 10.1 It is recommended that the Industry Resilience Group (IRG) continue to monitor and influence the activity and output from the industry activities below, exchanging progress updates and collaborating where necessary.

### 10.1 SESAR

- 10.2 The Single European Sky (SES) is an ambitious initiative that was launched by the European Commission in 1999 and now provides the overarching framework to upgrade the airspace and air transport network across Europe.
- 10.3 The SESAR Programmes are the technological pillar of the SES, the objective of which is to modernise European ATM by defining, developing and delivering new or improved technologies and procedures. SESAR programmes have been delivering on implementation projects since 2015 based on the regulation about the implementation of the Pilot Common Project (PCP - EU 716/2014).

10.4 As SESAR moves further into the Deployment Phase, the VIRG recognise the need to be completely aligned with the SESAR Deployment Manager (SDM) PCP ATM Functions (AFs) and associated implementation projects across the industry. The IRG will ensure Recommendations and delivery are aligned with the SESAR PCP AFs activity.

## 10.2 The A4 Alliance

10.5 The following four airline members of the EC's Aviation Platform created the A4 Alliance at the end of 2012:

- Air France-KLM group;
- easyJet;
- International Airlines Group (IAG); and
- Lufthansa Group, the four airline members of the EC's Aviation Platform.

10.6 The aim of these four members through the A4 Alliance is to help accelerate operational improvements in ATM and to coordinate airline participation in the SDM to ensure performance driven implementation of new ATM procedures and technologies. Ryanair joined the A4 in 2017 as part of its SESAR Deployment Manager accession process.

10.7 The VIRG has engaged with representatives of the A4 airline groups. There is also direct influence between the two bodies, with representatives from three of the A4 Alliance airlines embedded in the VIRG.

10.8 VIRG recommendations will be aligned with the SESAR deliverables, focusing on short-term improvements aligned with the A4 Alliance activity.

## 10.3 The A6 Alliance

10.9 The A6 Alliance is a strategic alliance between the following European ANSPs:

- DFS (Germany);
- DSNA (France);
- ENAIRE (Spain);
- ENAV (Italy);
- PANSO (Poland);
- NATS (UK);

10.10 The A6 Alliance, founded by the ANSP members of the SESAR Joint Undertaking (SJU), is an inclusive coalition of ANSPs across Europe who are committed to helping modernise the European ATM system. The following groups and their ANSP members are also members of the A6 Alliance:

- NORACON – Austro control (Austria), Avinor (Norway), EANS (Estonia), Finavia (Finland), IAA (Ireland), LFV (Sweden) and Naviar (Denmark); and



- Baltic 4 (B4) Consortium – PANSA (Poland), ORO NAVIGACIJA (Lithuania), ANS CR (Czech Republic) and LPS SR (Slovak Republic).

10.11 The aim of the A6 Alliance is to identify and synchronise the key capabilities of its members and deploy them to best effect to deliver customer and network benefits. The A6 Alliance also provides leadership at a European level in critical technical and strategic areas, including an influence on the SESAR programmes.

10.12 The VIRG has engaged with representatives of the A6 ANSPs. There is also direct influence between the two bodies, with representation from one of the A6 Alliance ANSPs embedded in the VIRG.

10.13 VIRG recommendations will be aligned with the SESAR deliverables, focusing on short-term improvements aligned with the A6 Alliance activity.

#### 10.4 Future Airspace Strategy Industry Implementation Group (FASIIG)

10.14 The main purpose of the FASIIG is to deliver on the Government's policy to modernise the airspace, enhancing the UK's global connectivity, enabling economic growth and improving aviation's environmental performance. In this capacity, the FASIIG brings together a broad mix of aviation stakeholders to coordinate the industry's approach to airspace modernisation, join-up individual investment plans and manage the key policy and regulatory dependencies. Specifically, the FASIIG's objectives are to:

- Deliver the airspace infrastructure to support a 40 per cent growth in commercial air transport in the UK by 2030;
- Make flying in the UK's airspace more efficient, reducing fuel-burn and emissions per flight;
- Reduce the total number of people severely affected by aircraft noise;
- Mitigate the top airspace-related safety risks;
- Maximise the performance, value and sustainability of additional runway capacity;
- Improve the management of flexible use of airspace (FUA) reserved for Military operations that is essential to our national security;
- Develop airspace structures that safely accommodate the needs of the General Aviation (GA) community and new airspace users, such as unmanned aircraft.

10.15 The VIRG recommendations will focus on short- to medium-term operational improvements. It will engage and brief FASIIG as required during delivery.

#### 10.5 IATA Worldwide Slot Guidelines (WSG)

10.16 The Strategic Review of the WSG is a joint initiative of [Airports Council International](#), IATA and [Worldwide Airport Coordinators Group](#). Its objective is to ensure the improvement and optimisation of the WSG, so that all stakeholders continue to benefit from one sustainable global slot process. Airlines, airport operators, and slot coordinators are fundamental partners in developing robust airport slot management

policies. The review is based on the WSG principles of transparency, flexibility, sustainability, certainty, and consistency. Its working groups include:

- Airport Levels;
- Historic Determination;
- Slot Performance Monitoring; and
- Access to congested Airports.

10.17 The VIRG will continue to monitor activity within the working groups, the most relevant being 'Slot Performance Monitoring', which looks at enhancing the application of performance monitoring and how the planning process can better support performance on the day. VIRG participants have representatives on this group.

### 10.6 European Airport Punctuality Network (EAPN)

10.18 The EAPN is an official working group affiliated to the Airports Council International (ACI) EUROPE Technical and Operational Safety Committee (TOSC). It was set up in January 2009 with the objective to exchange consistent data and best practices concerning punctuality among European airports.

10.19 The initial focus of the EAPN will be around the standardisation of Delay Coding to support improved airport delay analysis. The VIRG will monitor activity and subsume the output of the EAPN.

### 10.7 The European Airport Coordinators Association (EUACA)

10.20 EUACA is the trade association of airport coordinators and schedule facilitators. Its mission is to deliver a professional, neutral, transparent, non-discriminatory service to the aviation industry through contributing to efficient solutions to optimise capacity at European airports.

10.21 The VIRG will maintain a relationship with the EUACA through ACL, which is a member.

### 10.8 UK Operations Managers Association (UKOMA)

10.22 UKOMA is a non-commercial, non-profit organisation that allows the operations managers from the UK's leading airlines and aircraft operators to cooperate and share mutual experiences without commercial gain.

10.23 The VIRG has presented to the UKOMA on its research and recommendations and will continue to inform the Association in the future.

## 10.9 Network Directors of Operations (NDOP) Group Airport Integration (APTI) Taskforce (TF)

10.24 The NDOP APTI TF is required to:

- Identify and document changes in processes related to Air Traffic Flow and Capacity Management (ATFCM) that will support the better integration of airports with the network; and
- Assess and outline the changes that are required in terms of roles and responsibilities between the main partners, defined as:
  - the ANSP flow management positions (FMPs);
  - local ATC (as an integral part of the Airport Operations Centre (APOC) concept);
  - Airport Operators (as the driver for the APOC implementations); and
  - the Network Manager Operations Centre (NMOC).

10.25 As far as possible, the Task Force assesses where existing rules and regulations might be affected by the changes. The VIRG will track activity of this group through the VIRG representative organisations that are part of the Task Force.

## 10.10 Airport Operators Association (AOA)

10.26 The AOA is the national voice of UK Airports. It is a trade association representing the interests of UK airports, engaging with the UK Government and regulatory authorities on airport matters.

10.27 The VIRG has plans in place to present an activity update to the AOA Operations Meeting and will seek AOA support for an appropriate engagement strategy for non-member organisations.

# 11 Appendix 4: Demand versus capacity management

## 11.1 Background

11.2 Several UK airports, including Heathrow and Gatwick, currently operate at (or near to) their maximum capacity for large parts of the day. Consequently, when an event causes disruption, the time required for the airport to recover can be significant.

## 11.2 HAL voluntary capacity process

11.3 HAL operates a voluntary capacity reduction process to reduce the number of flights operating. The primary objective of this Capacity Constraints Policy is to ensure optimal resilience for all Heathrow operations during events that cause disruption. This involves the airport consulting, deciding and requesting that airlines reduce their flights by a percentage for a certain period. For some situations, this may require airlines to re-schedule outside the disrupted period to reduce delays and congestion and for the airport operation to recover as quickly as possible.

11.4 Sometimes it is difficult for airlines with low frequency operations to reduce flights and re-book passengers, which is taken into account in the policy guidance produced

by HAL. For example, a carrier with four flights a day would not be expected to take one flight out of the schedule with a 10 per cent reduction request.

- 11.5 As the airport process is voluntary it can lead to some airlines not acting on the request, whether for operational or compensation reasons. It may be unclear to airlines being asked to cancel whether the situation is considered an 'exceptional circumstance'. The effects on recovery can also be disproportionate for airlines operating higher volumes of flights in the schedule.

### 11.3 French DGAC (French Civil Aviation Authority)

- 11.6 In contrast, France operates a non-voluntary scheme for capacity issues, including due to extreme weather.

- 11.7 DGAC relies on EC regulation 1008/2008 Article 21 to exercise a Member State's right to limit capacity, and Article 14(1) of EC 95/93 ATM authorities that flight plans could be rejected where there are no slots allocated by the coordinator.

- 11.8 French Civil Aviation Code Article R221-3 also supports the above. This code states that capacity reduction decisions will be set out in a NOTAM. An example of a NOTAM issued by DGAC is included at the end of this Appendix. The NOTAMs issued by the DGAC state:

"AIRCRAFT OPERATORS ARE REQUESTED TO REDUCE THEIR SCHEDULED FLIGHTS BY 25 PER CENT" and that

"FPL (flight plans) NOT RESPECTING THESE RESTRICTIONS COULD BE REJECTED".

- 11.9 Based on provided French examples of issuing a capacity reduction, airlines generally appear to comply with the NOTAM rather than risk having their flight plan rejected shortly before departure. DGAC have issued warning letters to carriers who do not comply.

11.10 The following provides an example of a French 'capacity-reducing' NOTAM:

### **AERODROME BULLETIN**

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Production date (UTC)	: 2013/03/12 13:47
Date and validity hour (UTC)	: 2013/03/12 13:46
Language	: EN
Duration	: 12 Hour(s)
Flight rule	: IFR/VFR
GPS NOTAM selection	: No
NOTAM type	: General and miscellaneous
Aerodromes	: LFPO LFPG

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Number of NOTAM : 4 of 29

BE CAREFUL : This is an extract of full bulletin.

#### **LFPO PARIS ORLY**

##### **LFPA-A1312/13A02**

A) LFPO PARIS ORLY  
B) 2013 Mar 12 00:00 C) 2013 Mar 12 23:59  
E) DUE TO ANTICIPATED ADVERSE WEATHER, SPECIFIC MEASURES ARE REQUESTED FROM AIRCRAFT OPERATORS SERVING PARIS-ORLY AND PARIS-CDG AIRPORTS :  
1-AIRCRAFT OPERATORS ARE REQUESTED TO REDUCE THEIR SCHEDULED FLIGHTS BY 20 PER CENT ON PARIS-ORLY AIRPORT ON TUESDAY MARCH 12TH 2013 FROM 0800 UTC IF OPERATING MORE THAN 10 MVTs ARE SCHEDULED FROM 0800UTC.  
2-PARIS-ORLY NOT AVAILABLE FOR DIVERSIONS WITH THE EXCEPTION OF EMERGENCY TRAFFIC  
3-AIRCRAFT OPERATORS ARE REQUESTED TO REDUCE THEIR SCHEDULED FLIGHTS BY 25 PER CENT ON ROISSY-CDG AIRPORT ON TUESDAY MARCH 12TH 2013 FROM 0500 TILL 1100 UTC IF OPERATING MORE THAN 8 MVTs ARE SCHEDULED FROM 0500 TO 1100 UTC.  
4-EXPECT EXTRA FUEL AND WAITING CIRCUIT POSSIBLE OF 45MIN.  
5- PARIS-CDG NOT AVAILABLE FOR DIVERSIONS WITH THE EXCEPTION OF EMERGENCY TRAFFIC  
6-HEL LANDING AREA OF PARIS-CDG CLOSED  
7-AIRCRAFT OPERATORS SHALL SEND REMAINING PROGRAM AND CANCELLED FLIGHTS BEFORE MONDAY MARCH 11TH 1900 UTC TO DGAC/DTA BY MAIL TO : PROGRAMMES-COMPAGNIES.DTA(AT)AVIATION-CIVILE.GOUV.FR.

##### **LFPA-A1312/13B02**

A) LFPO PARIS ORLY  
B) 2013 Mar 12 00:00 C) 2013 Mar 12 23:59  
E) 8-FLIGHT PLANS EXCEEDING THOSE LIMITATIONS MAY BE REJECTED.  
9-AIRCRAFT OPERATORS MUST SYSTEMATICALLY CANCEL ALL FPL FOR THE FLIGHTS NOT PERFORMED.  
10-A RENEWED ATTENTION IS REMINDED TO AIRCRAFT OPERATORS OF THE NECESSITY TO RESPECT ENVIRONMENTAL MEASURES AT THOSE AIRPORTS

## 11.4 UK versus French legislation

11.11 A direct comparison of French and UK legislation is provided below by first identifying the applicable EC regulations, and then comparing the domestic differences. In the

UK the Secretary of State is the competent authority for the purposes of Article 21 of EC 1008/2008, but there is no further detail set out (as seen below).

#### **EC Regulation 1008 / 2008 Article 21 “Emergency Measures”**

- (1) A Member State may refuse, limit or impose conditions on the exercise of traffic rights to deal with sudden problems of short duration resulting from unforeseeable and unavoidable circumstances. Such action shall respect the principles of proportionality and transparency and shall be based on objective and non-discriminatory criteria.

The Commission and the other Member States shall be informed without delay of such action with its adequate justification. If the problems necessitating such action continue to exist for more than 14 days, the Member State shall inform the Commission and the other Member States accordingly and may, with the agreement of the Commission, prolong the action for further periods of up to 14 days.

- (2) At the request of the Member State(s) involved or on its own initiative, the Commission may suspend this action if it does not meet the requirements of paragraph 1 or is otherwise contrary to Community law.

#### **EC 95/93 (as amended) on common rules for the allocation of slots at Community airports – Article 14**

- (1) An air carrier's flight plan may be rejected by the competent Air Traffic Management authorities if the air carrier intends to land or take off at a coordinated airport, during the periods for which it is coordinated, without having a slot allocated by the coordinator.

#### **French Civil Aviation Code Article R221-3**

The use of an aerodrome open to public air traffic may at any time be subject to certain restrictions or temporarily prohibited if the conditions of air traffic on the aerodrome or in the surrounding airspace or reasons justify it. These decisions are the subject of notices to air navigators.

#### **UK SI 2009 No 41 PART 3 Access to routes**

22. The Secretary of State is the competent authority for the purposes of Articles 16 to 21 of the EC Regulation. [EC Regulation 1008 / 2008]

## **11.5 EuroControl Network Manager**

- 11.12 In pursuit of improving general flight plan and slot consistency, EuroControl published 'Eurocontrol Centralised Service on Flight Plan and Airport Slot Consistency (FAS) Concept of Operations (CONOPS) 04 October 2013'. This refers to Article 14(1), which suggests that the Member State has a right to mandate the Network Manager with rejecting flight plans as follows:

*“Based on Regulation (EEC) 95/93, article 14(1), a EuroControl Member State may want to exercise its right, to mandate the Network Manager (NM) with rejecting a flight plan, if no correct match with an Airport Slot (APSL) is possible. In such cases NM would request from the Member State a specific instruction in writing, as it also was already possible in the past.”*

## 11.6 Recommendations

11.13 Members of the VIRG have reviewed the above examples on legislation and believe that further UK Government policy should be considered to allow airports in the UK to instigate a non-voluntary demand vs capacity balancing process (similar to the French DGAC). The following points should be covered:

- 1) The Government's interpretation of, and therefore circumstances in which traffic rights could be limited under, EC Regulation 1008 / 2008 Article 21 "Emergency Measures";
- 2) Clarity on EC Regulation 261 compensation responsibilities in such circumstances;
- 3) Government, Airport, ATM and Airline responsibilities and procedures; and
- 4) Dispute and sanction procedures.

## 12 Appendix 5: Shared industry contingency planning roadmap

12.1 The following provides a VIRG roadmap to develop shared contingency planning to support reduced disruption and improved recovery. It includes industry-wide planning for the NATS ExCDS programme and sharing of data on thunderstorms and other scenarios within the London TMA.

Key Milestones	Planned date	Lead
Run Workshop (1) on ExCDS and Weather	July 2017	COMPLETE
Establish a workplan for ExCDS into TC North	Oct 2017	COMPLETE
Implement ExCDS Measures to deliver improvement	Nov 2017	NATS
Apply lesson learning to ExCDS delivery on TC North and establish workplan for SS, GW, TC South, LL, KK	Jan 2017	NATS
Run the weather scenario day and identify lessons learnt	Dec 2017	BA
Create a weather scenario playbook	Feb 2018	BA/NATS
Run Workshop (2) on Major failure scenario/Crisis Management	Jan 2018	Airport
Create Major Failure/ Crisis Playbook	March 2018	Airport/NATS

Run Workshop (3) on Major Diversion scenario and Management of Technical Diversions	March 2018	Easyjet
Create Major Diversion and Technical Diversion Playbook	May 2018	Easyjet/NATS
Understand Major Military Exercise planning and ability to influence or mitigate Network impact.	March 2018	NATS
Contingency Plans – understand and align Airport/Airline/ANSP contingency plans (high level overview)	Mar 18	NATS

## 13 Appendix 6: VIRG scheduling process and data

### 13.1 Scheduling process overview

### 13.2 Legislative framework

13.1 The scheduling process for UK airports is governed by the EU Slot Regulation<sup>27</sup> and the IATA Worldwide Scheduling Guidelines (WSG)<sup>28</sup>. The former is the European legislative framework that was adopted by the UK in the form of The Airports Slot Allocation Regulations 2006<sup>29</sup> and sets out the policy whereas the WSG provides additional guidance in the application of the policy and sets industry best practice. ACL is required to account for the guidance given in the WSG under Article 8(5) of the EU Slot Regulation.

#### Scheduling cycle

13.2 The scheduling cycle is determined by the WSG and takes place twice per year in preparation for the IATA Scheduling Seasons. The Calendar of Coordination Activities is published in the WSG on an annual basis and sets the milestones for airlines, coordinators and facilitators so that the entire industry works to the same timetable. It is these dates that trigger the associated processes that deliver the schedules that will operate in the corresponding season. Figure 5 shows the cycle of coordination activities, and Table 3 demonstrates the time of year they take place based on the IATA WSG Calendar of Coordination Activities<sup>30</sup>.

<sup>27</sup> European Regulation 95/93/EEC ('the EU Slot Allocation Regulation'), as amended by Regulation 894/2002/EC and 793/2004/EC

<sup>28</sup> IATA Worldwide Scheduling Guidelines 8<sup>th</sup> Edition effective 1<sup>st</sup> January 2017

<sup>29</sup> The Airports Slot Allocation Regulation 2006 (SI 2006 No. 2665)

<sup>30</sup> Page 3 of the 8<sup>th</sup> Edition



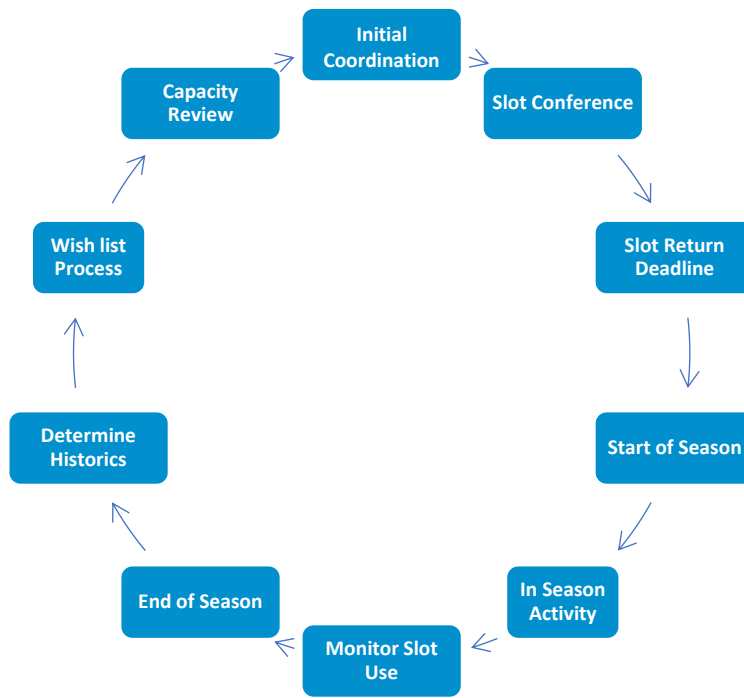


Figure 5: Scheduling Cycle

	Summer	Winter
Initial Coordination	October	May
Slot Conference	November	June
Slot Return Deadline	January	August
Monitor Slot Use	End March to End Oct	End Oct to End March
Determine Historics	September	April
Capacity Review	September	April

Table 3: Scheduling calendar based on the IATA WSG Calendar of Coordination Activities<sup>30</sup>

#### Data cycle

- 13.3 The key airline schedule milestone is ‘initial coordination’, as this is the first time in the process that the Coordinator will see the schedules that the airline intends to operate. It is also at this point that the airline will receive the initial allocation of slots to facilitate operational plans. From initial coordination through to the date at which the flight is scheduled to operate, schedules will change based on factors, including (but not limited to) the following:
- Schedule feasibility;
  - Commercial;
  - Political; and
  - Security.
- 13.4 Article 8a of the EU Slot Regulation<sup>31</sup> allows slot mobility and permits airlines to move slots from one route or type of service to another route or type of service. This gives those holding slots the ability to use the pool of slots allocated to them as they wish. There is no timeframe for finalising a schedule apart from the commercial pressure that it needs to be offered and sold to the public. The holder of the slots may make changes up to the point of departure, but the opportunity for changes naturally reduces.
- 13.5 The scheduling cycle also includes the Handback Deadline (HBD). It is at this point that the “use it or lose it” targets are set for a holder of slots to achieve historic status in a subsequent season. Any cancellations after this point would count towards this target and therefore this acts as an incentive for operators to finalise schedules at this point. Any slots handed back at this stage are then recycled and can be reallocated to those on the waiting list or for ad-hoc operations.

#### Data availability

- 13.6 ACL collects data at 24 airports<sup>32</sup> in the UK including all of those that are currently designated by the Secretary of State as IATA Level 2 (Schedules facilitated) and IATA Level 3 (Coordinated). In the South East this includes Heathrow, Gatwick, London City, Stansted and Luton. The data that ACL collects does not cover smaller undesignated airports such as Biggin Hill, Farnborough and Northolt, which tend to cater for general and business aviation. During the Olympics these airports were designated as Level 3 for the duration of the games. This experience demonstrated that the application for slots for this market tended to be close to the point of departure rather than in line with the IATA planning cycle.
- 13.7 The data that ACL collects is determined by the IATA scheduling process.<sup>33</sup> This information includes details of the flight associated to the slot, including time and date as well as aircraft type and destination airport. From this data ACL uses its

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<sup>31</sup> European Regulation 95/93/EEC (‘the EU Slot Allocation Regulation’), as amended by Regulation 894/2002/EC and 793/2004/EC

<sup>32</sup> Full list of airports that ACL collects data can be found at <https://www.acl-uk.org/airport-info/>

<sup>33</sup> IATA Standard Schedules Information Manual, 27<sup>th</sup> Edition issued March 2017

coordination system to derive additional data fields by using data tables. The information held is consistent across all airports at which ACL operates.

- 13.8 The accuracy of the data is dependent on the time at which it is taken and analysed. At the initial coordination stage, the coordinator receives the airlines' requests for slots. Airlines will tend to overbid at this stage in the process. Their plans are not firm and therefore they request to cover different scenarios or they bid in the hope of gaining capacity. There is less overbidding at airports that are at or close to saturation. The amount of overbidding results in the coordinator being unable to allocate slots to all that were requested, which results in the total allocated movements being less than those requested (Demand).
- 13.9 The Slot Return Deadline is the point at which the full season slots that are not required are returned to the slot pool for reallocation. Some of these returned slots will not be utilised as they tend to be in off-peak months. The reduced held slots caused by these cancellations are mitigated by ad-hoc flights that are subsequently requested during the season. For example, during summer 2017, Luton and Stansted operated higher movements compared with what was planned at the start of the season by 22.7 per cent (16,364 movements) and 7.3 per cent (8,269 movements) respectively. In summer 2017, the volume of slots was driven by those operations serving Western Europe<sup>34</sup>, which also demonstrated the most volatility (planned versus actual).
- 13.10 The versatility of the ACL data allows further manipulation of the data and can be used to provide granular analysis down to individual destination, by day and by time.
- 13.11 As part of the IATA Strategic Review the coordination calendar is currently under review. One proposal under consideration is re-timing the HBD to be earlier in the process. There is an opportunity to gain more accurate information earlier in the planning cycle through improved consistency in airline behaviour.

### 13.3 Schedule reliability/quality of data

- 13.12 The quality and reliability of the data that ACL holds is dependent on the information provided by the airline. Once the season commences, the Enforcement Code<sup>35</sup> provides the mechanism for ensuring that the slots held are accurate. However, prior to that period the airlines are not required to keep the schedules held by the coordinator in line with their planned schedule (although it is best practice to do so).
- 13.13 The scheduling process does not require the coordinator to complete feasibility checks of the proposed schedule submitted by the operator. To do so would be complex and require additional resource and expertise; this would also assume that the operators would be willing for such a practice to take place. Table 4 demonstrates the complexity of the schedule build process to build the schedule and factors that may need to be considered to assess its feasibility. These factors exclude the commercial considerations that different airlines in different markets may also need to include in the decision-making process. As such, although the data that

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<sup>34</sup> Western Europe – includes Portugal, Gibraltar, Spain, Austria, Belgium, France, Germany, Luxembourg, Monaco, Netherlands and Switzerland

<sup>35</sup> CONTROLLING THE MISUSE OF SLOTS AT COORDINATED AIRPORTS IN THE UK - MISUSE OF SLOTS ENFORCEMENT CODE, made by the Coordinator under Regulation 18 of The Airports Slot Allocation Regulations 2006 (SI 2006 No 2665) 15 June 2015

ACL holds may be reliable in terms of what has been provided by the operator, there is no correlation with the actual operation.

Performance Area	Considerations
Block Times	Taxi times at both ends of routes Benchmarking Different commercial strategies by airline (increase the block to provide more ground time) Aircraft types and airline fuel policy Preferred routings – longer routing to lower overflight charges
Turn Times	What is an acceptable turn time Turn time by carrier Operational requirements during the turn (fuelling, potable water, engineering, cleaning, crew change etc) Passenger profile Time of day of the turn Availability of ground services (fuelling, passengers with reduced mobility (PRM) etc)
Schedule	Aircraft utilisation and integrations Combination of flights on a line of flying Airports served Slot availability at UK airport and other end of route Night curfews at other end of route Aircraft availability and delivery
Crewing	Flight Duty Periods (FDP) Crew numbers Standby availability Crew utilisation Union agreements Specific airport qualification requirement (e.g. Gibraltar/Funchal)
Ground Handling	Suitable resources available
Engineering	Line check requirement Heavy maintenance schedule
Airport Readiness	Infrastructure Security Baggage systems

Table 4: Schedule Operational Readiness

13.14 Taking block times as an example, the variation in the amount of time used when building a schedule depends on many factors. There does not exist a set of requirements setting out standard block times and each operator determines its own based on its own commercial and operational strategy.

13.15 Figure 6 demonstrates the distribution of movements against the block time planned by the airlines serving the LHR-DXB route<sup>36</sup>. On an average planned block time of

<sup>36</sup> ACL is Coordinator for both London Heathrow and Dubai. The data is based on matching the flight numbers and date of operation at both ends of the route.

07:00 the range of planned block time varies from 06:50 up to 07:30, albeit a small number of operations operated at the higher limit. The variance in block times could be driven by the type of aircraft<sup>37</sup> on the route, day of the week or the time of day. For example, those flights that leave Heathrow at midday will arrive in Dubai at a time of high expected arrivals, therefore increasing the likelihood of longer holding compared with those flights that depart Heathrow in the evening.

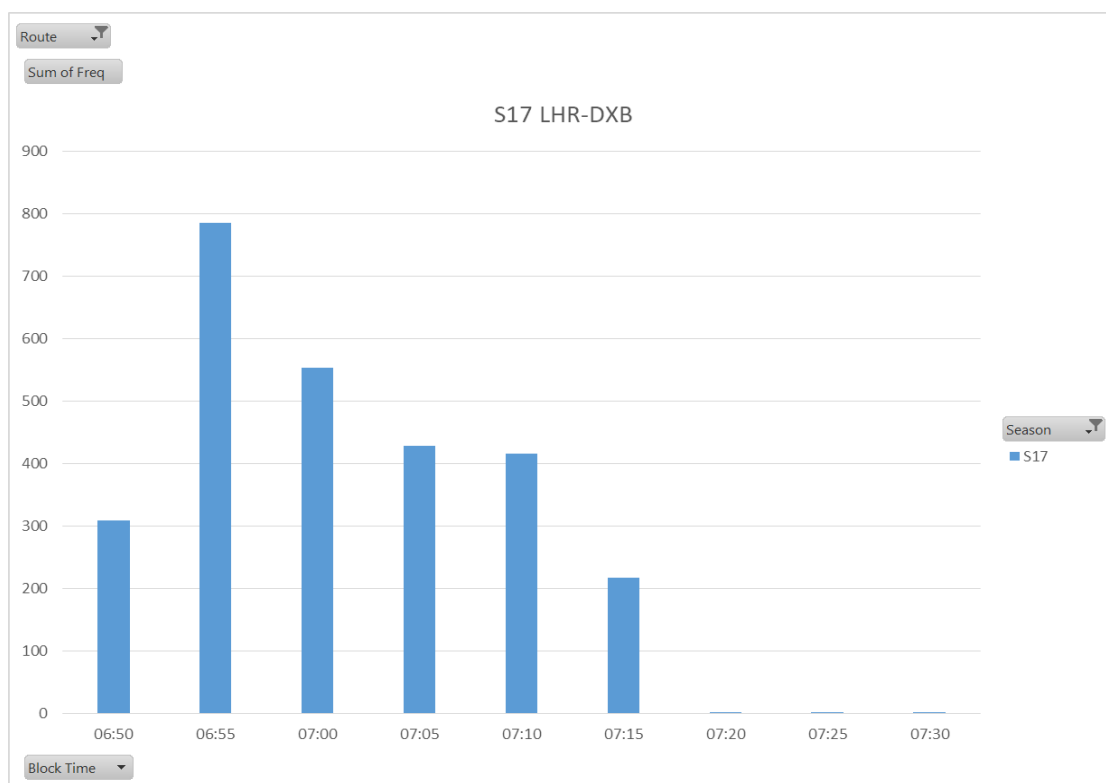


Figure 6: Summer 2017 – Distribution of planned operations against the planned block times **LHR-DXB**

13.16 Figure 7 demonstrates that the distribution on the return sector shows a wider distribution of planned block times, ranging from 06:55 to 08:05. Based on the data analysed, one carrier operating a consistent aircraft type planned block times against a range from 07:25 to 08:05, depending on the day of the week. Another carrier planned a different block on one of the day of the week, which seemed to be due the required slot not being available at Heathrow.

<sup>37</sup> A range of aircraft operate flights between LHR and DXB, including A380, B787 and B777

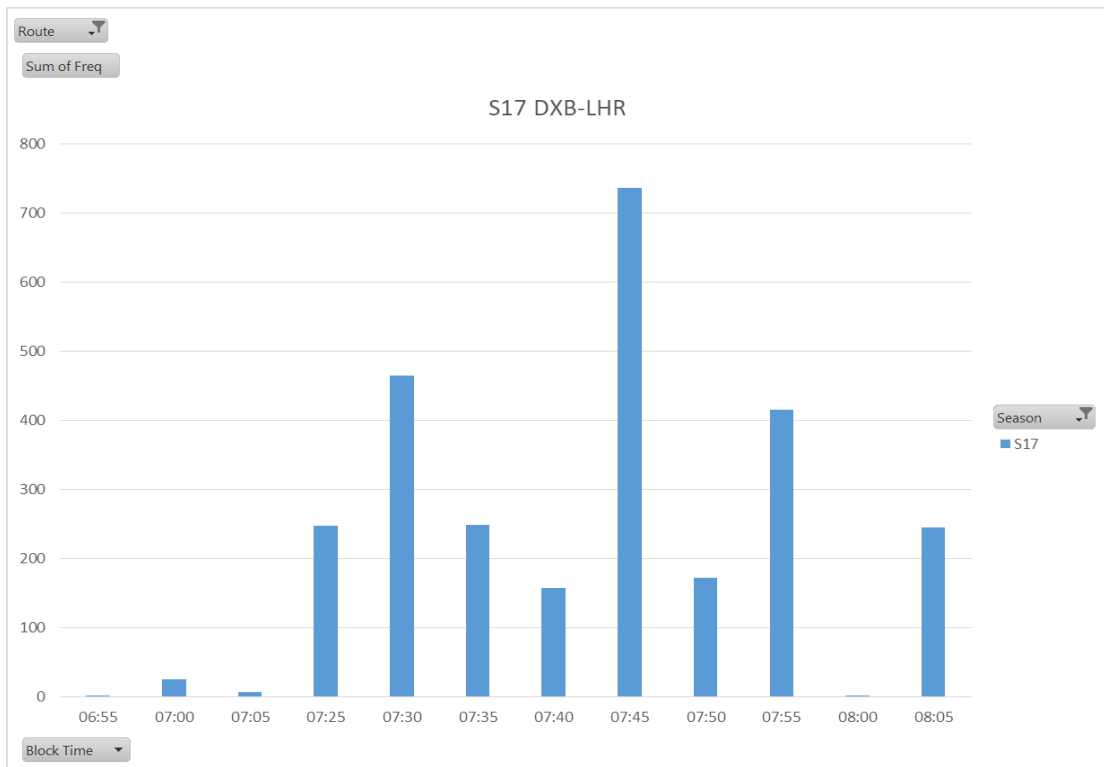


Figure 7: Summer 2017 – Distribution of planned operations against the planned block times **DXB-LHR**

13.17 Comparing planned block times with those achieved requires information that is not readily available. Required information would normally need to be derived from the airlines that operate the route, EuroControl<sup>38</sup> (requiring airlines to grant permission to view the data) or by combining information from the airports at each end of the route.

### 13.4 Capacity declarations process

13.18 Article 6 of the EU Slot Regulation<sup>39</sup> requires that the Member State shall ensure the determination of the parameters for slot allocation are completed twice yearly. The UK Slot Allocation Regulations devolve such responsibility to the individual airport. Each of the Level 3 coordinated airports will independently determine their capacity declaration following extensive analysis, taking account of all infrastructure that is likely to be insufficient to handle the planned demand. The general areas that are normally modelled are categorised as:

- Terminal<sup>40</sup>;
- Runway; and
- Stands.

13.19 The process for airport capacity determination has been well documented in previous studies. ‘Runway determination’ is the factor that is likely to have an impact on the

<sup>38</sup> Central Office for Delay Analysis (CODA) - EuroControl

<sup>39</sup> European Regulation 95/93/EEC (‘the EU Slot Allocation Regulation’), as amended by Regulation 894/2002/EC and 793/2004/EC

<sup>40</sup> Terminal capacity determinations will cover all areas of the terminal including security, check in, baggage makeup areas etc.

wider network. The immediate impact on runway delivery carries more weight compared with the delivery into the immediate network and the subsequent impact further down route.

- 13.20 As the wider network becomes more of a constraining factor, managed through temporary flow restrictions where demand exceeds capacity, the impact of individual capacity declarations become more critical. ACL holds data for the major airports in the UK, however this data is not aggregated at any point in the planning process to determine the overall system demand. At the point that this information is analysed, slots will have been issued and the permission to operate at those times granted.
- 13.21 Although the coordination function is focused on the immediate airport infrastructure, such infrastructure is not modelled. For example, if the runway declares 30 departures there is nothing preventing all 30 from planning to use the same SID and head in the same direction. Analysis of this data may identify areas of the network where the available capacity is insufficient. At that point, further consideration would be required to establish how the demand can be spread to periods where capacity is available. Currently there is no mechanism for managing this, and it therefore becomes the responsibility of the controller on the day. In future, capacity smoothing could be best achieved through an overlying system capacity constraint that allows the smoothing during the planning phase rather than waiting until the plans are set.

### 13.5 Recommendations

- 13.22 Members of the VIRG have reviewed the existing scheduling process and the current related issues to make the following recommendations:
- ACL & NATS should work on developing a data set that will allow greater planning;
  - The IATA Strategic Review should be supporting in achieving an earlier planning window to provide earlier accurate information;
  - There needs to be further analysis on managing the network to spread capacity demand; and
  - Enhancements to the scheduling system should include parameters that fall outside the immediate airport infrastructure, firstly considering 'directional slots'.

## 14 Appendix 7: Common analytical framework

### 14.1 Overview

14.2 The objective of developing a common analytical framework is to ensure that there is an agreed set of performance metrics that support an understanding of network punctuality performance at both the strategic and tactical levels. The sections that follow consider each metric in detail and provide illustrative reporting outputs.

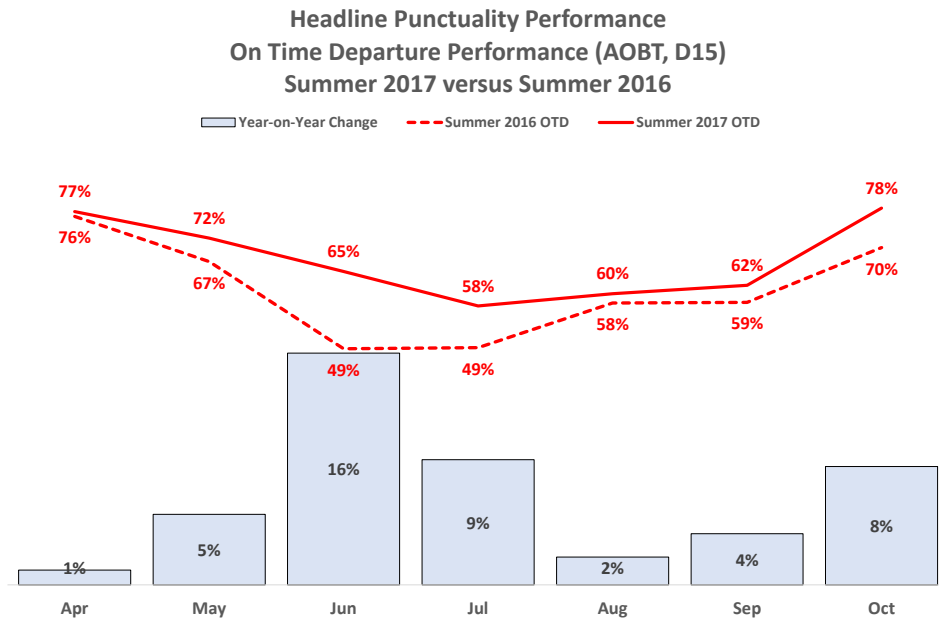
### 14.2 Punctuality Performance

14.3 The table below summarises the metrics proposed to support an assessment of punctuality performance.

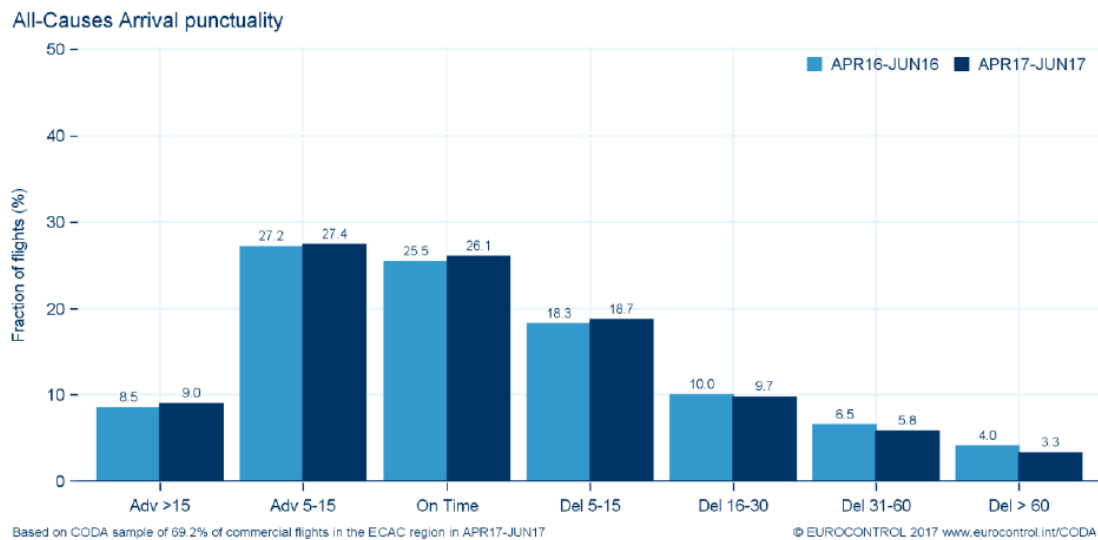
	Headline Punctuality Performance	Punctuality Range	Operational Cancellations
<b>Definition</b>	Percentage of flights satisfying the following criteria: <u>Deps:</u> AOBT <= SOBT + 15:59 <u>Arrs:</u> AIBT <= SIBT + 15:59	Percentage of flights satisfying the following criteria: <u>Deps:</u> AOBT <= SOBT + X mins <u>Arrs:</u> AIBT <= SIBT + X mins  Performance to be assessed under a range of 'X' values, both positive and negative.	Percentage of flights which received a slot and were confirmed by the carrier on the day before the operation and / or were contained in the daily list of scheduled flights prepared by the airport operator the day before the operation but the actual take-off or landing never occurred.
<b>Purpose</b>	Industry standard measure which provides a headline view of punctuality performance.	This metric provides greater context for punctuality performance by allowing the proportion of flights operating significantly off-schedule – both early and late – to be quantified.	Cancellations are a key indication of the overall resilience of the system and are not reflected in either of the other two punctuality metrics.
<b>Primary Data Source</b>	Airport Operational Database	Airport Operational Database	Network Manager
<b>Data Held by Network Manager?</b>	Yes	Yes	Yes



14.4 An illustrative output for the **Headline Punctuality Performance** metric is provided below. For each year, the lines show the proportion of departures that pushed back no later than 15 minutes after the scheduled off-block time. The bars show the year-on-year change in this metric.

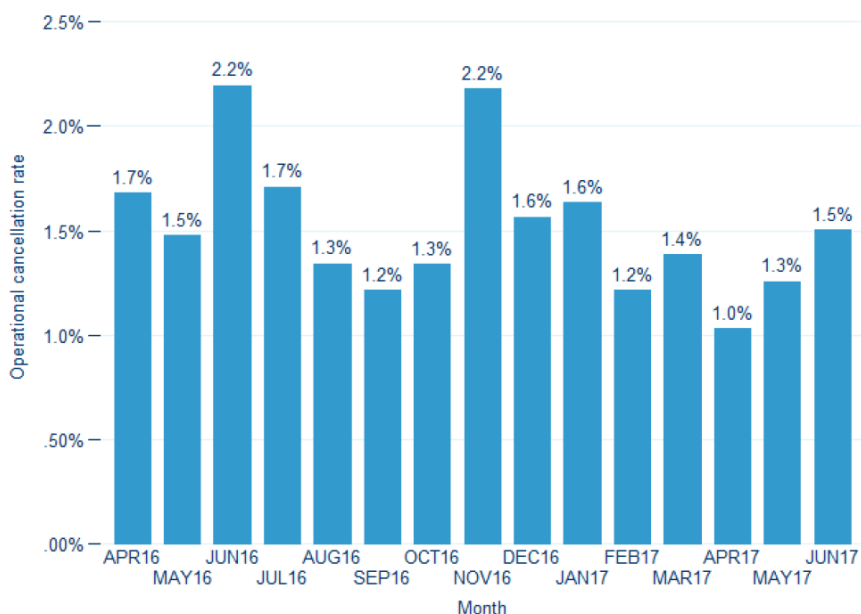


14.5 An illustrative output for the **Punctuality Range** metric is provided below and is sourced from EuroControl’s ‘CODA Digest Q2 2017’ publication.



14.6 An illustrative output for the **Operational Cancellations** metric is provided below and is sourced from EuroControl’s ‘CODA Q2 2017’ publication.

Figure 16. Monthly Rate of Operational Cancellations April 2016 – Q2 2017



### 14.3 Airspace & Aerodrome Regulation

14.7 There are two main forms of airspace and aerodrome regulation:

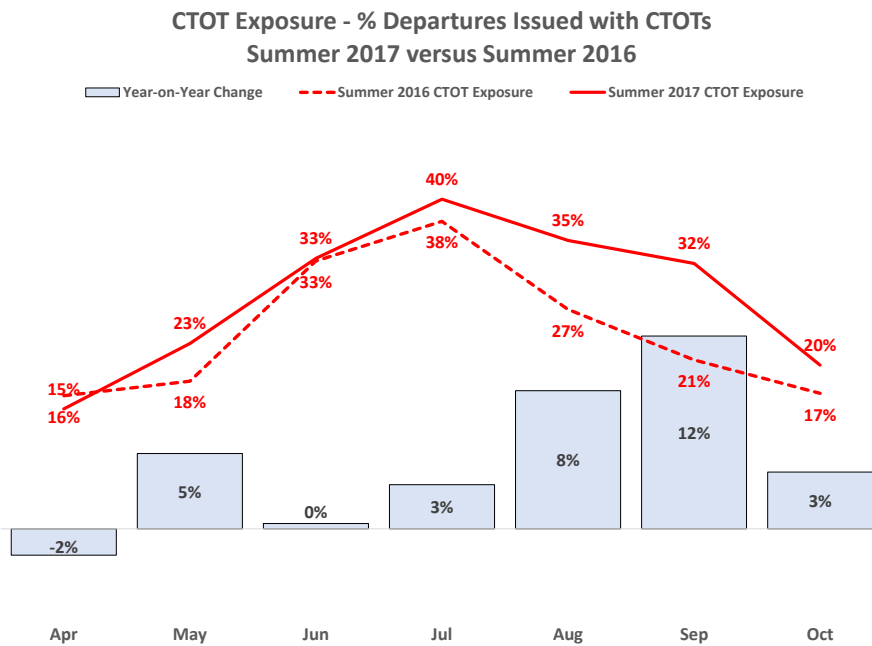
- **Calculated Take-off Times (CTOTs):** CTOTs are calculated and issued by the Network Manager’s Central Flow Management Unit (CFMU) to regulate the flow of traffic through certain airspace sectors. A CTOT is defined by a time and tolerance (-5 to +10 minutes), during which period the flight is expected to take-off.
- **Short Term ATFCM Measures (STAMs):** STAMs may be applied by local ANSPs to reduce traffic peaks through short-term application of minor ground delays, appropriate flight level capping and small re-routeings to a limited number of flights.

14.8 The table below summarises the metrics proposed to support an assessment of the contribution of airspace and aerodrome regulation to punctuality performance.

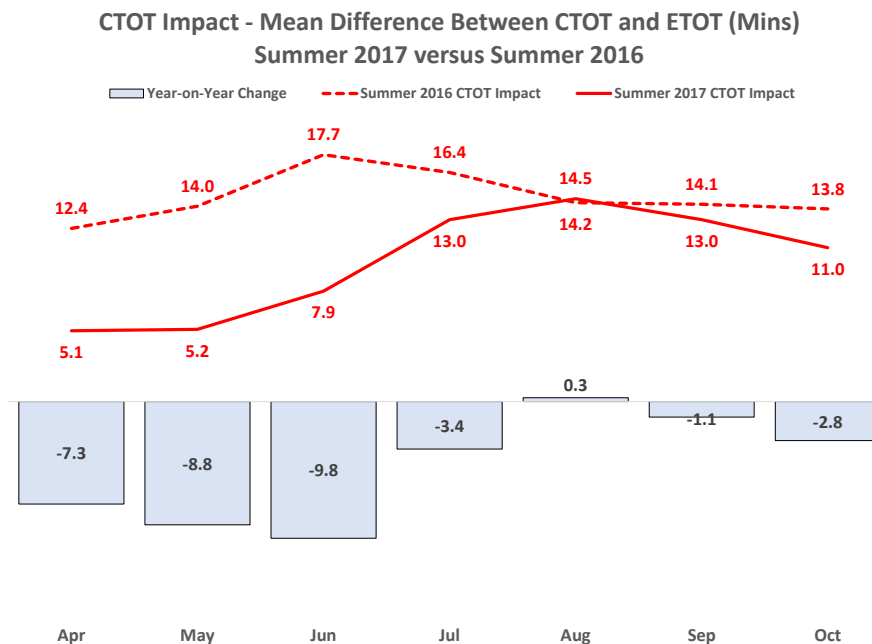
	Exposure to Regulation	Impact of Regulation
<b>Definition</b>	<p><u>Calculated Take-off Times (CTOTs)</u> Percentage of flights issued with a CTOT by the Network Manager.</p> <p><u>Short Term ATFCMs (STAMs)</u> Numerical count of the number of times a STAM was applied.</p>	<p><u>Calculated Take-off Times (CTOTs)</u> The difference in minutes between the CTOT and the ETOT for a range of statistical measures (e.g. mean / median / interquartile range).</p> <p><u>Short Term ATFCMs (STAMs)</u> The duration of STAMs across a range of statistical measures (e.g. mean / median / interquartile range).</p>
<b>Purpose</b>	<p>This metric provides a headline view of the direct exposure to airspace and aerodrome regulation.</p> <p>A low exposure to airspace regulation can generally be expected to support a more punctual performance and vice versa.</p>	<p>This metric helps to provide further context for the impact of airspace regulation by quantifying the delay associated with a CTOT and the duration of a STAM.</p> <p>The overall impact of airspace and aerodrome regulation to punctuality performance will be a combination of the exposure and delay duration associated with the regulation.</p>
<b>Primary Data Source</b>	<p><u>Calculated Take-off Times (CTOTs)</u> Network Manager</p> <p><u>Short Term ATFCMs (STAMs)</u> NATS</p>	
<b>Data Held by Network Manager?</b>	<p><u>Calculated Take-off Times (CTOTs)</u> Yes</p> <p><u>Short Term ATFCMs (STAMs)</u> No</p>	

14.9 The **Network Manager** has a comprehensive database that allows **CTOT** data to be broken-down by type and location as well as identifying the reason of the most penalising regulation. It is recommended that this rich data set is used to support a more detailed understanding of the root cause of the regulations. Any CTOTs issued due to issues in airspace sectors or at aerodromes in the south east of England will be particularly relevant.

14.10 EXPOSURE: An illustrative output showing CTOT exposure by month is provided below. The lines show the exposure during each year. The bars show the year-on-year change in exposure.

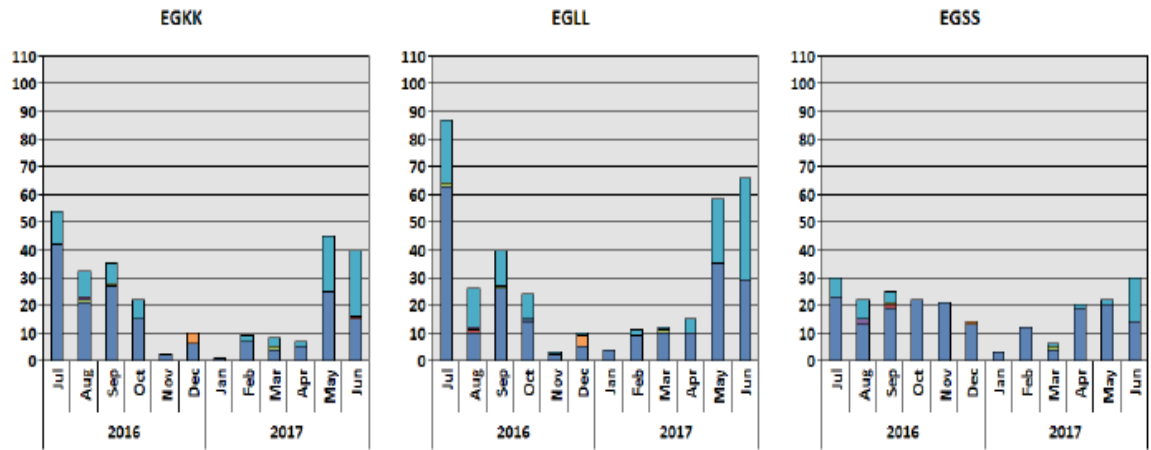


14.11 IMPACT: An illustrative output showing the mean CTOT duration by month is provided below. The lines show the mean CTOT duration in each year. The bars show the year-on-year change in duration. Similar charts or tables could be produced showing performance under a range of statistical measures.

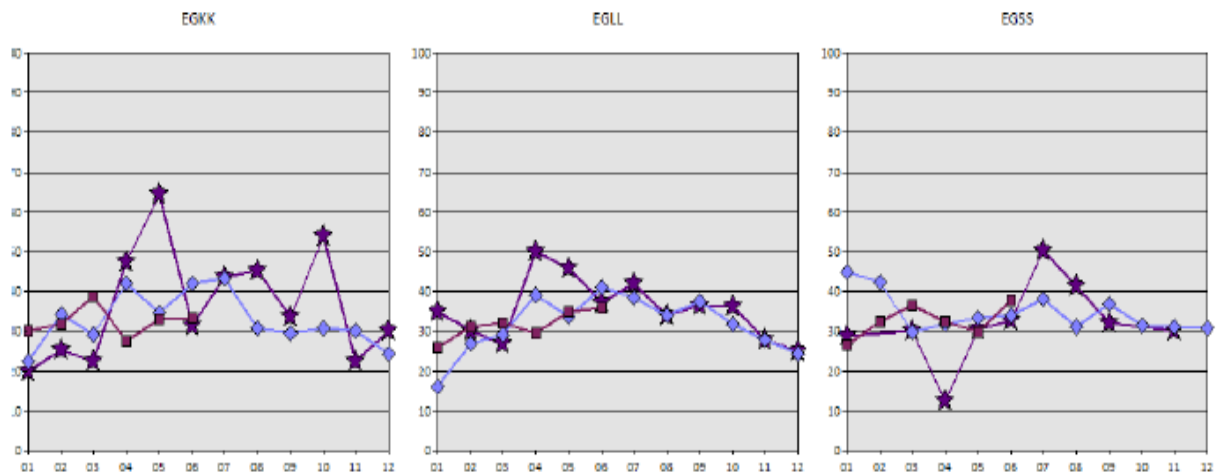


14.12 **NATS** publishes data on **STAMs** in its quarterly operational performance report. The illustrative charts below have been sourced from the NATS Operational Performance Report for the period April to June 2017.

14.13 **EXPOSURE**: An illustrative output showing the number of STAMs by cause and month is provided below. Each differently coloured bar represents a different causal factor.

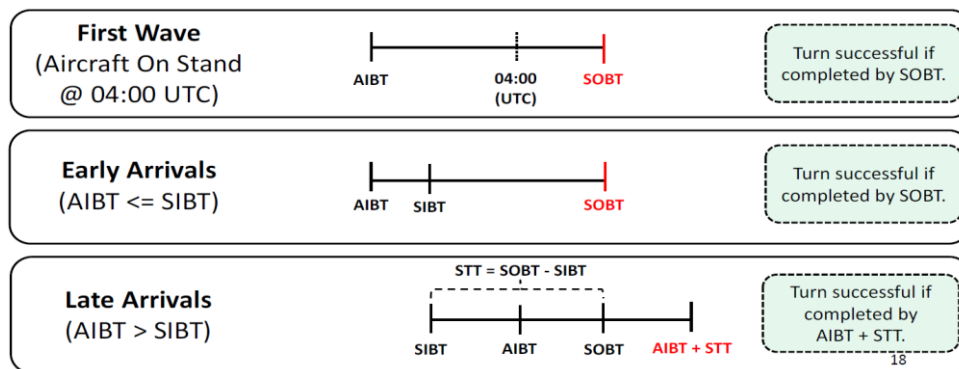


14.14 **IMPACT**: An illustrative output showing the mean STAM duration by month is provided below. Each line shows data for a particular year. Similar charts or tables could be produced showing performance under a range of statistical measures.



## 14.4 Turn Performance

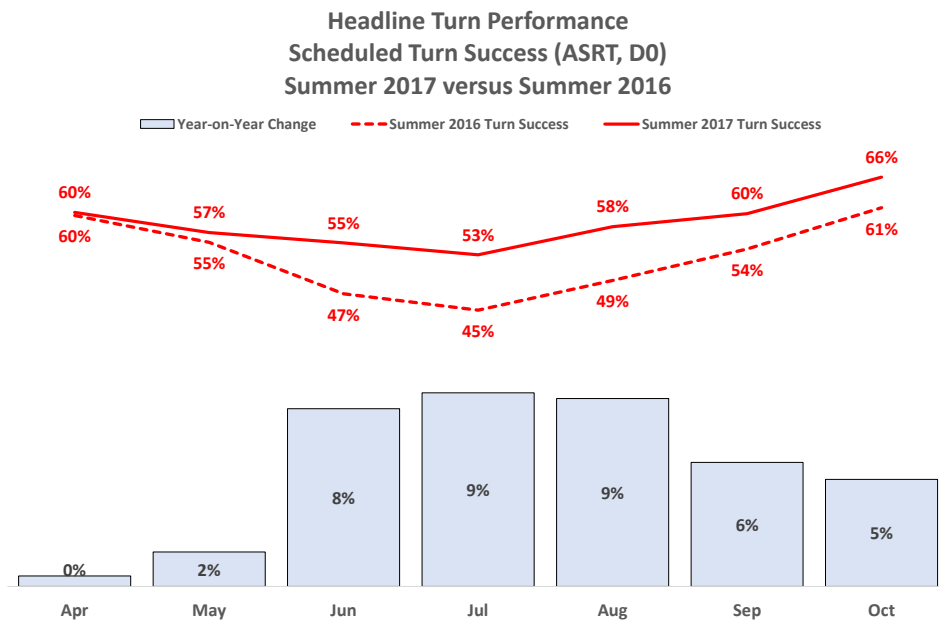
- 14.15 It is proposed that turn performance is assessed with respect to the criteria illustrated in the graphic below.
- 14.16 For first wave departures and early arrivals, the turn will be considered successful if completed by the scheduled off-block time.
- 14.17 For late arrivals, the turn will be considered successful if completed within the time that was scheduled for the turn, regardless of when the aircraft arrived on stand.
- 14.18 In the context of the continued high levels of airspace regulation, it is proposed that the end of the turn will be assessed with respect to the start request time (i.e. the time the pilot contacts the tower to request push-back) rather than the actual off-block time, as the push-back may be delayed by the application of a regulation.



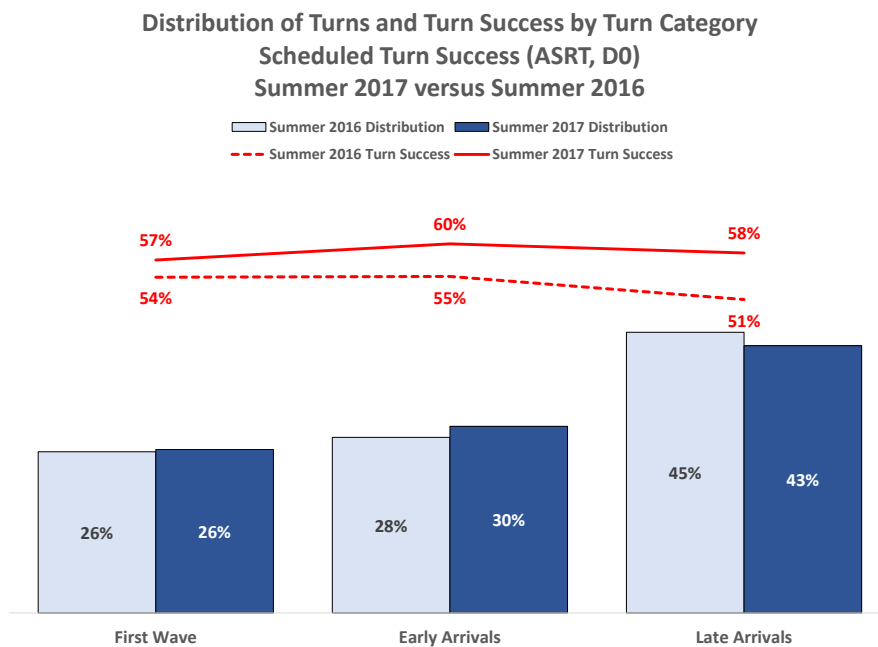
14.19 The table below summarises the metrics proposed to support an assessment of the contribution of turn performance to punctuality performance.

	Headline Turn Performance	Distribution & Turn Success by Turn Category	Distribution & Turn Success by Turn Time
<b>Definition</b>	Percentage of turns satisfying the turn success criteria.	Percentage of turns attributable to each turn category (first wave / early arrivals and late arrivals) and the percentage turn success for each category.	Percentage of turns by scheduled turn time and the percentage turn success for each turn time.
<b>Purpose</b>	<p>This metric provides a headline view of the contribution that turn performance makes to punctuality performance.</p> <p>A high level of turn success can generally be expected to support a more punctual performance and vice versa.</p>	<p>This metric helps to provide context for the achieved turn performance; for example, it may be reasonable to expect a lower level of turn success for the turns associated with late arrivals as ground crew and resources may not be in place to support off-schedule activity.</p>	<p>This metric helps to further disaggregate performance and should help to establish whether there are any common performance trends linking the duration of the turn with turn capability.</p>
<b>Primary Data Source</b>	Airport Operational Database	Airport Operational Database	Airport Operational Database
<b>Data Held by Network Manager?</b>	<p>To be confirmed.</p> <p>May need to (i) supplement existing data set with ASRT timestamp and (ii) identify an efficient way of linking flights.</p>		

14.20 An illustrative output for the **Headline Turn Performance** metric is provided below. The lines show the turn success of each year and the bars show the year-on-year change in the turn success.

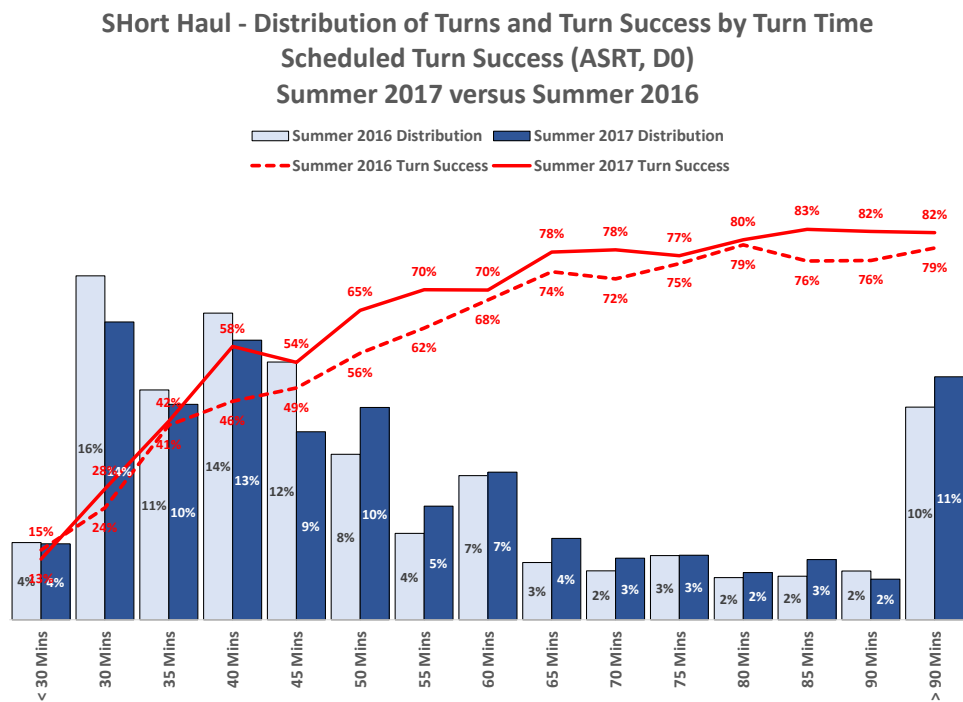


14.21 An illustrative output for the **Distribution & Turn Success by Turn Category** metrics is provided below. For each year, the bars show the distribution of turns and the lines show the turn success by turn category.





14.22 An illustrative output for the **Distribution & Turn Success by Turn Time** metrics is provided below. For each year, the bars show the distribution of turns and the lines show the turn success by turn time.



14.23 For presentation purposes, it is proposed that the turns associated with short haul flights and long haul flights are considered separately, with market segments defined with respect to the destination country associated with the flight.

## 14.5 Block Performance

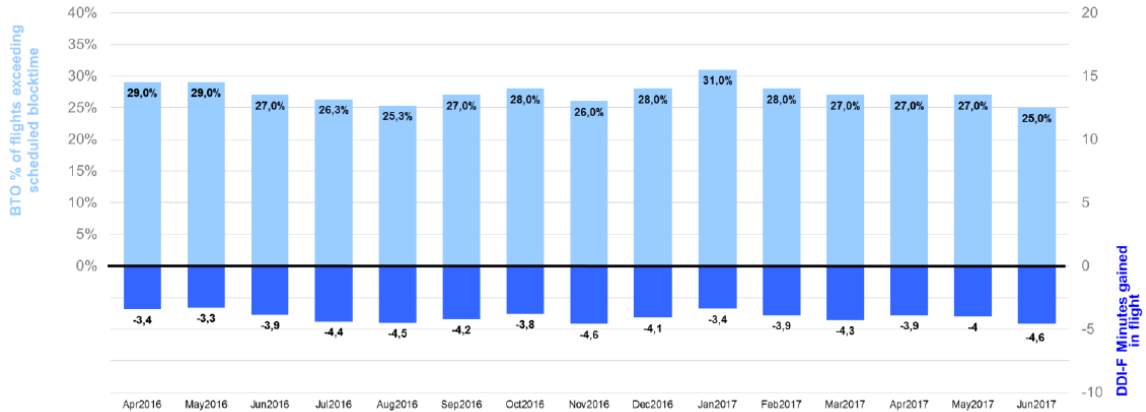
14.24 The table below summarises the metrics proposed to support an assessment of the contribution of block performance to punctuality performance.

14.25 The **Block Time Overshoot** and **Delay Difference Indicator** metrics are widely reported by EuroControl. The **Block Time Performance Range** is an additional metric proposed by the VIRG that builds on the Block Time Overshoot concept.

	Block Time Overshoot (BTO)	Block Time Performance Range	Delay Difference Indicator (DDI-F)
<b>Definition</b>	Percentage of flights for which the actual block time is greater than the scheduled block time, where the actual / scheduled block time is defined as the difference between AIBT / SIBT at the destination airport and AOBT / SOBT at the origin airport.	Percentage of flights overshooting or undershooting the scheduled block time at various pre-defined thresholds – e.g. the proportion of flights where the actual block time was between 15 and 30 mins less than the scheduled block time.	The average difference between the arrival punctuality (AIBT versus SIBT) and the departure punctuality (AOBT versus SOBT) expressed in minutes.
<b>Purpose</b>	<p>This metric provides a headline view of the contribution that block performance makes to punctuality performance.</p> <p>A low BTO can generally be expected to support a more punctual performance and vice versa.</p>	<p>This metric provides greater context for block performance by allowing the proportion of block times that were materially different to the scheduled block time (shorter or longer) to be quantified.</p>	<p>This metric builds on the Block Time Performance Range metric by quantifying the average time gained or lost on the block.</p> <p>A low DDI-F can generally be expected to support a more punctual performance and vice versa.</p>
<b>Primary Data Source</b>	Network Manager	Network Manager	Network Manager
<b>Data Held by Network Manager?</b>	<p style="text-align: center;">Yes</p> <p style="text-align: center;">N.B. Data only held for airlines reporting to CODA – coverage to be confirmed.</p>		

14.26 An illustrative output for the **Block Time Overshoot** and **Delay Difference Indicator** metrics is shown below and is sourced from EuroControl’s ‘CODA Digest Q2 2017’ publication.

Figure 18. Block Time Overshoot (BTO) and Delay Difference Indicator - Flight (DDI-F) 2016 – Q2 2017

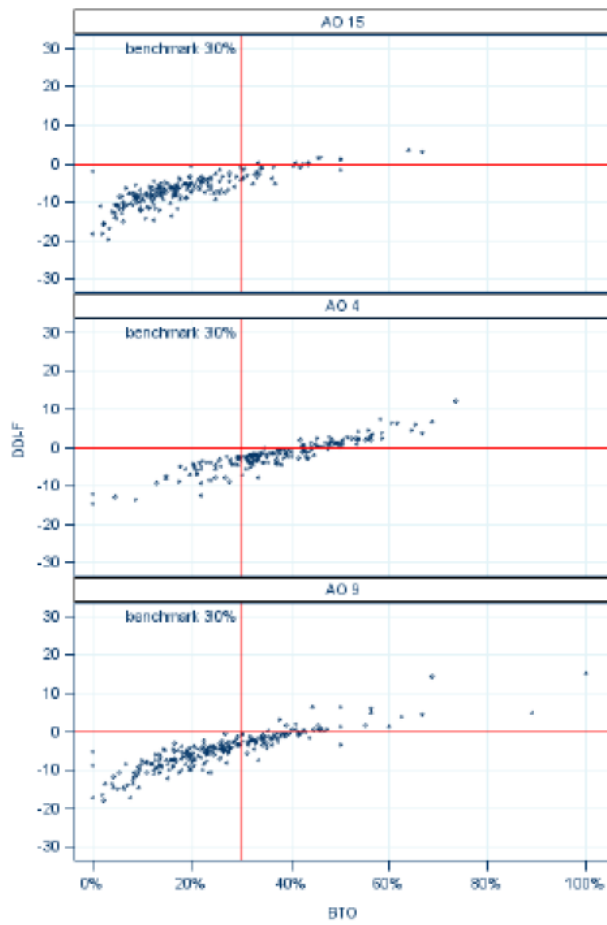


14.27 There is the potential to disaggregate this analysis further by considering the block performance by city-pair at an airport and/or for an airline. This is illustrated in the chart below, which is an extract from a EuroControl presentation to the VIRG as follows:

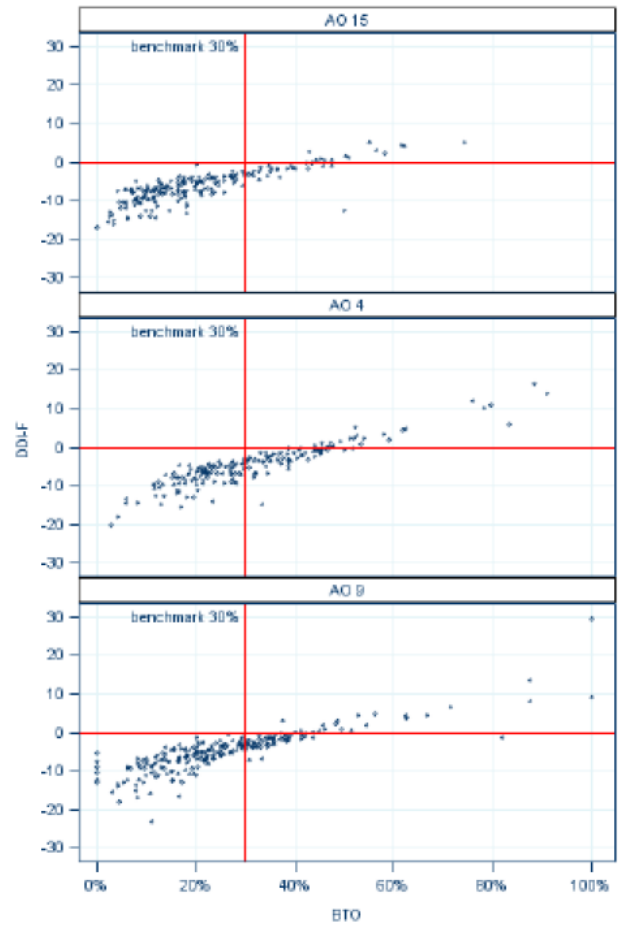
- Data is shown for three different airlines (AO15 / AO4 / AO9).
- Separate charts are provided for the outbound and inbound blocks from/to VIRG airports.
- Each scatter point represents a city-pair served by the relevant airline.
- The x-axis shows the Block Time Overshoot (BTO) for each city-pair.
- The y-axis shows the Delay Difference Indicator (DDI-F) for the city-pair.
- The charts include reference values for the BTO (30%) and the DDI-F (0 mins).

14.28 City-pairs in the bottom-left quadrant have a lower than average BTO and DDI-F; this may indicate a more resilient schedule. City-pairs in the top-right quadrant have a higher than average BTO and DDI-F; this may indicate a less resilience schedule.

## Departing VIRG airports



## Arriving VIRG airports



14.29 This analysis may help to identify routes where scheduling assumptions may need to be revisited.

## 14.6 Airfield Performance

14.30 The table below summarises the metrics associated with the arrivals process that are proposed to support an assessment of the contribution of airfield performance to punctuality performance.

	<b>Arrival Sequencing and Metering Area (ASMA) Additional Time</b>	<b>Additional Taxi In Time</b>
<b>Definition</b>	<p>The difference between the actual ASMA transit time and the unimpeded ASMA transit time.</p> <p>The ASMA is defined as a virtual cylinder of a given radius around the airport.</p> <p>The ASMA transit time is defined as the difference (in minutes) between the actual landing time (ALDT) and the time at which the aircraft entered the ASMA.</p>	<p>The difference between the actual taxi in time and the unimpeded taxi in time.</p> <p>The taxi in time is defined as the difference between the actual in block time (AIBT) and the actual landing time (ALDT).</p>
<b>Purpose</b>	<p>This metric helps to provide an indication of how efficiently aircraft are being processed once entering local airspace will be influenced by the ability of the runway and the local air navigation service provider to process demand.</p>	<p>This metric helps to provide an indication of how efficiently aircraft are being processed from the runway onto stands and will be influenced by the availability of airport infrastructure.</p>
<b>Primary Data Source</b>	Network Manager	Airport Operational Database
<b>Data Held by Network Manager?</b>	Yes	Yes

14.31 The table below summarises the metrics associated with the departures process that are proposed to support an assessment of the contribution of airfield performance to punctuality performance.

	Start Approval Holding Time	Additional Taxi Out Time
<b>Definition</b>	The difference between the start approval time (ASAT) and the start request time (ASRT).	The difference between the actual taxi out time and the unimpeded taxi out time.  The taxi out time is defined as the difference between the actual take-off time (ATOT) and the actual off block time (AOBT).
<b>Purpose</b>	This metric helps to provide an indication of the efficiency of the departure process and will be influenced by the ability of the local air navigation service provider to process demand.	This metric helps to provide an indication of how efficiently aircraft are being processed from stands to the runway and will be influenced by the ability of the runway and the local air navigation service provider to process demand.
<b>Primary Source Data</b>	Airport Operational Database	Airport Operational Database
<b>Data Held by Network Manager?</b>	To be confirmed. ASRT timestamp may not be held.	Yes

14.32 In the context of the high levels of airspace regulation experienced by airports in the UK south east, it is proposed that the metrics are shown for two categories of flights: those issued with a CTOT and those that are not. The application of a CTOT can materially impact the start approval holding time (e.g. to ensure compliance with the CTOT) and the taxi out time (e.g. through use of slow taxi out procedures).

## 15 Appendix 8: Abbreviations

A-CDM	Airport Collaborative Decision Making, EuroControl
ACI EUROPE	Airports Council International - Europe
ACL	Airports Coordination Limited
AIBT	Actual In Block Time
ALDT	Actual Landing Time
ANS	Air Navigation Services
ANSP	ANS Provider
AOA	Airport Operators Association
AOBT	Actual Off Block Time
AOP	Airport Operations Plan
APOC	Airport Operations Centre
APSL	Airport Slot
APTI TF	Airport Integration Task Force, NDOP
ASAT	Actual Start Approval Time
ASMA	Arrival Sequencing and Metering Area
ASRT	Actual Start Request Time
ATC	Air Traffic Control
ATCSCC	ATC System Command Centre, FAA
ATFCM	Air Traffic Flow and Capacity Management
ATFM	Air Traffic Flow Management
ATICCC	Air Traffic Incident Coordination and Communication Cell, NATS
ATM	Air Traffic Management
ATOT	Actual Take Off Time
BTO	Block Time Overshoot
CAA	Civil Aviation Authority, UK
CAP	CAA Publication, UK
CDL	Departure Clearances via Data Link
CDM	Collaborative Decision Making
CEO	Chief Executive Officer
CODA	Central Office for Delay Analysis, EuroControl
CONOPS	Concept of Operations
CFMU	Central Flow Management Unit, EuroControl Network Manager
CPDLC	Controller-Pilot Data Link Communications
CRM	Cockpit Resource Management
CTOT	Calculated Take Off Time
DDI	Delay Difference Indicator
DfT	Department for Transport, UK
DGAC	French CAA

DMAN	Departure Manager
DXB	Dubai (IATA Code)
EAPN	European Airport Punctuality Network
EUACA	European Airport Coordinators Association
ExCDS	New electronic flight strip technology, NATS
FAA	Federal Aviation Administration, US
FAS	Future Airspace Strategy
FASIIG	FAS Industry Implementation Group
FDP	Flight Duty Periods
FIDS	Flight Information Display System
FMP	Flow Management Position
FOD	Foreign Object Damage
FOLG	Flight Operations Liaison Group
FPL	Flight Plan
FTE	Full Time Equivalent
FUA	Flexible Use of Airspace
GAL	Gatwick Airport Limited
GPS	Global Positioning System
HAL	Heathrow Airport Limited
HBD	Handback Deadline
IAG	International Airlines Group
LGW	London Gatwick (IATA Code)
IATA	International Air Transport Association
IRG	Industry Resilience Group
LHR	London Heathrow (IATA Code)
MAG	Manchester Airports Group
NADP	Noise Abatement Departure Procedure
NAS	National Airspace System
NATS	National Air Traffic Services, UK
NCM	Network Collaborative Management, SESAR
NDOP	Network Directors of Operations
NERL	NATS En-Route Limited
NMOC	Network Manager Operations Centre
NOP	Network Operations Plan, SJU
NORACON	North European and Austrian Consortium
NOTAM	Notice to Airmen
NPR	Noise Preferential Routeing
OCC	Operations Control
ODLG	Operations Director Liaison Group
ORD	Optimised Runway Delivery
PCP	Pilot Common Project, SDM



PCP AF	PCP ATM Function, SDM
PERTI	Plan, Execute, Review, Train and Improve (FAA process)
PRM	Passengers with Reduced Mobility
RP2	Reporting Period 2, Single European Sky
RECAT	European Wake Turbulence Categorisation
SDM	SESAR Deployment Manager
SEAT	South East Airports Taskforce
SES	Single European Sky
SESAR	SES ATM Research
SIBT	Scheduled In Block Time
SID	Standard Instrument Departure
SJU	SESAR Joint Undertaking
SOBT	Scheduled Off Block Time
STAM	Short Term ATFCM Measure
STATFOR	Statistics and Forecasts, EuroControl
STN	London Stansted (IATA Code)
TMA	Terminal Manoeuvring Area
TOSC	Technical and Operational Safety Committee, ACI EUROPE
TSAT	Target Start-up Approval Time
UKOMA	UK Operations Managers Association
VHF	Very High Frequency
VIRG	Voluntary Industry Resilience Group
TBS	Time Based Separation
WSG	Worldwide Slot Guidelines