Report for the CAA on further analytical support to the SEAT sub-group on punctuality, delay and resilience

FINAL REPORT

29 Hercules Way
Aerospace Boulevard | AeroPark
Farnborough | Hampshire | GU14 6UU | UK

T +44 1252 451 651
F +44 1252 451 652
E info@askhelios.com
W www.askhelios.com

Document information

Document title	Report for the CAA on further analytical support to the SEAT sub-group on punctuality, delay and resilience
Author	Graham Howarth, XPX Consulting, Michael Fairbanks, Helios
Produced by	Helios 29 Hercules Way Aerospace Boulevard - AeroPark Farnborough Hampshire GU14 6UU UK
Produced for	Civil Aviation Authority, DAP/RPG
Helios contact	Michael Fairbanks Tel: +44 7900 584 039 Fax: +44 1252 451 652 Email:mike.fairbanks@askhelios.com
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Contents

1 Introduction

1.1 General

1.1.1 This report has been produced for the Civil Aviation Authority (CAA) under contract 1387 services order 19 amendment 1. It concerns the provision of additional support to the sub-group on punctuality, delay and resilience of the South East Airports Taskforce (SEAT).

1.2 Context

1.2.1 The Government established the South East Airports Taskforce on 15 June 2010. Chaired by the Rt. Hon. Theresa Villiers MP, Minister of State for Transport, the Taskforce was asked to identify and investigate options for making the best use of existing capacity and enhancing the passenger experience to, from and within the airport, whilst having regard to the local environmental implications of any measures.

1.2.2 The Taskforce identified seven priorities on which to focus, with one of these being *punctuality, delay and resilience*:

- **punctuality** is the difference between the planned off- or on-blocks time as defined in the schedule and the actual off- or on-blocks time
- **delay** is the time lost through holding in queues while an aircraft is waiting to safely access infrastructure and/or airspace. These queues take various forms, including airborne holding stacks, taxiway queues and being held on stand awaiting clearance from air traffic control (ATC)
- **resilience** is defined as the ability to anticipate, withstand and recover from disruptions caused by adverse conditions.

1.2.3 To take forward this element of its work, the Taskforce established a technical sub-group led by the Civil Aviation Authority (CAA) and composed of senior operational managers from the three airports, NATS, four airlines and Airport Coordination Ltd, together with appropriate representatives from the DfT.

1.2.4 The sub-group was asked to consider what action could be taken to improve punctuality, tackle delays and strengthen resilience at Heathrow, Gatwick and Stansted. The sub-group identified a package of proposals for **strategy and policy interventions** to improve the operational performance of the three airports, based on the following themes:

- A **Performance Charter** specific to and developed by each individual airport taking into account local specificities and to be agreed by all of the airport's stakeholders laying out: performance objectives, the planning process (including each stakeholder's specific responsibilities), the performance management regime to be applied, incentives/sanctions and protocols for adverse conditions and disruption
- Formulation of a set of policy **Guidelines on Capacity Management** compliant with the Slot Regulation and IATA Guidelines, covering, inter alia, the criteria to be applied during the capacity declaration process in terms of economic, environmental and operational impact assessment and slot efficiency. Given the terms of the EU Slot Regulation and the related UK Statutory Instrument it is appropriate that the development is led by airports,

but in conjunction with other stakeholders such as ACL, DfT, NATS and airlines

- A set of **Operational Freedoms** specific to each airport, drafted in the first instance by the airports and their stakeholders within a framework agreed by the DfT. These freedoms would then be reviewed by DfT and granted to allow certain tactical measures to be applied solely in the context of disruption: i.e. to prevent/mitigate disruption and facilitate recovery. The Operational Freedoms will define the conditions under which these tactical measures can be applied. The tactical measures could include, for example, tactical relaxation of night movement constraints, use of temporary departure routes and temporary enhanced modes of runway operation. The Operational Freedoms would also have attached an improved performance/service quality regulatory regime including performance standards and incentives/sanctions.

As noted in the SEAT Report, each airport and its operational stakeholders already have a number of **local improvement plans** under way which should be strengthened, coordinated and made coherent within the recommended framework.

1.2.5 Following the adverse weather and subsequent disruption in November and December 2010 which resulted in the closure of both Heathrow and Gatwick Airports, the Taskforce considered the issue of winter resilience at its January 2011 meeting. As a result, the sub-group was asked to consider, without duplicating any of the work ongoing at the individual airports, some specific snow-related operational issues as part of its work, viz:

- the degree to which the major airports were adequately equipped to deal with snowfall in terms of their stocks of snow-clearance equipment and de-icer
- what general lessons could be learned from the execution of the airports' plans for managing capacity during such extreme events.

1.2.6 This document provides a summary of the status, outputs and conclusions concerning the implementation of the strategy and policy interventions and the outcomes of the investigation of the snow-related issues. In such a dynamic environment, the report can only represent a snap-shot of the progress made to date (early summer 2011).

1.3 Document structure

1.3.1 The document is structured as follows:

- section 2 provides a detailed review of the proposed responses to snow disruption, focused on Heathrow, where the need was viewed as the most pressing
- section 3 highlights progress made on the three areas of strategy and policy intervention and makes some recommendations on other measures that could be considered
- section 4 highlights conclusions and recommendations arising from this phase of the work
- Annex A provides an example process, based on that implemented at Heathrow, for managing capacity reduction in response to disruption
- Annex B provides a detailed description of the capacity declaration and slot allocation processes.

2 Assessment of snow response

2.1 Introduction

2.1.1 Following the serious disruption experienced in December 2010 in reaction to exceptional snow falls, the Taskforce requested that the Resilience sub-group undertook an additional piece of work investigating certain aspects of lessons learned and the ability and preparedness to withstand future potential events. In turn, the CAA, as chair of the sub-group, asked the consultant support team to undertake relevant analyses and discussions with stakeholders. This section of the report documents the findings of that review.

2.1.2 It was requested that the focus of the assurance review should be on

- Heathrow airport, which had obviously suffered the biggest impact, and specifically…
- equipment levels and the logistics of the de-icer supply chain
- the plans for managing significantly reduced runway capacity during serious disruption.

2.1.3 The findings were presented to a meeting of the full Taskforce on 14 June 2011.

2.2 Context

2.2.1 The focal points of the review are only two out of a wide range of operational improvement initiatives taking place at, or influencing Heathrow. The diagram below illustrates the three main themes, viz.

- The suite of existing initiatives being undertaken to improve general performance and operational resilience at the airport – covering a range of technological, process and scheduling improvements
- The specific set of projects to implement the 14 recommendations of the Heathrow Winter Resilience Enquiry (the “Begg Enquiry”)
- Those recommendations emerging from the strategic framework report of the SEAT sub-group.

2.2.2 The two particular foci are highlighted in their positions relative to other activities. Clearly, as expected, there are many overlaps between the different themes and these will be managed accordingly.

2.2.3 Although Gatwick Airport does not have the equivalent of a Begg Enquiry, there are analogous initiatives running in terms of local action plans (e.g. CDM and Command and Control improvements) and, of course, the SEAT-derived recommendations will be followed up there. At Stansted the needs are less acute given the relative capacity utilisation position, but steps continue to be made as part of continuous efforts by both the airport and locally-based airlines.

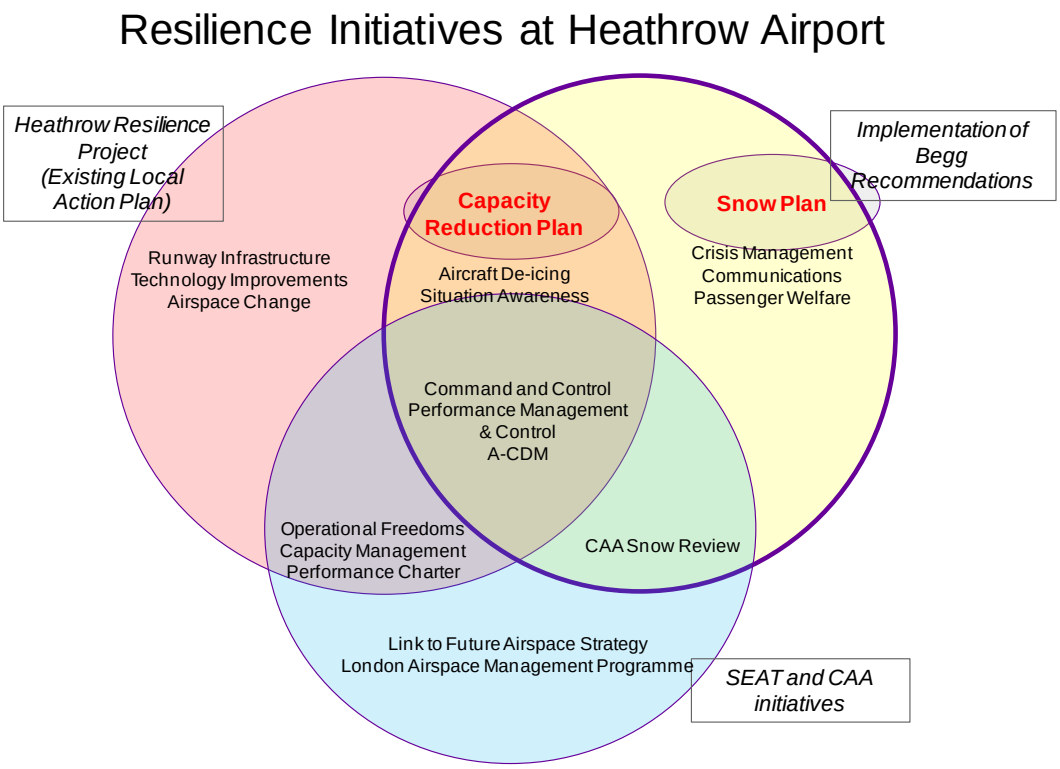

Figure 1: Inter-relations between resilience initiatives at Heathrow

2.3 Approach taken in the exercise

2.3.1 Inevitably, and correctly, the two main areas of interest in this supplementary exercise feature in the Winter Resilience Enquiry and its recommendations. Therefore our approach has been geared towards reviewing the outputs of the enquiry, the project plans to implement the relevant recommendations and the progress being achieved against them. Specifically we have reviewed these against

- The conclusions of the Taskforce sub-group insofar as they relate to the principles of maintaining operations in the face of disruptive pressures, whether related to snow or more generally
- The standards set within the Begg Enquiry report; the report aims for very high standards, specifically relating to enforced closure of the airport
- Accepted good practice in airfield operations and the management of major programmes such as the planned implementation of the 14 recommendations.

2.3.2 We have, therefore, covered the Begg Enquiry outputs in relation to the coverage of the topics included in the Terms of Reference, but perhaps more importantly, in terms of how these might be translated into improved resilience in the future, we have assessed

- The overall framework of the Heathrow Winter Resilience Programme (HRWP) to implement the project plans and therefore its influence on the success of the plans
- The quality of the specific project plans for the two areas of referral, viz. the enhanced Snow Plan and logistics support to it; and the plan for managing reductions in capacity caused by e.g. severe weather

- The approach to delivery of change, again for the two focal areas, reflecting the fact that analysis and planning can be good, but recommendations only become effective if there are practical methods for achieving changes, and overcoming the many barriers and risks which can exist around process and people issues.

2.3.3 The following three sections therefore reflect the findings in relation to the general framework of implementation, and comment on the implementation plans and delivery issues for each of the two specific areas.

2.4 Findings – general framework

2.4.1 At an overall level, the findings of the Begg Enquiry have been widely accepted as an accurate analysis of the events of the winter and as a credible set of recommended safeguards against such negative impacts on passengers happening again on that scale. As a review team we were willingly granted access to relevant data and analyses, which we are happy to acknowledge.

2.4.2 It is evident that the recommendations have been translated into a significant level of project resources and investment by the airport, closely aligned around the 14 recommendations. There is no value in revisiting those proposals here, but a few comments can be made on their scope and relevance, particularly in the light of the wider objectives of the Taskforce to help put the airports in a better position to resist and manage disruption.

2.4.3 The scope was deliberately restricted to a specific event. While the proposals can be applicable to a wider range of events, there is an obvious risk that other forms of serious disruption could occur and that some unforeseen weaknesses in the collective capabilities could be exposed.

2.4.4 The most obvious opportunity which encompasses both the SEAT recommendations and those areas at risk in the comment above is in the field of command and control. The Begg Enquiry recommendations focus on the requirements for addressing serious disruption – the SEAT perspective is geared towards a more basic capability which manages routine operations and which can be escalated as necessary in times of potential or actual disruption.

2.4.5 We believe this is being addressed through the combined efforts of the Winter and General Resilience teams.

2.4.6 In terms of the arrangements and structures for organising the HWRP, again there is a high level of commitment and organisation, with a comprehensive governance structure and with significant stakeholder input at both a Steering Group and Working Group level. A central Programme Management Office has been established with appropriate progress tracking mechanisms. All these approaches are well reflected in the project reporting which goes to stakeholders, including the CAA and other external bodies. They would be available if more extensive detail were required for SEAT or any subsequent governance arrangements.

2.4.7 This scale of effort is not without its own risks and, from an assurance perspective, the main threats to delivering improved resilience (which is the primary concern of this review) lie in the breadth of the HRWP and the challenges of delivering a large set of changes simultaneously. Therefore, we would recommend that this concern is addressed by confirming the priorities, and particularly those which need to be in place before the Winter season – and ensuring that the programme milestones and controls are carefully aligned to these.

2.5 Findings – enhanced Snow Plan and logistics support

2.5.1 In investigating the changes required, and being delivered, to improve the robustness of the Heathrow Snow Plan and its logistical support, the review team undertook a number of steps

- Revisited the Winter 2010/11 Snow Plan. (A Snow Plan is, of course, required every year, and the Begg Enquiry acknowledged that many previous snow and ice events had been handled well.)
- Reviewed the Begg Enquiry findings and recommendations
- Assessed the plans of the relevant project streams in terms of their scope, tasks and dependencies, milestones and risk management mechanisms
- Assessed the likely preparedness for the coming winter with respect to
  - Governance and stakeholder engagement, with the related accountabilities of lead and contractor organisations
  - The new and extended capabilities and capacities which would be necessary to meet the raised standards for the future
  - The testing and assurance regimes to ensure that the new capabilities met the design criteria and could be deployed when required.

2.5.2 Again it is clear that a substantial project plan has been put in place, including external benchmarking of other airports and the use of external expertise. The practical output should be a Snow Plan for Winter 2011/12 which will include substantial enhancements to:

- Snow clearance plans, sequences and disposal arrangements, covering stands, manoeuvring areas, taxiways and runways
- Equipment levels – including that available on a contract basis as well as that owned by the airport
- Equipment storage and maintenance facilities and arrangements, although time will be required on construction of all the new infrastructure
- Staffing and training levels, including the involvement of a wider group of internal resource and sub-contractors
- Contractual arrangements involving the resourcing and supply implied above.

2.5.3 Although still work-in-progress, many of the new pieces of equipment are on order and/or have already been delivered. In approximate terms, the emerging Snow Plan envisages a trebling of the capacity and capability which was the base case for last year. For example,

- **equipment** – plans show an increase in the total number of relevant operational vehicles from 50 to around 110 plus an additional 65 contracted snow removal trucks
- **human resources** – the number of available airside staff (on a typical shift basis) would rise from around 120 to over 300, including trained contractor staff
- **materials** – the volume of de-icing media available from accessible storage should rise from 0.4m litres to 1.3m litres.

2.5.4 On the more specific question of the robustness of the supply chain for de-icing media, steps are being taken to establish additional storage capacity both on and off-site. This should substantially reduce the risk to supply created by the physical distance from the main supplier and the multiple demands which will come from a number of facilities when adverse conditions are experienced. The arrangements for the off-site facility, which effectively would act as a forward supply depot, are currently being negotiated, but as these have not been completed, it would be inappropriate to document them yet.

2.5.5 The Snow Plan and its associated processes, resources and supply chains are obviously central components of the airport's ability to cope with any future disruption. From an assurance perspective, a number of observations can be made

2.5.6 The enhanced plan calls for a substantial increase in the levels of staff resources, equipment and materials. Although a strength in terms of the pace and scale of response possible in the face of bad weather, the resources do need to be deployed effectively – meaning both the appropriate amount and seniority of operational management and the level of airfield ramp training required. Inadequately trained or managed staff (including sub-contractors) can be more of a hindrance than a help (and, in extreme cases, a safety risk). So the plan and the organisation do need to be thoroughly tested from all angles.

2.5.7 The storage and maintenance facilities will take time to plan and construct. While preliminary plans exist for location and design, there will remain an obvious residual risk until the programme is completed.

2.5.8 The Snow Plan necessarily involves inputs and co-ordinated responses from many airport operational stakeholders and commercial suppliers. It will only work when agreements are in place around accountabilities and boundaries of responsibilities. We understand that there remain some outstanding issues in this respect – e.g. with regard to clearance of stands. While discussions are in hand this will remain a residual risk until resolved.

2.5.9 All of the above point to the need for extensive training and thorough testing through desk-top methodologies and through practical simulations and exercises.

2.5.10 In addition, of course, aircraft de-icing is a complementary process which is the primary accountability of the airlines. In a physically constrained airport like Heathrow with variable de-icing demands, there will always be debate as to whether dedicated and separate infrastructure is appropriate or justified. This is also currently under review and will form part of the longer-term response on the airport's resilience.

2.5.11 The possibility of pooling de-icing media storage among the South-East's airports had been mooted at one stage as a response to the supply chain problems. In practice, this has not found favour with the airports and, for Heathrow, the Begg Enquiry came out against the idea. There are some obvious initial attractions but a number of factors mitigate against it, such as:

- The media requirements at different airports vary with local conditions such as pavement type and media recovery and re-cycling capabilities
- Airports tend to want to establish their own suppliers and contracts.

2.5.12 Although part of the supply chain problem would be reduced (mainly the initial transport journey from supplying factories), unless the levels of stocks held were very high, prioritisation decisions would be very difficult to reach.

2.5.13 On balance, this does not seem to be a practical answer, and it is more realistic to put the onus on each airport and their airlines (and de-icing contractors) to ensure adequate supplies and response – for all reasonably predictable scenarios.

2.5.14 The Snow Plan for Winter 2011/12 is not yet complete, but will obviously be fully consulted upon with stakeholders and available for external discussion with appropriate bodies.

2.6 Findings – Capacity Reduction Plan

2.6.1 The second area which was specifically included in the scope of this review is the Plan to be deployed when Heathrow's runway capacity is known to be incapable of meeting the demand for arrivals and departures, as happens in times of significant snowfall.

2.6.2 Of course, on a smaller scale, this happens regularly, when weather or other conditions cause a temporary reduction in the flow-rate capacity of the runways (most commonly for arrivals). In these circumstances, delay management techniques and a level of tactical cancellations by airlines are necessary to allow normal operations to be re-established in due course with varying levels of disruption and passenger inconvenience.

2.6.3 However, when the capacity is severely reduced and for protracted periods, these measures must be superseded by a structured reduction in traffic. Although guidelines have existed for some years, these were perceived to have proved inadequate at Heathrow last winter. Hence the requirement and value in establishing a full plan and procedure for matching capacity and demand – in practice, a process for planning and agreeing a significant reduction in the schedule for a given period. This is not a simple task to achieve equitably, given the commercial and competitive implications for all involved. But this is a vital component in the optimum management of the airport and in the communication to passengers impacted.

2.6.4 Since the winter the airport's management and representatives of the stakeholders have been working on a plan to address the issues, and have made considerable progress.

2.6.5 A new procedure has been agreed – "Procedures for temporarily reduced capacity". This has been incorporated as "Local Guideline 4" into the Slot Management procedures agreed by the Heathrow Co-ordination Committee, in accordance with the EU Slot Regulation framework, after appropriate levels of consultation and engagement were undertaken.[1]

2.6.6 The highlights relevant to this review are as follows:

- the establishment of a stakeholder committee to oversee the process when severe disruption occurs. This is called "HADACAB" – the Heathrow ATM Demand and Capacity Balancing group.
- guidelines on when the group should be convened within the airport's command and control structure, and how the reductions might be distributed among airlines

[1] The document is not reproduced here, but can be viewed on the website of Airport Co-ordination Limited at www.acl-uk.org/UserFiles/File/LHR%20Local%20Guideline%20%204%20-%20v6.pdf.

- processes for tracking compliance and ultimately applying sanctions, as any abuse would undermine the airport operation and the collaborative nature of the agreements.

2.6.7 These are all very positive developments and the HADACAB procedures were invoked for the recent second volcanic ash incident. Stakeholders' reaction was positive and confirmed progress relative to previous experience.

2.6.8 From an assurance perspective, there are a few observations which can be made around continuing risks to deriving the full benefit of the concepts and processes behind the agreed procedures. These are:

- At the time of writing, some detailed procedures remain to be completed in the slot co-ordination area e.g. ensuring compliance with the agreed schedule reduction

- The procedures cover only Heathrow and its runway capacity and slots. These are only part of a wider system of airspace and other airports in the region and in the network. Therefore, the value of Heathrow action can be reduced by events and decisions elsewhere – and particularly so if there is a perception of other airports or airlines taking advantage of Heathrow's traffic reduction. This should be monitored by HADACB members in conjunction with the CAA.

- To derive the full benefit of anticipating disruption (relative to only reacting to it) it is necessary to implement mitigating actions early. While this is operationally sound for the overall airport, it can mean difficult decisions for individual airlines, who might be asked to cancel flights based on "probabilities" rather than "existing realities".

- In turn this points to the value of integrating early warning indicators and the procedures for deploying capacity reduction rule sets into much enhanced command and control capabilities and structures. This forms part of both the Winter Resilience and wider general Resilience programmes.

3 Frameworks for strategy and policy interventions

3.1 Introduction

3.1.1 This section describes in more detail the potential approach and progress made along each of the three principal axes for strategy and policy intervention: viz Guidelines on Capacity Management; Operational Freedoms and Performance Charter. The section also introduces the overall governance structure that has been proposed for these areas.

3.2 Governance arrangements

3.2.1 The proposed governance structure for the strategy and policy interventions is illustrated in the following figure.

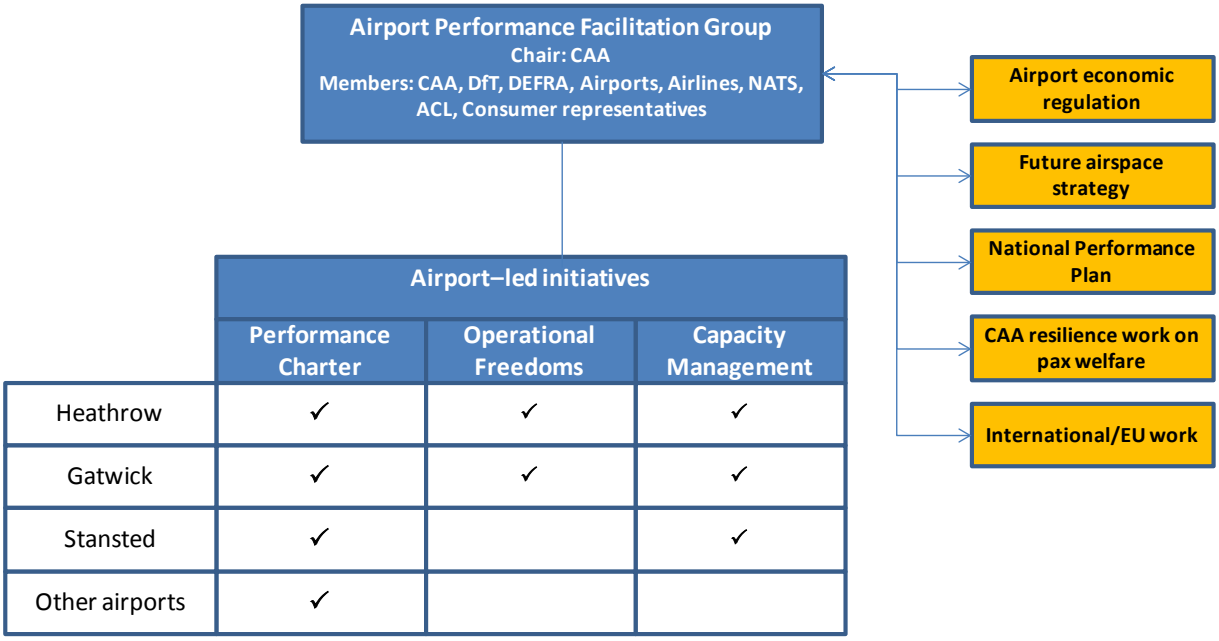

Figure 2: Proposed governance structure for strategy and policy interventions

3.2.2 All activities will be overseen at the highest level by an Airport Performance Facilitation Group chaired by the CAA with members from CAA, DfT, DEFRA, NATS, airlines, airports and ACL, plus consumer representatives. This Group will interface, coordinate and communicate with:

- airport economic regulation
- the Future Airspace Strategy programme
- the National Performance Plan programme
- activities being led by the CAA on passenger decision making and welfare
- international/EU work.

3.2.3 There will be sub-groups/streams of work for each of the main London airports on each of the three strategy and policy intervention areas, because the airports are sufficiently different to require different specifics in each area. Best practice and

common approaches can still be shared within the governance structure, acknowledging, however, that competition issues between the airports might become more significant in the future. Additional UK airports are to be invited to participate.

3.2.4 Each of the activities – Performance Charter, Operational Freedoms and Guidelines on Capacity Management – will be airport-led.

3.3 Performance Charter

3.3.1 The purpose of the Performance Charter is to set out clearly the roles and responsibilities of the various parties that contribute to a good passenger experience at airports, including defining how parties will be held accountable to delivering those roles. The SEAT report envisaged that the Performance Charter would be applicable to all three London airports. Charters could be agreed by other airports. The general shape of the Performance Charter is set out below, although a one-size-fits-all approach may not be appropriate for every airport.

3.3.2 The Performance Charter should set out the policy framework within which more detailed performance management would occur. The Performance Charter will be of particular importance in defining roles and responsibilities applicable at times of disruption, but will also set out the general framework applicable in normal periods. The Performance Charter will refer to other documents setting out more detail (such as an airport's conditions of use, slot allocation rules, the slot performance committee, the service quality regime, ground handling licence, stand governance boards, noise and track-keeping, etc.) and will integrate these into a multi-lateral framework for co-operation (whereas a number of these other instruments are uni- or bi-lateral in character). The Performance Charter should not, however, interfere in the bilateral relationships/contracts between the actors and, specifically, should not prevent competition where service quality is a differentiator.

3.3.3 The Performance Charter embraces primary players (airport, airlines) and also a range of other players (e.g., ground-handlers, ACL, NATS, retail and car-parking operators). Although they are not explicitly involved, the Charter would have at its core the interests of passengers and, potentially, local residents, and would, hence, be complementary to established local consultation processes.

3.3.4 The Performance Charter should be specific to, and developed by, each individual airport, taking into account local factors and agreed by all of the airport’s major operational stakeholders, laying out:

- performance objectives and targets
- the planning process (including each stakeholder’s specific responsibilities)
- the performance management regime to be applied, as well as incentives/sanctions and protocols for adverse conditions and disruption.

3.3.5 All local stakeholders must be engaged with the local ambitions. To this end, best use should be made of the consultative bodies such as the Airline Operators Committee (AOC) as well as individual airlines to ensure inclusivity. It is important that the Performance Charter is agreed and bought into by all stakeholders with the objective of ensuring that they are all incentivised to pull in the same direction as far as improving the overall performance of the airport is concerned. It should define, in terms of broad parameters, the levels of performance that are expected from the key players (the airport, the airlines, the ground handlers and NATS), as well as roles and responsibilities to address periods of disruption.

3.3.6 As an example, derived from the sub-group work, the parameters for inclusion in the performance management regime under the Performance Charter could include the following:

- **Targets applicable to airlines**
  - arrival (on-blocks) punctuality
  - departure (off-blocks) punctuality
  - arrival at top-of-stack (or some other upstream point on the approach path).
- **Targets applicable to airports**
  - runway availability (throughput)
  - stand availability
  - taxi-in time (landing to on-blocks)
  - taxi-out time (off-blocks to holding for take-off)
- **Targets applicable to ground handlers/airlines**
  - targets relating to CDM compliance, including turnaround times
- **Targets applicable to NATS**
  - start-up delay due to airspace congestion
  - targets relating to CDM compliance, including target start approved time (TSAT).

3.3.7 These areas for targets are for illustrative purposes only, are not meant to be prescriptive and would need considerable analysis at individual airport level in order to: (i) ensure that the list is complete and sensible; (ii) understand the interactions between the various elements of the system; (iii) set targets that are challenging but acceptable to all stakeholders.

3.3.8 The Performance Charter provides an opportunity to integrate various streams of activity arising for example from work to improve resilience (outcomes from the Begg report at Heathrow, and from CAA's wider work on improving resilience). Industry players clearly need to weave these various stands into a single operational system and the Performance Charter provides a governance counter-part to facilitate such integration. For example, and in terms of recovering from disruption, the Performance Charter would be expected to cover areas such as:

- the **Snow Plan**, which would in turn include the resource and equipment levels required to prevent airport closure across a range of scenarios e.g. the snow clearance machinery and de-icer required for winter disruption as well as the roles and accountabilities of all relevant stakeholders
- the **Capacity Reduction Plan**, which would include the airport community's collectively agreed strategy for revising schedules in response to disruptive events such as extreme weather and for resuming a full schedule in the fastest possible time. A generic process for capacity reduction based on Heathrow's

approach that could be used as a model for other airports is illustrated in Annex A[2]

- The **Passenger Care Plan**, outlining the airport community's plans for looking after customers during severe disruption, including service information, welfare arrangements and statutory rights.

3.3.9 A key part of the Performance Charter, as yet to be investigated in detail, will be the **Sanctions and Incentives Regime** that will be needed both to enforce and reward behaviours. A clear conclusion of the sub-group was that both incentives and penalties would be needed for such a regime to work correctly. The regime must also function in a constructive environment:

- a blame/avoidance of blame culture must be avoided
- performance failings must be investigated using a positive approach to identify and mitigate root causes.

3.3.10 Measurement of performance within the Charter needs to be underpinned by reliable, consistent and readily available data. The airports collaborative decision making (CDM) systems are a potentially a single, validated source of such data and should be used and developed as a critical support tool.

3.4 Operational Freedoms

3.4.1 The objective of Operational Freedoms is to provide the airport with the authority to put in place enhanced operational mechanisms under a well-defined rule-set in certain conditions as: (i) a preventative measure in anticipation of disruption; and/or (ii) to recover from disruption when it has occurred. Operational Freedoms will deliver short-term tactical surges in capacity if and when it is required. This tactical capacity will not be counted in the capacity declaration process.

3.4.2 It is likely that Operational Freedoms would require policy consideration and may require legislative or regulatory change. The basic process would be for the airport to make a proposal for an Operational Freedom, supported by the appropriate ex ante impact assessment and trials results, if relevant. The Government would then consider the proposal and make a decision whether or not to grant the Operational Freedom and under what conditions it could be exercised. This stream of work is most applicable to Heathrow and Gatwick.

3.4.3 The sub-group identified three main types of Operational Freedom that could be considered:

- more flexible use of runways at Heathrow
- temporary SIDs at Gatwick
- re-definition of night jet rules (at all three airports).

The last of these was effectively ruled out as an option by the main Taskforce.

3.4.4 The airports have addressed their needs for Operational Freedoms as follows:

[2] The effectiveness of the capacity reduction part of the process was confirmed by the deployment of the Heathrow's plan, recently enshrined in the airport's operational scheduling processes as Local Rule 4, in May 2011 in anticipation of potential disruption due to volcanic ash in May. The airport community showed it was well prepared to respond to the situation and align airline schedules to airport capacity in a rapidly changing environment.

- at **Heathrow** proposals have been made for more flexible use of the airport's runway infrastructure to deliver the benefits of minimising delay and offsetting perturbations caused by external factors such as weather to improve passenger experience and environmental impact. This proposal has been approved for a trial period by SEAT and the DfT and concerns the use of enhanced modes of runway operation (tactically enhanced arrivals measures – TEAM and tactically enhanced departures – TED) for limited periods of disruption forming part of the '50' day amber periods. This would occur during strong winds, low visibility operations (fog) and significant operational delays caused by factors outside the immediate control of the airport or its customer airlines. The airport would revert to the segregated mode of runway operation when peaks in demand had been mitigated

- at **Gatwick**, work is being undertaken in the context of increased use of the WIZAD SID[3] for limited periods in the case of very high departure demand as a reliever for this demand and to prevent high departure delays

- other than potential relaxation on night movement restrictions on rare occasions, **Stansted** does not currently foresee the need for any Operational Freedoms for resilience purposes because of (i) its position of having relatively high (compared to Heathrow and Gatwick) spare capacity; (ii) the cancellation policy of its airlines which reinforces the resilience of the airport at least from a recovery perspective.

3.4.5 The process followed by Heathrow could be used as a model for the application of Operational Freedoms. A template for an application process could be as follows:

- identify the **resilience issue** to be addressed

- identify the **appropriate Operational Freedom** to mitigate the resilience issue:

  - develop the procedure to be invoked

  - specify the trigger points at which it would be invoked

  - highlight the performance improvements that would be delivered to the stakeholders (airport and airlines) qualitatively and quantitatively as far as is practicable

- perform preliminary paper-based **impact assessments**

  - delays and passenger experience

  - environmental emissions (CO_2)

  - noise (re-)distribution spatially and temporally

- design a **trials programme** (as necessary)

  - scenarios to be assessed, that is the situations in which the Operational Freedom would be invoked for the trial

[3] The WIZAD SID is little used currently partly because of its interaction with arriving traffic. In periods of high departure demand, and hence low arrival demand, the SID could be used more extensively to relieve potential departure delays. However, because of its limited usage, any addition traffic using the SID is likely to be viewed as additional noise by residents.

- performance tests to be investigated, that is how the impact of the Operational Freedom would be measured
- consultation to be undertaken during and post-trial

- consolidate into a **proposal for operational trials** for consideration by DfT. Trials are likely to be important to validate the result of the impact assessments, both in terms of positive and negative effects, and to gauge the community's response through the appropriate consultation programme
- plan and **undertake the trials**
- **report** on trials, including performance and consultation results, for consideration of the granting of the Operational Freedom on a permanent basis by DfT.

3.4.6 The airports should review continuously their requirements for Operational Freedoms and make proposals, under the auspices of the Airport Performance Facilitation Group, as and when necessary.

3.5 Guidelines on Capacity Management

3.5.1 The scheduling process in place at the South East's airports is viewed as global best practice and has evolved continuously over time. Together with operational mitigations, this has delivered notable performance improvement, for example in reductions in the magnitude of stack holding at Heathrow. Within this context, the purpose of Guidelines on Capacity Management is to: (i) ensure that all relevant factors are taken into consideration when assessing the sustainable capacity of the airport, including passenger experience, environmental impact, resilience, commercial and economic factors; and (ii) for airports that are not at capacity, to avoid the risks associated with over-scheduling; and for airports at capacity, to provide a framework for best management of capacity arising from operational and other improvement measures.

3.5.2 The airport is defined as the competent body for declaration of capacity on a season-by-season basis. Subsequent to the declaration, ACL is responsible for allocating slots within that capacity in accordance with the Slot Regulation and IATA Scheduling Guidelines. However, any changes to the capacity management process would likely need to be agreed within the airport's governance structure for scheduling, probably through the Coordination Committee[4]. There will clearly be advantages in sharing best practice across the capacity management processes at all three airports (this used to be the case when the airports were under single ownership, but might need external encouragement now and in the future). This stream of work is most urgent for Heathrow and possibly Gatwick, but in the longer term will be applicable to all slot-coordinated airports: as their demand increases they will start to face the issues already faced by Heathrow and Gatwick.

3.5.3 Slot allocation and capacity declaration are at the core of the airport capacity management process. These are described and analysed in detail in Annex B, which indicates that they have a number of inherent **risks**:

- delay is the only performance indicator that is considered explicitly in declaring the capacity of the runway, which forms the core part of capacity declaration

[4] See Annex B for a description of the capacity declaration and slot allocation processes

- the review of the previous like-season's performance is based on a small number of sample days selected to be typical of the 300-day scenario, rather than on the entire season. This sample is also used as the basis for modelling the new schedule. Use of this small sample carries the risk of statistical uncertainty and gives no indication of the performance in the 50- and 15-day scenarios. It would be better to use the whole season's data for the analysis to give clearer insight into the expected performance and its variability for the 300-, 50- and 15-day scenarios

- the wish-list upon which the schedule and capacity declaration is based may reflect increased buffers in airline timetables, within or outside block-times, to account for the previous season's delays. The likely effect of this is a downward spiral in ever-increasing block times, inefficient utilisation of aircraft and, possibly, increased schedule-related delays

- the declared capacity is based on modelled delays alone, with additional flights being assessed as acceptable strictly if the modelled delays do not increase beyond a pre-agreed threshold, but more usually if the overall delay does not increase. Because delays are characterised as the average delay per flight, additional flights, even when they maintain the same average delay per flight, mean an increase in total delay

- the delay criteria that form the basis of capacity declaration are simple averages that give no indication of the wide variation in delay performance that might result. Predictability is likely to be as important a factor in performance, if not more important, to both airlines and passengers. Furthermore, as the system becomes more stretched, predictability is reduced

- when delays are reduced by operational improvements, additional slots can be generated without explicitly considering the trade-off of the commercial value of the additional slot against the increase in total delay[5]. Subsequently additional operational improvements are more difficult to achieve and the system is operating in a more stretched and, hence, unstable state. This can continue in a downward spiral. Given the grandfather rights associated with slots, it is extremely difficult to reverse the process

- the delays modelled in the capacity declaration are sometimes only partially representative of those that can be reliably attributed to the schedule, although other components of delay are reported in the operational summary and during the capacity declaration process, at least for Heathrow. The risk here is that, based on the partial assessment of delays coupled with expert opinion, over-scheduling will occur but that the resultant delays above and beyond the criteria will be absorbed elsewhere in the system, e.g. ATFM and start-up delay that are <u>not</u> accounted for quantitatively in the scheduling process, although they are reported and considered. The potential knock-on effect is that this will lead to further over-scheduling, ever-increasing ATFM delays and reduced resilience, contributing to the downward spiral mentioned above

- slot allocation does not necessarily take into account all of the factors that are used to derive the capacity declaration, such as aircraft size, direction, origin/destination, etc and can therefore lead to operational situations where the achievable performance is different to that on which the capacity declaration is based. This is being addressed through post-IATA conference

[5] This risk is unlikely at Heathrow where additional slots are prevented by the 480,000 cap on air traffic movements but is more significant for Gatwick ands Stansted

modelling of the delays associated with the schedule to give an indication of what the impact on performance of the real schedule will be as opposed to only the wish-list, as was the case in the past.

- operators are sometimes free to:
  - change (increase) the gauge of the aircraft that they are operating post slot allocation, as long as terminal and stand capacities are not exceeded, potentially increasing wake vortex separations and delays beyond those predicted in the capacity declaration
  - change the destination of departures post slot allocation, with the risk that SID congestion will be greater than that predicted in the capacity declaration process. It should be noted that this directionality issue is affected by all of the London airports collectively and cannot, therefore, be addressed at each airport individually
- slot allocation can include an *overbooking* factor taking into account the underlying level of cancellations to ensure that the airport is operating near to its maximum daily capacity at all times but without exceeding any movement cap that is in place. Without overbooking, the daily demand would necessarily be lower because there would be no compensation for cancellation
- ad hoc slots[6] can be allocated at short notice up to the capacity declaration when seasonal slots are cancelled. This means that cancellations do not necessarily result in the breathing space in the schedule that may occur in the depressed parts of the economic cycle (e.g. over the past few years) where significant cancellations occur. In stronger economic climates, fewer cancellations are likely to occur, actual operations will be nearer to the schedule and fewer ad hoc slots will be allocated
- slot compliance monitoring is relatively light-handed in terms of driving performance improvement at congested airports. The slot compliance window is currently: -20 to +30 minutes for arrivals and -10 to +30 minutes for departures. In addition to slot compliance, ACL monitors general performance.

3.5.4 In summary, the general risks associated with the current capacity declaration process are continuous increases in schedule (where demand exists) leading to over-scheduling, escalating delays and increased unpredictability in performance. These risks are less likely to manifest themselves at Heathrow where, due to the 480,000 air traffic movement cap, scheduling additional flights is not realistic.

3.5.5 These risks have been realised at Heathrow for the vast majority of the time and at Gatwick at certain times. The spare capacity available at Stansted means that these risks are currently minimal there, but they must be avoided as Stansted's traffic increases in the future.

3.5.6 Therefore, the **airports should review** their capacity management processes[7] bearing these risks in mind. Each airport should define its process for its own specifics, but the overall review of the process should include:

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[6] An ad hoc slot is a slot that does not form part of a series of slots allocated within the slot pool. Ad hoc slots are generally used by business aviation, air taxi, general aviation, charter and for positioning and technical flights. The process for ad hoc slot allocation is described in Annex B

[7] This review has started at Heathrow as part of the Operational Resilience Programme and several improvement measures, such as de-peaking the departure schedule are in train

- **measurement and reporting** of the previous like-season's performance (specific to capacity management and separate from but drawing on the Performance Charter activities)
- the **parameters** used as the basis of the capacity declaration process:
  - such that they are inclusive of all delays that can be attributed to the airport and no delay impacts are missed
  - average delay
  - peak delay
  - predictability
  - resilience in terms of the risk (probability and impact) of disruption and the ability to recover
  - runway throughput.
- the **criteria** to be applied to capacity declaration: that is the values that are to be applied to the above parameters to determine whether additional slots can be considered:
  - the operational impact on delays and resilience, taking into account the passenger experience
  - environmental impact
  - the commercial impact in terms of, for example, the value of additional slots to the airlines and revenues to the airport
  - economic impact.
- measures to **manage post-slot allocation** variations, including ad hoc slots, change of aircraft gauge and change of origin/destination.

3.5.7 The output of the review process should form the core of the Guidelines on Capacity Management for each of the airports. The Guidelines could be established as a local rule for each airport (in compliance with EU slot regulation 95/93).

3.5.8 Although there is considerable latitude and freedom to define the Guidelines, they must be compliant with:

- the IATA Worldwide Scheduling Guidelines
- the EU Slot Regulation, 95/93, and its amendment Regulation 793/2004 on common rules for the allocation of slots at Community airports
- and the UK statutory instrument 2006, no 2665, the airports slot allocation regulations 2006.

4 Conclusions and recommendations

4.1 Snow response

4.1.1 From all the evidence, supported by the views of stakeholders, considerable efforts are underway at Heathrow to prevent a recurrence of the events of last December. This work is on-going and much of it is in response to the recommendations of the Winter Resilience Enquiry which reported in March. Therefore, it is too early and inappropriate to reach final conclusions on either the overall status or that of the specific areas of referral. From an assurance perspective, the indications are very positive, but we would raise a few aspects which constitute the more significant or systemic risks to be managed over the course of the full implementation of the plans, particularly against our terms of reference. These are:

- Being clear on the priorities to be delivered in time for the Winter 2011/12 season
- Gaining agreement where individual stakeholder commercial considerations are in conflict with the collective objectives of the airport, other stakeholders and the wider responsibilities
- The sheer scale and practical challenges of resourcing and deploying the increased numbers of staff and equipment
- The value of extensive and rigorous assurance and testing in the run-up to the winter season – particularly reflecting the additional factors which would come into play in “real” circumstances compared with some artificiality in even the best-prepared exercise
- The importance of improving the command and control structures within which the new planned procedures and capabilities would sit
- Agreeing on the funding for the capital and operating expenditure involved which will, no doubt, be discussed within the airport’s regulatory forum.

4.1.2 These issues are all recognised in the governance discussions which take place – but are repeated for completeness and to underline the significance to eventual success and greatly improved resilience to snow disruption at Heathrow.

4.2 Policy and strategy frameworks

4.2.1 Of the policy and strategy frameworks, most progress has been made on Operational Freedoms with one trial approved for Heathrow and a proposal in preparation at Gatwick.

4.2.2 Of the other two frameworks, far less progress is apparent:

- although performance management regimes are emerging at individual airports, these fall short of the aspirations of the Performance Charter, as described above
- the risks associated with the current capacity declaration and slot allocation processes are well understood and are being addressed, albeit in a less structured and narrower way than envisaged in the concept for Guidelines on Capacity Management.

4.2.3 It is recommended, therefore, therefore, that the Airport Performance Facilitation Group convenes at the earliest opportunity to kick-start the development of these latter two frameworks.

A Outline process for capacity reduction

A.1 Introduction

A.1.1 Heathrow has established a procedure for capacity (demand) reduction in the case of disruption. This annex has made this process generic as it might be useful as a model for other airports, albeit adapted to suit specific, local requirements.

A.2 Governance

A.2.1 Capacity reduction needs a governance structure reflecting the requirements and potential contributions of all stakeholders. Therefore a Capacity Reduction Group (CRG) should be established that comprises:

- the airport, whose representative should chair the CRG
- the AOC
- the main airlines (British Airways, BMI, Virgin Atlantic at Heathrow)
- other airlines at the request of the AOC
- NATS as the air traffic services provider
- ACL, as the coordinator
- the Chair of the Scheduling Committee.

A.2.2 Based on the Heathrow model, the roles of these actors would be:

- the **Chair**: would coordinate the CRG and, in the absence of any clear decision or preference, would determine the measures to be applied to restore normal operations
- together **the AOC and the airlines** would:
  - determine the course of action necessary to make best use of the available capacity
  - communicate this course of action to the airport's airlines
  - ensure that the airlines comply with the decisions, specifically cancellation of slots and flight plans. Penalties for non-compliance should be promulgated in the airport's conditions of use.
- **ACL** would advise on measures that could be taken with the allocated slots to mitigate the disruption and communicate this to the AOC and airline representatives. ACL would also be responsible for undertaking any actions associated with the cancellation or emergency allocation of slots
- **NATS** would advise on the prevailing traffic situation and any pertinent weather forecasts. NATS would also be responsible for the issue of NOTAMs and other operational information as directed by the CRG.

A.3 Process

A.3.1 The basic process associated with capacity reduction should fit seamlessly within the airport's crisis management and business recovery procedures and could be as follows:

- the relevant duty manager is informed by one of the stakeholders that a significant disruption event is anticipated
- the duty manager then informs the Chair of the CRG via normal crisis management channels of the need for the group to be convened
- the group meets, discusses and agrees, based on all available information, any need for revised capacity declaration for the airport for the period of the disruption. This revised capacity declaration should be reviewed throughout the period of disruption especially if the situation changes
- the capacity reduction should be applied in a tiered approach:
  - Operational Freedoms should be applied to mitigate disruption
  - flow should be restricted using air traffic flow management for arriving aircraft. NATS would be responsible for implementing this
  - if flow restrictions and Operational Freedoms are insufficient to manage the situation, a structured and proportionate reduction in flights should be implemented based on a cancellation policy determined by the CRG
- the outcome of the meeting should be promulgated to all concerned parties via the airport's normal crisis management and recovery procedures in sufficient time for them to act, particularly considering the time needed for long-haul inbound flights to cancel
- the capacity reduction measures should be put in place and compliance monitored by ACL
- once the disruption has decreased in magnitude to a sufficient degree, the CRG hands back to the normal channels
- post-event, a review of the process and its performance should be performed in order to identify lessons learnt and improve the overall process.

A.4 Formalisation

A.4.1 As with the Heathrow situation, it is probably necessary for each airport to formalise its capacity reduction policy through a local rule in order for it to have sufficient weight and to be enforceable.

B Generic capacity declaration process

B.1 Overview

B.1.1 The scheduling process and associated governance arrangements at Heathrow, Gatwick and Stansted are consistent and compliant with:

- the IATA Worldwide Scheduling Guidelines
- the EU Slot Regulation, 95/93, and its amendment Regulation 793/2004 on common rules for the allocation of slots at Community airports
- and the UK statutory instrument 2006, no 2665, the airports slot allocation regulations 2006.

B.1.2 The processes are more detailed, more transparent and go beyond what is undertaken at most of the World's airports and in a comparative sense could be viewed as best practice. This is not to say, however, that they could not be improved.

B.1.3 The basic governance arrangements in place are illustrated in Figure 3 below.

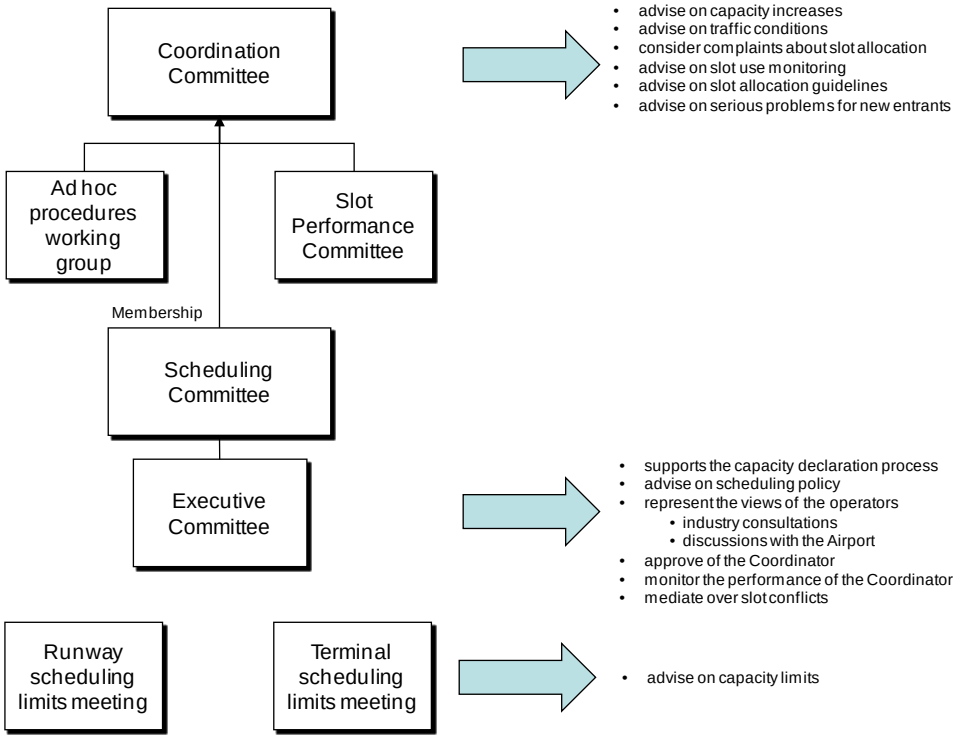

Figure 3: Governance arrangements for the scheduling process

B.1.4 The main committees and their roles and responsibilities in the governance process can be summarised as follows:

- the **Coordination Committee** is required by the regulations and guidelines listed above. Its principal purposes, as defined in its constitution are to:
  - advise on the possibilities for capacity increases in accordance with Article 6 of the Regulation
  - advise on improvements to traffic conditions

- consider complaints about slot allocation in accordance with Article 8.7 of the Regulation
- advise on slot use monitoring
- advise on slot allocation guidelines
- advise on serious problems for new entrants in accordance with Article 10 of the Regulation.

The members of the Coordination Committee are: the airport operator; the air traffic control provider; the air carriers that use the airport regularly (or that have expressed an interest in the slot allocation/scheduling); the representative organisations of the air carriers; and the Scheduling Committee. Decisions are taken by voting on a majority basis where the air carriers have 900 votes divided between them, the airport operator has 40 votes, the ATC provider has 20 votes and all other organisations present at a meeting where voting take place have 40 votes divided between them.

- The Coordination Committee can establish sub-committees as needed at each airport. Examples of sub-committees are the Ad Hoc Procedures Working Group (Heathrow), the Slot Performance Committee (Heathrow) and the Mediation Committee (Stansted).
- the **Scheduling Committee** (which is not required by the Regulation) is open to membership by all operators that have an interest in the allocation of slots and is defined by its constitution. The principal purposes of the Scheduling Committee can be paraphrased as to:
  - advise on scheduling policy
  - represent the views of the operators, particularly in but not limited to: industry consultations and discussions with the airport operator
  - approve of the Coordinator nominated by ACL
  - monitor the performance of the Coordinator
  - mediate over slot conflicts.
- The main instrument of the Scheduling Committee is its **Executive Committee** which is responsible for policy and general management. Decisions of the Scheduling Committee are taken by voting, where each operator is entitled to one vote for each of its slots
- there are also two series of meetings to advise on capacity issues during the scheduling process. These are the **Runway Scheduling Limits** and the **Terminal Scheduling Limits** meetings respectively.

B.1.5 In addition to the Regulations and guidelines listed above, there are also a number of local rules and guidelines in force covering:

- Heathrow night movement and quota allocation procedures
- Heathrow procedures for ad hoc operations
- administration of the Heathrow air transport movement cap
- Heathrow procedures for temporarily reducing capacity
- Gatwick night movement and quota allocation procedures

- Gatwick procedures for urgent or time critical operations
- Gatwick sanctions against the late handback of slots
- Stansted night movement and quota allocation procedures
- Stansted procedures for ad hoc operations.

B.1.6 The overall end-to-end scheduling process comprises several steps as illustrated in the following figure.

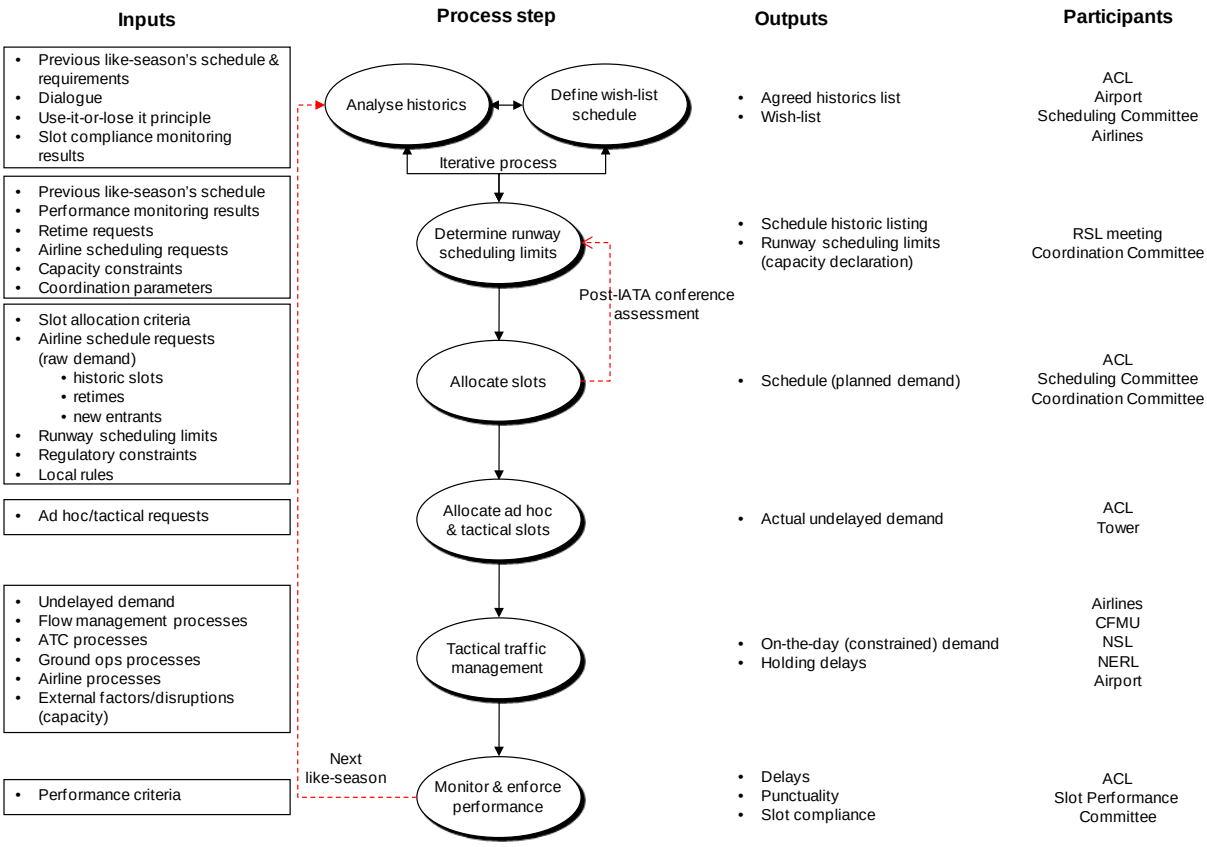

Figure 4: End-to-end scheduling process

B.1.7 The main steps in the end-to-end process can be summarised as:

- definition of the historics for the previous like-season and the definition of the wish-list for the season to be coordinated as a baseline for assessment of available capacity
- reporting the performance achieved on the previous like-season and determination of the runway scheduling limits as part of the capacity declaration
- allocation of seasonal slots, and creation and maintenance of the slot pool, based on the historics, slot requests and the capacity declaration, prior to the start of the season
- allocation of ad hoc and tactical slots throughout the season

- tactical traffic management to moderate demand to the available on-the-day capacity and to optimise the utilisation of scarce resources including runways and airspace
- monitoring and enforcing slot performance, compliant with the schedule.

B.2 Capacity declaration

B.2.1 Overall process

B.2.1.1 As part of the coordination process for a fully coordinated airport, the airport managing body is required to declare its available capacity on a season-by-season basis. There is not formal requirement for any particular tool to be used in this capacity declaration process but that the scheduling limits are agreed between the airport managing body, the ATC provider and the airlines.

B.2.1.2 The overall generic capacity declaration process used at Heathrow is illustrated in Figure 5. The main participants in this process are:

- the Airport
- NATS En Route Limited (NERL) comprising Operational Analysis (OA), and Terminal Control (TC)
- NATS Services Ltd represented by the Tower (TWR)
- ACL
- the Scheduling Committee
- the airlines.

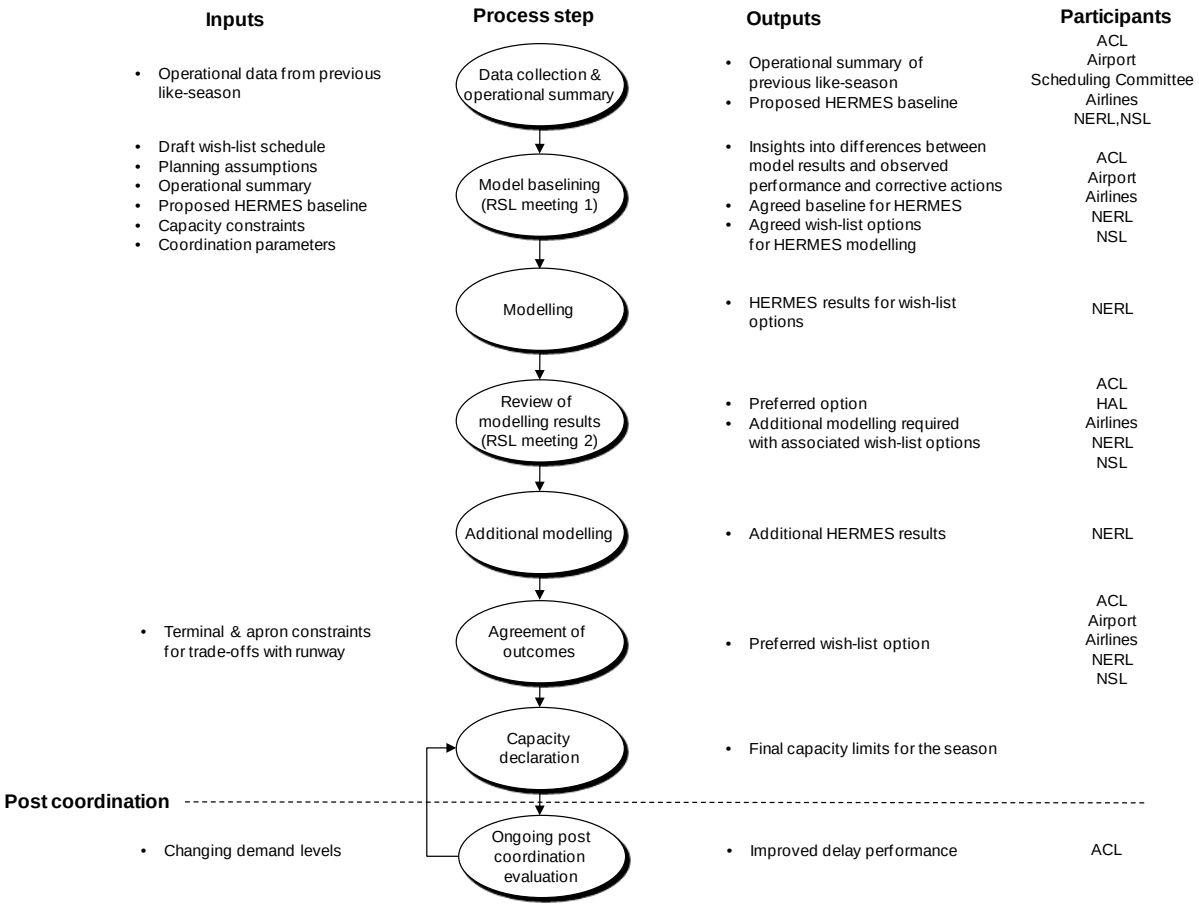

Figure 5: Capacity declaration process

B.2.1.3 The basic steps in the process as illustrated in the figure are as follows:

- **data collection and operational summary:** NATS OA prepares a report on the operational performance for the previous like season, highlighting factors such as demand, capacity utilisation, delay, fleet mix, etc. This operational summary is based on observation of a small number, typically 8 to 10, of representative days for the season, although the criteria used to define *representative* are not explicitly stated. NATS OA also establishes the HERMES[8] baseline to be used to undertake capacity analyses for the forthcoming season. This baseline is based on observations of input parameters, such as fleet mix, runway occupancy time, rapid exit taxiway use, etc. The model is established using these parameters and is then calibrated so that its outputs correspond to those observed on the days used to build the model. It is believed that the observation days used in the analysis exclude days where there was poor performance and that only westerly operations are included – this would imply a bias towards high capacity declaration.

  - In parallel to production of the operational summary, ACL produces a summary of the capacity utilisation for the previous like season and TC produces a report on the utilisation of terminal airspace for the previous like season.

[8] An outline description of HERMES is given below

- The operational and capacity utilisation summaries are distributed to the participants in the runway scheduling limits (RSL) meeting two weeks prior to the first meeting (RSL 1). During this period, the participants are responsible for reviewing the summaries to validate the observations and to understand and explain any variances and changes from the previous like season. In particular, TC and the TWR provide feedback to OA to determine which is the most appropriate sub-set of the observation days to use to establish the HERMES baseline.

- **model baselining (RSL 1):** At the first runway scheduling limits meeting:
  - OA presents the operational summary and the HERMES baseline model
  - ACL presents the draft wish-list schedule
  - TC presents its summary of the previous like season and describes any developments that might influence the forthcoming season
  - all participants: (1) provide insights into the potential causes of any variance between the HERMES baseline and the observed performance for the previous like season; (2) comment on the wish-list
  - the Airport ensures consistency between the runway capacity declaration and parallel processes for terminal/stand capacity.
- The principal outputs from the meeting are (1) an agreed baseline for HERMES modelling; and (2) potential changes in the schedule (wish-list options) based on the wish-list that is the subject for capacity analysis using HERMES.
- **modelling:** OA uses the agreed HERMES baseline to model the impact of the agreed wish-list options.
- **review of modelling results (RSL 2):** OA presents the results of the wish-list modelling to the meeting. These results are then discussed and either a new capacity declaration is agreed or further modelling is requested.
- **further modelling:** As directed at the RSL 2 meeting, OA undertakes and presents the results on additional modelling.
- **agreement of outcomes:** Based on the results of the further modelling (if any) and input on terminal and stand constraints, the RSL participants come to a conclusion on the preferred wish-list option.
- **capacity declaration:** Taking into account the preferred wish-list option, stands and terminals, the Airport informs ACL of the season's capacity declaration, which is then promulgated by ACL and used in the coordination process.

B.2.2 The Chairman of RSL plays a key role in that he/she is responsible for:

- maximising participation in the process, not least from the airline community
- facilitating understanding of technical and operational inputs, e.g. operational summaries and modelling results
- ensuring that decisions are collaborative and consensual.

B.2.2 HERMES

B.2.2.1 The HEuristic Runway Movement Event Simulator (HERMES) is the main tool used by OA to assist in the capacity declaration process. HERMES is a proprietary tool and, as such, its precise algorithms and methodologies are confidential.

B.2.2.2 HERMES uses operational observations to simulate runway associated delays for arrivals and departures. These delays are limited to the time spent in airborne holding for arrivals and the time spent at the holding point for departures. As such, the delays represent a partial picture as they do not include airport-related ATFM delays for arrivals or other congestion-related delays, such as taxiway or tactical measures for departures (which may also be influenced by departures from the other London airports).

B.3 Seasonal slot allocation

B.3.1 Overall process

B.3.1.1 Following capacity declaration, the seasonal allocation of the slot pool is undertaken. This can be viewed as a two-stage process: (1) prior to the IATA Schedules Conference as shown in Figure 6; and (2) after the IATA Schedules Conference as shown in Figure 7.

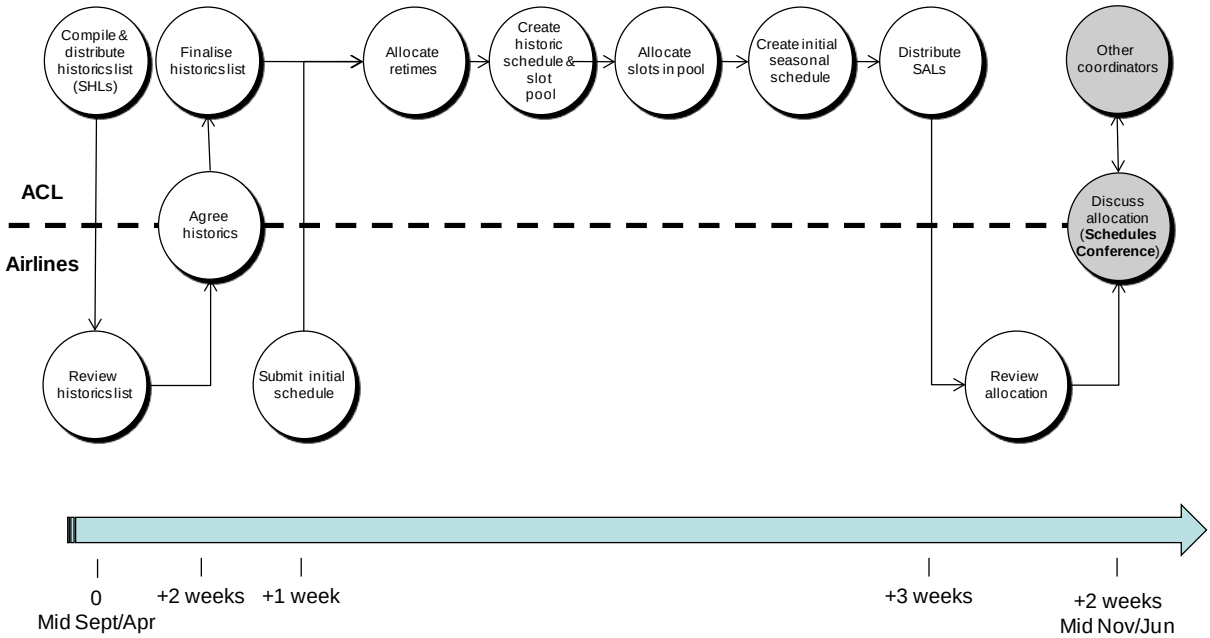

Figure 6: Slot allocation process prior to the IATA Schedules Conference

B.3.1.2 The basic process steps prior to the IATA Schedules Conference are as follows:

- by mid-September for the summer schedule and mid-April for the winter schedule, ACL compiles what it considers to be the historic schedule (the SHL) based on the preceding season for each airline and sends it to them individually for review. Any disagreements between ACL and the airline are then resolved through a discussion process. The historic schedule is based on the results of the slot monitoring and the use-it-or-lose-it principle

- the airlines submit schedule requests to ACL by early October for the next summer season and by early May for the next winter season
- ACL classifies the slot requests as historics, changed/retimed historics, new entrants and new incumbents. Retimed historics are accommodated as far as possible within the scheduling limits
- the remaining slots, including those historic slots no longer required, unused slots, those lost through use-it-or-lose-it and additional capacity identified during the capacity declaration process, are allocated to the slot pool
- new slots requests are allocated from the pool with up to 50% of the capacity allocated to new entrants both new to the airport and qualified incumbent new entrants i.e. those holding fewer than four slots per day, with the remaining 50% being allocated to new requests by incumbent carriers. If the 50% available to new entrants is not fully subscribed, the remaining slots are also allocated to new flights by incumbent operators. No slots are added that break the scheduling limits
- ACL then creates an initial seasonal schedule and distributes this to the airlines (as SALs which show the slots requested and the slots offered) by late October for the summer season and late May for the winter season
- the airlines then review and process their allocation in preparation for the IATA Schedules Conference
- the principal objective of the IATA Schedules Conference is to agree the slot allocations for the coming season between airlines and coordinators around the world. The process for this is for airlines to discuss with the coordinators of each of the airports they plan to serve in the coming season the feasibility of their proposed schedules. Airlines may also engage in slot exchanges with one another in order to improve the slots which they have been allocated by the coordinators.

B.3.1.3 The main part of the post-Conference activity is one of iterative dialogue between the airlines and ACL for a period of two months, as illustrated in the following figure:

- the airlines make new requests and return unwanted slots
- ACL endeavours to meet requests and maintains a waitlist of outstanding requests
- ACL maintains the updates and maintains the schedule and slot pool.

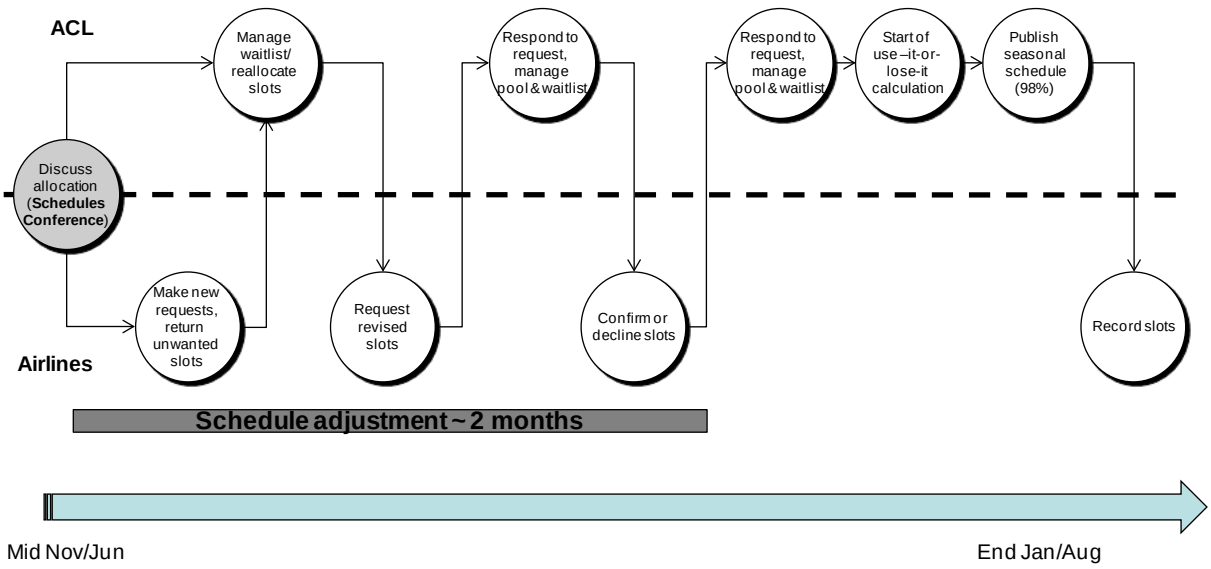

Figure 7: Slot allocation process after the IATA Schedules Conference

B.3.1.4 By the end of January for the summer season or the end of August for the winter season, ACL publishes the season's schedule, which is around 98% of that which will be operated. This schedule is the basis of the use-it-or-lose-it calculations which start at this point (slots returned prior to this time are not included in the calculations). The airlines record their allocations.

B.3.1.5 However, slot requests and the maintenance of the waitlist, schedule and slot pool continue throughout the season, as described below for ad hoc slots. Unused slots invariably remain in the slot pool as they are commercially unattractive or operationally infeasible.

B.3.2 Basic criteria for slot allocation

B.3.2.1 According to the Slot Regulation a slot is defined as "the permission given by a coordinator in accordance with this Regulation to use the full range of airport infrastructure necessary to operate an air service at a coordinated airport at a specific date and time for the purpose of landing or take-off".

B.3.2.2 All Heathrow slots must be allocated within the 480,000 air transport movement (ATM) cap in force at the airport. This cap translates roughly into around 657 arrivals and departures each day of the year. The basic process applied to maintaining this limit is that:

- the planning limit includes an overbooking factor (<~2% in summer and <~4% in winter) to allow for cancellations based on historical analysis and to ensure full use of the available ATMs
- the operational budget is the apportionment of the actual ATM usage and is one of the bases for ad hoc slots

B.3.2.3 The penalty for an overrun of the limit is a reduction in the planning limit for the next year of twice the overrun.

B.3.2.4 Slot allocation must also be compliant with **night quotas**, which are again based on historical precedence and overbooked (for most airlines) accounting for delays that result in a proportion of night flights operating outside of the night period and, therefore, not counting towards night quotas.

B.3.2.5 Although slots are allocated on the basis of the capacity declaration process, there is potentially a disjoint between the capacity declaration, based on an assumed schedule, aircraft type, observed taxi times, etc and the allocation of slots that do not necessarily take these factors into account, including:

- arrival/departure route, origin/destination
- taxi time from the runway to/from on-/off-blocks (this is based on assumptions that are different to observations).

B.3.2.6 The basic criteria and order of precedence for allocation of slots is as follows:

Primary criteria

- historical precedence
- changes to historics
- new entrants
- introduction of year-round services

Secondary criteria

- effective period of operation
- size and type of market
- improved competition
- other scheduling constraints e.g. curfews
- requirements of the travelling public
- frequency of operation
- local rules
- night flying restrictions
- availability of traffic rights.

B.3.2.7 The basic principles applied to **retiming** of slots are:

- swaps between peak hours are allowed
- retiming from peak to off-peak is allowed
- retiming from off-peak to off-peak is allowed
- retiming from off-peak to peak is not allowed.

B.3.2.8 The basic coordination parameters applied to slots vary from airport to airport to meet local requirements within the constraints of local conditions: for example at Heathrow scheduling is performed in ten-minute periods that are offset by -5 minutes from clock-hours to reduce clock-hour bunching, whereas at Gatwick scheduling is performed over 15 minute intervals.

B.3.3 Risks associated with the process

B.3.3.1 Slot requests, especially for retimes, are likely to be based on the block-time performance experienced by the airline in the previous season. If this performance has been poor or erratic, it is likely that that airline will introduce additional buffer into the timetable either:

- in the block-time based on some percentile, typically the 65th%ile, of the achieved block-time; or
- outside of the block-time, for example as additional buffer in turnaround times.

B.3.3.2 Either way, the additional buffer may have a positive effect on punctuality but is likely to create a vicious circle for delays and efficiency as, for example, retimed flights arrive at their milestones earlier than the schedule, cause bunching and

have to be managed through additional holding. The other effect will be to decrease effective aircraft utilisation.

B.4 Ad hoc slot allocation

B.4.1 Basic process

B.4.1.1 The allocation of ad hoc slots is essentially a continuation of the post-Conference iterative dialogue between ACL and the airlines and is governed by a local rule. The overall process is summarised in Figure 8.

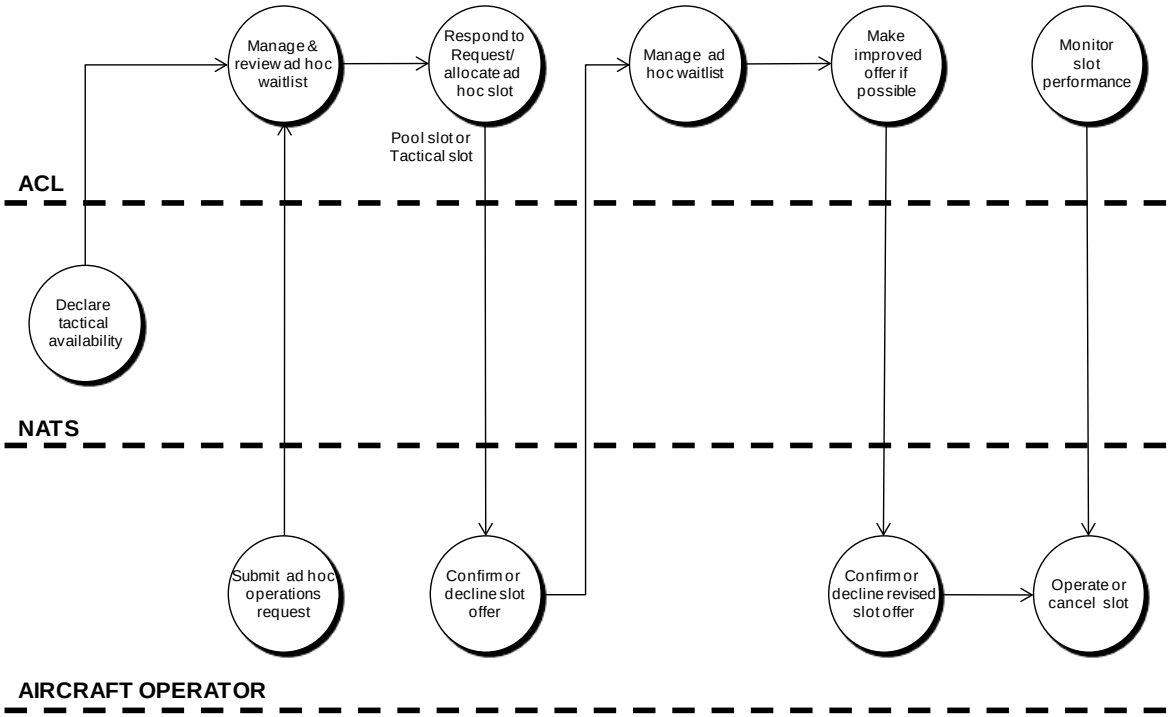

Figure 8: Process for allocating ad hoc slots

B.4.1.2 The basic process is iterative:

- the airline makes a slot request
- ACL responds to the request, allocating a slot as near as possible to that requested
- the airline confirms or declines the slot offer
- ACL maintains the waitlist and slot pool, making an improved offer where possible.

B.4.1.3 Ad hoc slots are mainly drawn from the pool:

- the slot pool consists of unallocated slots and commercial returns
- allocation from the slot pool of unallocated slots and commercial returns is performed on a seasonal basis that:
  - opens mid-January for summer
  - opens mid-August for Winter

- short-term returns allocated to carriers on the waitlist rather than new requests
- slots[9] are allocated according to the following priority:
  - VIP (other than governmental) flights
  - commercial passenger
  - commercial cargo
  - positioning
  - ambulance
  - air taxi, business and other general aviation
  - other non-commercial operations.

B.4.1.4 In addition, a number of types of flight that operate on an ad hoc basis are exempt from the requirement to be allocated a slot. These types of flights are:

- emergency operations
- medical emergencies
- official flights (the Queen's flight, flights carrying government ministers, flights carrying visiting heads of state, etc)
- technical flights
- recovery flights
- unplanned delays of less than 24 hours.

B.5 Performance monitoring

B.5.1 Basic process

B.5.1.1 Slot performance monitoring is concerned mainly with detecting and correcting deliberate abuse or misuse of slots. Currently slot conformance monitoring enforcement is performed through the Slot Performance Committee (SPC) with ACL actually responsible for the day-to-day operational analysis. ACL reports cases of non-conformance to the SPC and HAL as and when they occur.

B.5.1.2 Conformance monitoring is done on a statistical basis where persistent and deliberate out-of-tolerance performance is identified using various statistical techniques. The slot conformance window is very wide (-20 to +30 minutes either side of the schedule). Previous work indicates that, even though this window is very wide, at present very few flights achieve this performance to a high confidence level.

B.5.1.3 Performance monitoring does not feedback on the general delay performance associated with the schedule – this is only done through the operational summary element of the capacity declaration process (see section 3.3) and, even in this

[9] Note that a number of these operations, viz governmental flights, emergencies/diversions, including the subsequent departure, air ambulance, general aviation, air taxi – empty or maximum 10 seats with passengers, positioning and training, do not count against the 480k air transport movement cap

case, is limited to the delays included in the capacity declaration process rather than the total set of demand-related delays attributable to the airport.

B.5.2 Weaknesses

B.5.2.1 The main weaknesses associated with the current performance monitoring process are:

- other than at Heathrow, it mainly focuses on deliberate offenders, thereby missing the opportunity to correct general poor performance, which itself might have as negative an impact as the deliberate offenders
- the window for compliance is -20 to +30 minutes for arrivals and -10 to +30 minutes for departures
- generally, other than at Heathrow, only slot performance and not the general delay performance of the schedule is monitored.