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Airport Capacity

Guidance on Airport Capacity Declarations

First Edition

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EXECUTIVE SUMMARY

This paper provides guidelines on how to assess and declare airport capacity and coordination parameters.

The objective is to promote practical guidance material applicable at airports worldwide, and to encourage a process of continuous capacity enhancement and optimization.

These guidelines build on the agreed principles of the Worldwide Airport Slot Guidelines (WASG), in particular:

- The Objectives of Airport Slot Coordination (Section 1.2)
- Roles and Responsibilities for Level 2 and Level 3 Airports (Sections 4 and 5)
- Demand and Capacity Management (Section 6)
- Deadline Dates (Calendar of Coordination Activities)

These guidelines deal with the normal seasonal capacity declaration process. They do not deal with temporary capacity reductions, which are addressed by the Worldwide Airport Slot Board (WASB) best practice paper “Managing temporary reductions of airport capacity.”

While the focus of these guidelines is on the seasonal capacity declaration process, the principles underpinning the capacity analyses are also applicable to the process for changing an airport from Level 2 to Level 3 (or vice versa).

The general principles that serve as common denominator for airport operators in the process of capacity declaration are:

❖ **Prime objective**
The prime objective of airport slot coordination is to ensure the most efficient declaration, allocation, and use of available airport capacity in order to optimize benefits to consumers, taking into account the interests of airport operators and airlines.[1]

❖ **Governance, roles, and responsibilities**
Effective capacity management requires all stakeholders to work constructively together: airport operators, airlines, air traffic control (ATC) providers, coordinators, control authorities, and regulators.

Airport operators are the competent body for the assessment of airport capacity, playing a pivotal role in its declaration. They are responsible for developing and managing airport infrastructure and should take overall leadership of the capacity management process.

Airport operators are best placed to undertake the objective analysis of capacity constraints, champion capacity optimization and enhancement processes to alleviate bottlenecks, and to ensure the regular review of coordination parameters.

[1] Worldwide Airport Slot Guidelines (WASG), paragraph 1.2.1.

The airport operator should commission and fund the necessary data collection and analyses to support the capacity declaration. Airport operators may employ qualified consultants to assist in undertaking these technical capacity analyses.

In some jurisdictions, a government body or regulator has formal responsibility for declaring airport capacity. In these cases, the government body should look to the airport operator to undertake the technical capacity assessments and should rely on its expert advice and recommendations.

- **Capacity in the context of desired levels of service**
  The capacity of an airport facility is the volume of demand that can be accommodated or processed through the airport while delivering desired levels of service.

  The level of service is measured in terms of the queue times for aircraft to use the runway or passengers to be processed through check-in, security, immigration, etc. Level of service also includes space-per-passenger standards designed to avoid excessive congestion and crowding. The International Air Transport Association (IATA) Airport Development and Reference Manual (ADRM) "optimum" level of service standards may be used as a reference point, although individual airports may have their own standards.

  Capacity management needs to strike a balance between the benefits of additional capacity to meet demand and the risk that extra capacity will result in poorer operational performance or resilience.

- **Objective and transparent methodology**
  The capacity assessment and declaration process should be founded on robust and objective analyses, measuring capacity against agreed service standards and performance criteria.

  Ultimately, there are judgements to be made in deciding whether to declare additional capacity, so consultation with stakeholders is essential, but these judgements should be based on objective criteria.

  Capacity assessment modelling is a technical exercise; its results should be presented to stakeholders in an open, clear, and transparent way via the Coordination Committee (where they exist).

- **Optimizing capacity to meet demand**
  The capacity declaration should be optimized to best meet patterns of airline and passenger demand at the airport, taking into account market requirements and the community that the airport serves.

  The airport operator should lead a capacity optimization and enhancement programme to alleviate capacity constraints, better match capacity to demand, and achieve best-in-class performance where possible. Capacity assessments and declarations should be reviewed and updated on a seasonal basis.

- **Principle of efficient use**
  The capacity assessment should be based on the capabilities of the airport infrastructure assuming normal operating conditions, facilities are fully staffed to meet demand and in good repair,[2] and facilities such as check-in desks or aircraft stands are allocated efficiently.

  The declared capacity should be based on typical operating conditions; it should not be overly optimistic, but neither should capacity be under-declared based on inefficient management or staffing. The objective should be to remove any artificial operational constraints and to make efficient use of facilities.

  Similarly, runway capacity should be assessed based on good/average operating conditions (wind, visibility, etc.), not perfect weather, nor low visibility conditions.

- **Allowing necessary scheduling flexibility**
  The coordination parameters should be designed and optimized to manage peaks in demand within capacity while delivering desired levels of service, but still providing flexibility for airlines to construct operationally and commercially efficient schedules.

  Well designed and targeted capacity limits can help to maximize slot allocation efficiency and capacity utilization, while ensuring desired levels of service.

- **Establishing effective coordination parameters**
  The airport's operational and environmental constraints need to be translated into effective coordination parameters, defining which components of capacity require scheduling limits and calibrating these limits to effectively control demand in the lightest touch and most flexible way.

[2] Where appropriate, allowances should be made for facility outages due maintenance or development works.

1. INTRODUCTION

Airport operators are responsible for developing and managing airport infrastructure and are best placed to own and lead the capacity management process. These guidelines are designed to inform and assist airport operators on how to manage the assessment and declaration of capacity for the airport coordination process.

The focus of this paper is on the seasonal capacity review and declaration process, but the assessment methodologies could also apply to the demand and capacity assessment required to support the designation of an airport as Level 2 or Level 3.

Capacity management is most critical at Level 3 airports where airport capacity is scarce; however, the principles outlined in this paper also apply at Level 2 airports.

Although this paper is intended to have global applicability, it is recognized that roles and responsibilities may vary between countries and regions, and that local conditions may affect how airport capacity is managed.

These guidelines are not intended to be a one-size-fits-all approach. They are intended to provide a framework of guidance for effective capacity management processes that can be applied at a wide range of airports.

The structure of this paper is:

- Principles of Capacity Assessment
- Governance, Roles, and Responsibilities
- Capacity Assessment Guidelines:
  - Runways
  - Aprons
  - Terminals
  - Environmental limits
- Circumstantial Capacity Declaration and Capacity Management and Enhancement

2. PRINCIPLES OF CAPACITY ASSESSMENT AND DECLARATION

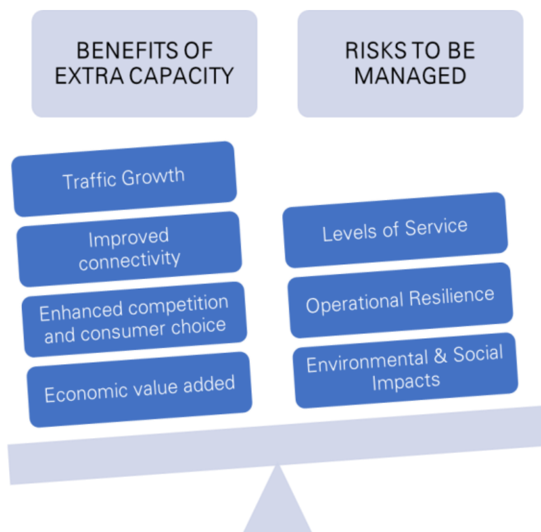
The prime objective of airport slot coordination is to ensure the most efficient declaration, allocation, and use of available airport capacity in order to optimize benefits to consumers, taking into account the interests of airport operators and airlines.[3]

The general principles that serve as a common denominator for airport operators in the process of airport capacity assessment and declaration are:

- **Capacity in the context of desired levels of service**
  The capacity of an airport facility is the volume of demand that can be accommodated or processed through an airport facility while delivering desired levels of service.

  The level of service is measured in terms of the queue times for aircraft to use the runway or passengers to be processed through check in, security, immigration, etc. Level of service also includes space-per-passenger standards designed to avoid excessive congestion and crowding.

  Capacity management needs to strike a balance between the benefits of additional capacity to meet demand and the risk that extra declared capacity will result in poorer operational performance or resilience.



- **Objective and transparent methodology**
  The capacity assessment and declaration process should be founded on robust and objective analyses, measuring capacity against agreed service standards and performance criteria.

  Ultimately, there are judgements to be made in deciding whether to declare additional capacity, so open consultation with stakeholders is essential; however, these judgements should be based on objective criteria.

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[3] Worldwide Airport Slot Guidelines (WASG), paragraph 1.2.1.

Capacity assessment modelling is a technical exercise; its results should be presented to stakeholders in an open, clear, and transparent way.

- **Optimizing capacity to meet demand**
  The capacity declaration should be optimized to best meet patterns of airline and passenger demand, with due consideration of the network development needs of the airport, its local community, and the market it serves.

  The airport operator should lead a capacity optimization and enhancement program to alleviate capacity constraints, better match capacity to demand, and achieve best-in-class performance where possible. Capacity assessments and declarations should be reviewed and updated in advance of each season.

- **Principle of efficient use**
  The capacity assessment should be based on the capabilities of the airport infrastructure, assuming normal operating conditions, facilities are fully staffed to meet demand and in good repair,[4] and facilities like check-in desks or aircraft stands are allocated efficiently.

  The declared capacity should be based on typical operating conditions; it should not be overly optimistic, but neither should capacity be under-declared based on inefficient management or staffing. The objective should be to remove any artificial operational constraints and to make efficient use of facilities.

  Similarly, runway capacity should be assessed based on good/average operating conditions (wind, visibility, etc.) – not perfect weather, nor low visibility conditions.

- **Allowing necessary scheduling flexibility**
  The coordination parameters should be designed and optimized to manage peaks in demand within capacity while delivering desired levels of service, but still providing flexibility for airlines to construct operationally and commercially efficient schedules.

  Well designed and targeted capacity limits can help to maximize allocation efficiency and capacity utilization, while ensuring desired levels of service.

- **Establishing effective coordination parameters**
  The airport's operational and environmental constraints need to be translated into effective coordination parameters – defining which components of capacity require scheduling limits and calibrating these limits to effectively control demand in the lightest touch and most flexible way.

[4] Where appropriate, allowances should be made for facility outages due maintenance or development works.

3. GOVERNANCE, ROLES, AND RESPONSIBILITIES

Effective capacity management requires all stakeholders to work constructively together: airport operators, airlines, ATC providers, coordinators, control authorities and regulators. The airport operator should take overall ownership and leadership of this process.

3.1 Role of the airport operator

Airport operators are responsible for developing and managing airport infrastructure and should own and lead the capacity management process. They are best placed to undertake the objective analysis of capacity constraints, champion capacity optimization and enhancement processes to alleviate bottlenecks, and to ensure the regular review of coordination parameters.

The airport operator should be the competent body for all matters relating to the airport's capacity. In some jurisdictions, a government body or regulator may have formal responsibility for declaring airport capacity, in which case the regulator should rely on the airport operator's expert advice and recommendations.

The airport operator's responsibilities include:

- Undertaking airport capacity and demand analyses.
- Ensuring that the airport is designated at the appropriate coordination level.
- Determining the declared capacity and coordination parameters, after consultation with the Coordination Committee and other relevant stakeholders.
- Ensuring that seasonal coordination parameters are declared by the deadline dates set out in the WASG (except where a government body is the competent authority for making the declaration).
- Implementing a capacity optimization and enhancement plan to alleviate capacity constraints, better match capacity to demand, and achieve best-in-class performance where possible.

The airport operator should commission and fund the necessary data collection and analyses. Airport operators may employ qualified consultants to assist in undertaking these technical capacity analyses.

3.2 Consultation with stakeholders

Prior to determining airport capacity and coordination parameters, the airport should consult with the Coordination Committee and other relevant stakeholders. Key stakeholders include:

- **Airlines** – airlines have an interest in maximizing capacity to enable growth while minimizing congestion and delays, but different airlines may prioritize growth versus delay differently.

  The airport operator should ensure that it is consulting with a representative cross-section of the airline community, and that it assesses feedback in a balanced way and does not give undue weight to the views of any particular airline(s).

- **ATC provider**[5] — the airport's ATC provider has a key responsibility for handling air traffic safely, while minimizing delay. They may also have data and modelling capabilities that can support the airport operator in assessing runway capacity.

- **Coordinator** — the coordinator has information on airline demand and where capacity changes could facilitate growth or scheduling flexibility. The coordinator's software system must be capable of modelling the airport's capacity constraints effectively.

- **Control authorities** — government agencies are responsible for delivering some components of capacity, such as immigration and customs controls and (at some airports) security screening. The airport operator needs to proactively engage and consult with these authorities to ensure that they meet desired levels of passenger service.

- **Ground handlers** — ground handlers act as agents for the airlines in delivering operational services and may also be consulted on capacity declarations. Following the principle of efficient use, the capacity assessment should be based on facilities that are fully staffed to meet demand.

It is not practical to consult directly with the travelling public on capacity matters, so the airport operator and airlines should seek to fairly represent the views and interests of passengers.

After consultation with stakeholders and taking their views into account whenever possible, the airport operator[6] should be empowered to make the final capacity declaration decision. The capacity declaration should be made in good time by the deadline dates set out in the WASG.

3.3 Transparency

The capacity assessment should be based on objective analyses using commonly recognized methods. Typically, the information presented will include:

- A summary of the capacity assessment methodology
- Outputs, and results
- Recommendations of declared capacity and coordination parameters

The results of the analyses should be presented to the Coordination Committee and to stakeholders in an open, clear, and transparent way, designed to inform and aid constructive discussion.

While it is not necessary to present the full technical details of the capacity calculations, the airport operator and other parties involved in preparing the analyses may provide further details upon the reasonable request of stakeholders.

5 The ATC provider includes both airport control tower services and en route air navigation services.
6 Or other competent body responsible for declaring capacity, following the advice of the airport operator.

4. CAPACITY ASSESSMENT GUIDELINES

4.1 Runway capacity

Runway capacity is the primary constraint at most Level 3 airports worldwide. This is because building new runways is usually more difficult than expanding an airport's terminal or apron capacity. Scarce runway slots can hinder an airport's growth and the development of its route network and connectivity, as well as limit competition and consumer choice. Therefore, adopting rigorous and objectives practices for the assessment, enhancement, and optimization of runway capacity is essential to make the most efficient use of airport infrastructure.

Where runway capacity is the dominant constraint, every attempt should be made to ensure that other critical subsystems (taxiways, aircraft parking stands, gates, terminal capacity, landside access, etc.) are in balance with the maximum runway throughput.

4.1.1 Runway capacity and delay

A runway system's **service rate** is the number of movements per hour that can be handled for a given traffic mix and operational conditions. It is a theoretical capacity that does not take account of the random variations in service rate and demand that cause queuing and delay.

The runway system's **capacity** is the movement rate that can be sustained while maintaining acceptable levels of delay and operational resilience.

Delay in this context is the time that aircraft spend queuing to use the runway:[7]

- For departures, delay is additional outbound taxi time (compared with an undelayed standard) plus any time spent queuing at the runway holding point.
- For arrivals, delay is any additional flying time and/or stack holding used by ATC to smooth and sequence arrivals demand.

Figure 1 below illustrates how delays rise exponentially as demand approaches the theoretical maximum service rate. The practical capacity is a level where delays are within acceptable levels. The optimum is to target modest levels of delay, around 5-12 minutes,[8] which strikes a reasonable balance between maximizing capacity, minimizing delay and environmental impacts, and ensuring operational resilience.

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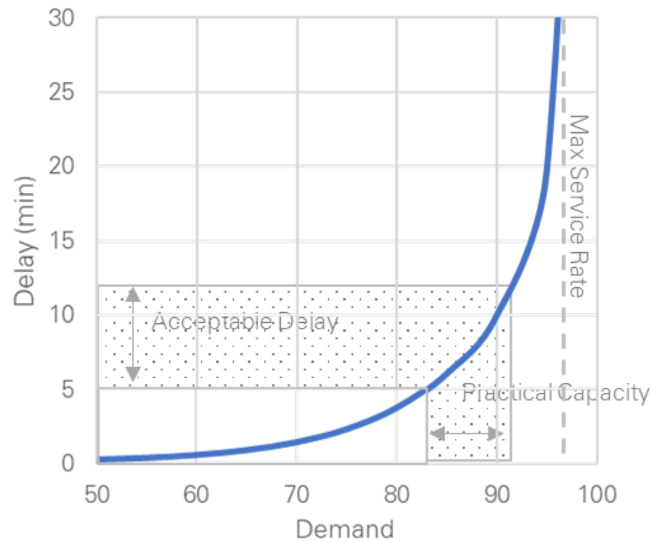
[7] "Delay" is not the punctuality of flights. Punctuality is the difference between the scheduled and actual times of operation, whereas delay is the system queue time, irrespective of whether the flight is operating "on time".

[8] For example, UK airports use 10-minute average delay criteria, and some airports use a 12-minute delay criteria.

Figure 1 — Runway capacity versus delay



Source: Mott MacDonald illustration, based on a dual parallel runway operation

4.1.2 Factors affecting runway capacity

The runway system service rate and capacity is a function of a number of factors:

- **Runway configuration** — number of runways, length, orientation, spacing, elevation, gradients, obstacles, noise preferential use
- **Taxiway infrastructure** — parallel taxiways, runway entry and exit geometry (including RATs/RETs),[9] space to sequence departing aircraft, holding points, runway back-tracking, and runway crossing requirements
- **Mode of operation** — mixed mode or segregated mode, independent or dependent operations, runway conflicts, or dependencies
- **Airspace design** — SIDs and STARs,[10] holding stacks, noise preferential routings, conflicts with other airports
- **Aircraft mix** — wake turbulence separations, approach speed categories, take-off and landing distances, ratio of arriving and departing aircraft
- **Meteorological conditions** — wind direction and speed, visibility, rain/ice/snow

[9] RAT: Rapid Access Taxiway; RET: Rapid Exit Taxiway.
[10] SID: Standard Instrument Departure route; STAR: Standard Arrival Route.

- **ATC procedures and equipment** — radar minimum separations, wake turbulence separation standards, controller aids, and controller performance

- **Pilot performance** — pilot reaction time, line-up time, and runway occupancy time

- **Slot performance** — inconsistent demand, intentional off-slot operations or poor on-time performance can lead to flight bunching and delay[11]

4.1.3 Runway modes of operation

A runway can operate in segregated mode, handling either departing or arriving flights, or in mixed mode, where both arrivals and departures operate together. The runway capacity depends on the average time interval between movements, which depends on the mode of operation and the traffic mix:

- **Arrival-Arrival (A-A)** [12] intervals are determined mainly by wake turbulence separation minima (as illustrated in Figure 2 below). Therefore, the arrival rate depends on the mix of aircraft types and the ability to efficiently sequence aircraft.

- **Departure-Departure (D-D)**[13] intervals are determined mainly by the departure routings and whether successive departures are on divergent paths, as well as wake turbulence minima. Therefore, the departure rate depends on the airport's SIDs and the ability to efficiently sequence aircraft.

- **Arrival-Departure-Arrival (A-D-A)** intervals in mixed mode operations depend mainly on runway occupancy time and line-up time. The gap between arrivals is typically at least 5.5 – 6 NM to allow for the interleaving departure, so wake turbulence minima and departure routing separations are usually less critical. Mixed mode capacity is limited by how quickly a landing aircraft exits the runway and the following departing aircraft lines-up to begin its take-off.

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[11] The airport's Slot Performance Committee and/or slot sanctions scheme (where available) may be used to help address slot performance issues.

[12] The approach speed for a commercial jet aircraft (ICAO approach category C) is 140 kts, which is equivalent to about 25 sec per 1 nm. So, A-A intervals for 3 nm separations is ~75 sec, increasing to ~125 sec for a Medium following a Heavy with 5 nm separation.

[13] Typically, D-D intervals are 60 sec where departure routes diverge immediately, or 120 sec where routes are in-trail before diverging. This depends on SIDs available and ATC procedures.

Figure 2 — ICAO wake turbulence categories and separation minima[14]

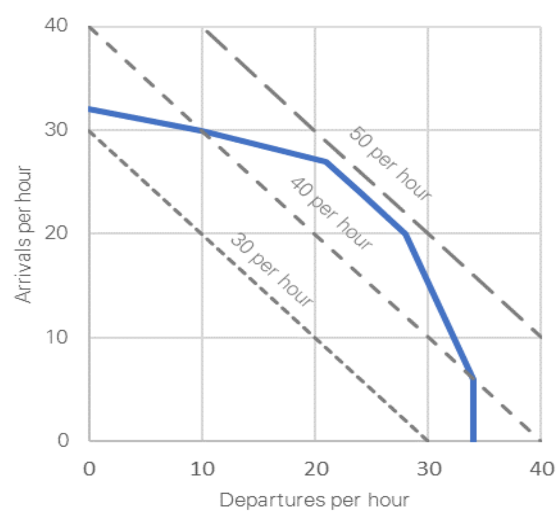
LEADER / FOLLOWER Example aircraft MTOW	SUPER HEAVY A380	HEAVY A330, B744 >136t	MED A220, A321 7t – 136t	LIGHT <7t MTOW
SUPER HEAVY		5 nm	7 nm	8 nm
HEAVY		4 nm	5 nm	6 nm
MEDIUM			3 nm	6 nm
LIGHT				5 nm

Note: Where blank, minimum radar separations apply, which are usually 3 nm but can be 2.5 nm under certain conditions.

The hourly capacity of a mixed mode runway depends on the proportion of arrivals and departures. Usually, total capacity is highest when there is an even split of arrivals and departures so that an A-D-A sequence can be maintained. Moving away from a 50/50 split reduces the total runway capacity, as illustrated in the runway capacity curve of Figure 3 below.

For the example single-runway airport in Figure, a capacity of 48 movements-per-hour can be achieved with an even arrival/departure mix. If demand in a particular hour is heavily departure-biased then up to 34 departures are possible, but total capacity reduces to 40 movements-per-hour (allowing 34 departures plus 6 arrivals). Similarly, in an arrival-biased hour, the runway capacity could be 30 arrivals, 10 departures, and 40 total movements.

Figure 3 — Runway capacity curve



Source: Mott MacDonald illustration, based on a single runway mixed mode operation

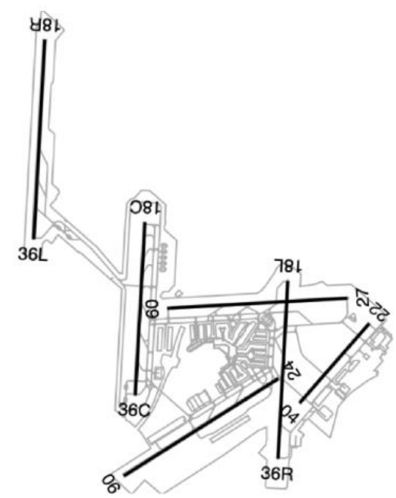
[14] Some countries (e.g., the EU and US) are implementing reduced wake turbulence separations based on more aircraft categories (e.g., RECAT-EU) or moving to pairwise or time-based separations. These new standards tend to reduce separation requirements and increase runway capacity.

4.1.4 Runway configuration and use

The capacity of a runway system may depend on which runway(s) are in use, which is determined by wind direction but may also be set by noise mitigation measures.

A multi-runway airport may have a complex layout with different combinations of runways in use under different conditions, and these combinations can have different service rates and capacity. Even a single runway has two directions of operation, and the capacity may be different for each direction depending on the taxiway infrastructure and airspace procedures (see section 4.1.2 above).

Figure 4 — Example Multi-Runway Airport



Source: AMS Schiphol Airport

The airport coordination process manages capacity on a planned basis, and declared capacity must be set in advance of each scheduling season. Declared capacity cannot vary with on-the-day operational factors such as wind direction and visibility.[15] The capacity assessment should be based on a typical or standard runway configuration and mode of operation.

The best approach for declaring runway capacity will depend on local circumstances. For example, if prevailing winds mean that one runway configuration is used 75% of the time, then that configuration may be the appropriate basis of the capacity assessment. Care should be taken if other runway use combinations have significantly lower capacity, however, as this could result in excessive delays and poor resilience on the days when those runways are in use. The capacity assessment should seek to reflect the sustainable capacity of the airport system as a whole – it should not be based on the most optimistic or the most pessimistic scenario.

15 ATC flow controls are used to manage on-the-day capacity on a tactical basis.

4.1.5 Capacity assessment methodology

The preceding discussion illustrates that a runway capacity assessment (based on objective delay-based criteria) is not a simple calculation. It requires simulation modelling of the runway system, calibrated against observed actual operations and delays.

Using a simulation model, it is possible to assess runway throughput and traffic sequencing under various conditions, and to evaluate the impact of proposed capacity changes. Changes in traffic mix, operational procedures, or airport infrastructure can also be modelled. The process is illustrated in Figure 5 below.

This modelling should be part of a continuous capacity enhancement and optimization process that looks for season-on-season opportunities to increase capacity and/or to optimize the profile of flights to minimize delay (see section 4.5 for further details).

Figure 5 — Runway Capacity Modelling Process

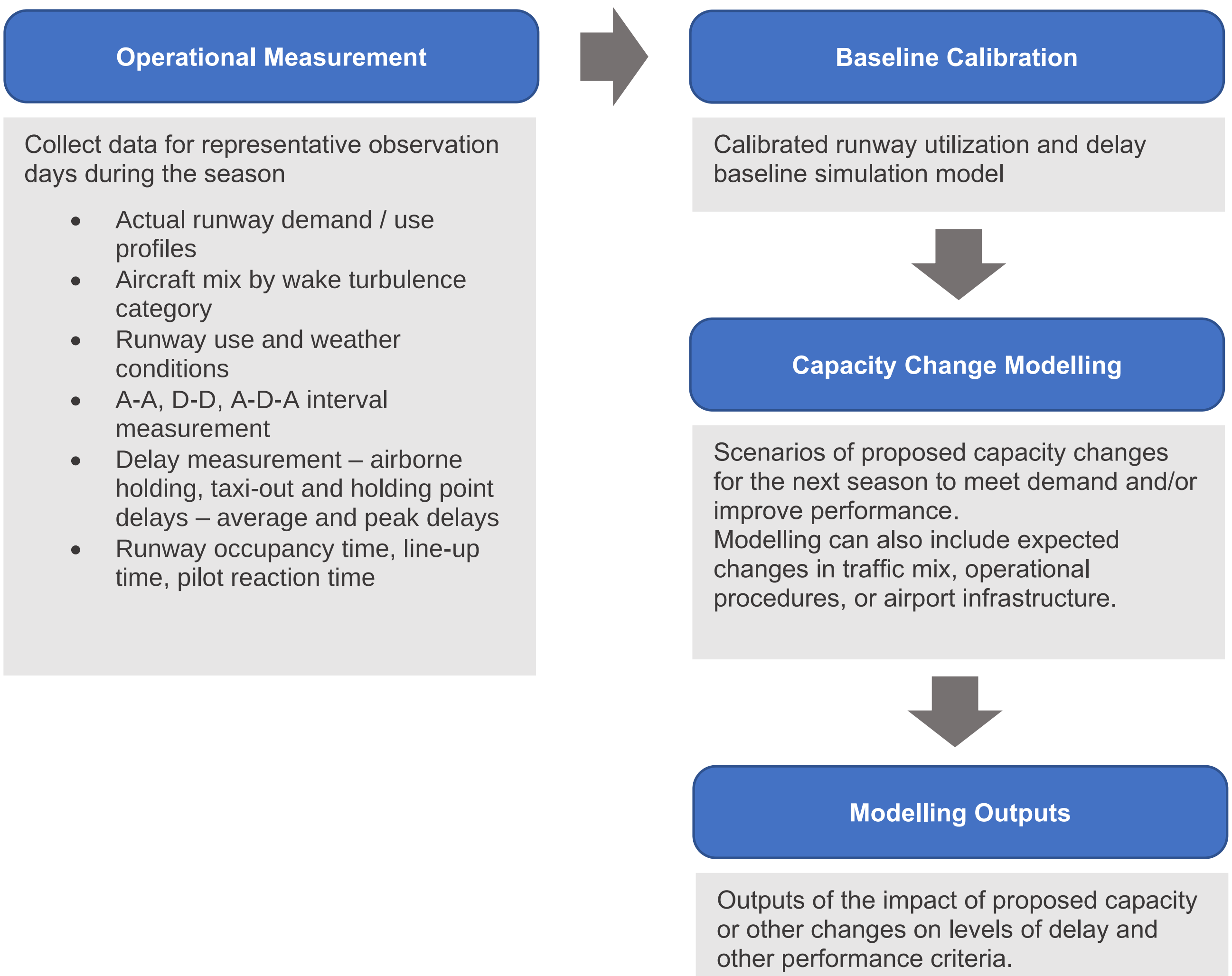
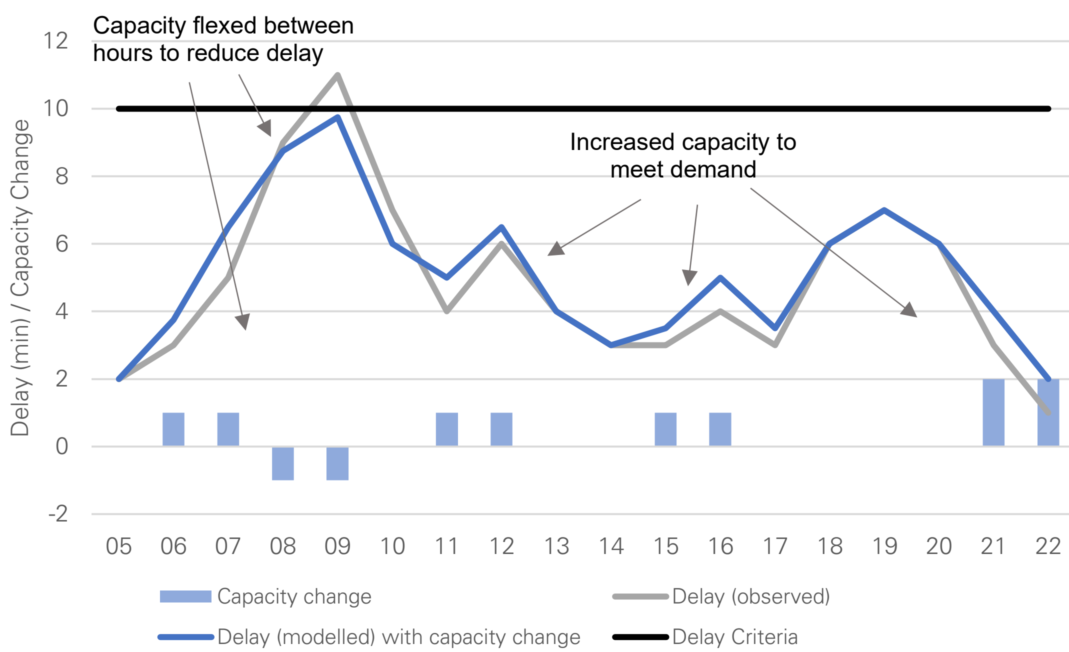


Figure 6 is an illustration of a seasonal runway capacity assessment based on delay modelling. In this example, runway capacity changes are modelled which seek to both reduce peak delay and increase capacity where runway performance permits. This approach has been adopted at leading airports such as Heathrow, Gatwick, and Dubai to maximize capacity within acceptable levels of delay (as illustrated in Figure 7 below).

Figure 6 — Example Runway Capacity and Delay Modelling



Source: Mott MacDonald illustration

Figure 7 — Leading Runway Capacity Airports

(Total movements-per-hour in the peak hours)

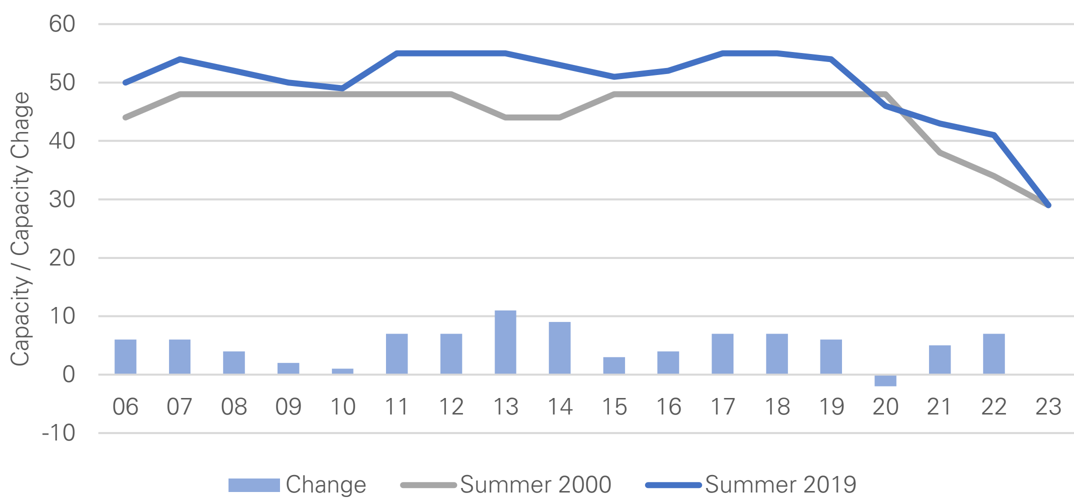
Runway configuration	Average Airport (Max/Mix)	Leading Airports	Leading airports' capacity enhancement (*) (original > current)
Single runway	36 (18-55)	London LGW	48 > 55 (+15%)
2 close parallel	50 (24-66)	Dubai DXB	52 > 66 (+27%)
2 parallel	61 (30-92)	London LHR	77 > 92 (+19%)

Source: ACI Slot Policy Study (2019) (*) Current (Summer 2023) peak hour capacity versus: Heathrow – Summer 1992, Gatwick – Summer 2000, Dubai – Summer 2009

A consequence of the continuous improvement approach to runway capacity, measured against objective delay criteria, is that the declared runway capacity evolves over time and varies by hour in line with patterns of demand and delay.

Figure 8 illustrates the evolution of London Gatwick's declared capacity – originally the capacity was a relatively simple (constant) 48 movements-per-hour with a 'fire break' in the middle of the day.[16] Over the years, the capacity profile has been optimized to best match patterns of demand while minimizing delays, so that it now varies by hour. Peak hour capacity increased by 15% to 55 movements-per-hour, and daily capacity (06:00 – 22:59) increased by 90 slots (+12%).

Figure 8 — London Gatwick Capacity History



Source: Airport Coordination Limited data

4.1.6 Runway capacity optimization

Where airport operators lead the capacity declaration process, they have the ability to drive how slots are allocated by shaping capacity to best meet demand.

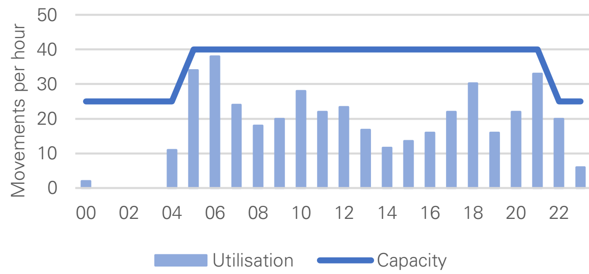
The delay-based capacity modelling described above is based on an input **wish list** of capacity changes and new slots. This wish list is based on an assessment of airline and passenger demand for new or changed capacity, as well as changes that might reduce delay and improve operational resilience. The wish list should be compiled by the airport operator and coordinator sharing market intelligence and assessments of slot demand.

[16] A 'fire break' is a period of lower capacity designed to allow any built-up delay from the peak morning period to dissipate before the evening peak.

Figure 9 — Runway Capacity Optimization

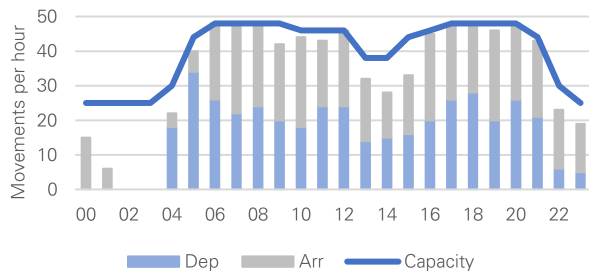
Constant Declared Capacity

- Simple constant capacity profile before optimization
- Appropriate at a Level 2 airport where runway capacity is not constraining except in some peak hours



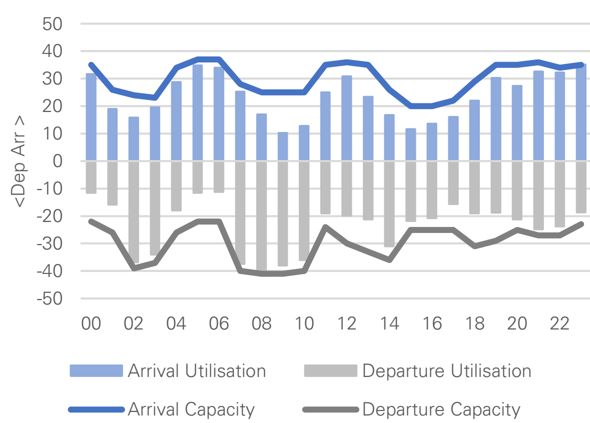
Profiled Capacity

- Profiled capacity in line with demand, while managing delays
- Fire break in the midday period when demand is lower, allowing delay recovery
- Departure and arrival splits optimized, allowing departure-biased hours in the morning and an arrival-bias in the evening to meet base-aircraft demand from LCCs



Hub-Optimized Capacity

- Profiled capacity in line with strategic hub requirements
- Arrival-wave and departure-wave hours built into the capacity declaration to ensure efficient hub connections
- Fire breaks to allow for runway maintenance and delay recovery



Source: Mott MacDonald illustrations

The airport operator should seek to declare capacity in a way that best accommodates demand while balancing the costs and benefits of increasing declared capacity. The process should take into account the network development needs of the airport, its local community and the market it serves.

4.1.7 Runway coordination parameters

The above analyses determine the hourly runway capacity. This needs to be translated into coordination parameters.

Arrival-departure sub-constraints

Figure 10 below shows the Gatwick runway capacity declaration with variable hourly capacity and the split of arrivals and departures in each hour. There is some flexibility to swap arrivals and departures within the total capacity – for example, in the 1000 hour the capacities are 28 arrivals, 29 departures and 55 total movements. This could be allocated 28 arr + 27 dep, or 26 arr + 29 dep, or some intermediate combination.

Figure 10 — Gatwick Summer 2023 Capacity Declaration

Time (UTC)	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	17h Total (05-21)
Total limit	29	53	55	52	50	51	55	54	55	54	52	52	55	55	54	49	46	40	29	30	882
Arrival limit	20	20	25	26	23	26	28	28	28	27	26	26	28	28	28	28	25	35	27	25	455
Departure limit	20	37	36	29	30	28	29	29	30	29	29	28	29	30	28	25	22	10	10	10	478

Source: ACL website; single runway airport

10- or 15-minute sub-constraints

In addition to the hourly limits, 10-minute or 15-minute sub-constraints are typically used to smooth demand and avoid flights bunching in one part of the hour.

The runway sub-constraints should be set slightly higher than the equivalent hourly rate, to provide some flexibility while still smoothing demand. For example, an airport with a total capacity of 40 movements-per-hour may have 15-minute sub-constraints of 6 arrivals and 6 departures and 11 total movements. The sub-constraints should strike a balance between providing effective schedule smoothing while maintaining some flexibility for airlines.

4.2 Apron capacity

Apron capacity – aircraft parking stands and gates – is a constraint at some airports. Modelling stand demand within the slot coordination system is more complex than runway and terminal capacity. Rather than simply summing runway movements or terminal passengers in a given time period, a stand model must quickly assess the impact of new or changed flights across a full season considering the aircraft-level integration of the arrival and departure slots operated by a particular airline in a particular terminal/apron, plus operational rules like towing of long-stay aircraft, maintenance inputs, etc.

4.2.1 Stand demand modelling

How stand capacity is best declared depends on the modelling methodology. Broadly, there are two ways to model stand/gate demand:

Count-in/count-out method

This method requires an input of the number of overnighting aircraft by stand size,[17] for a particular apron. The method then counts-in arrivals and counts-out departures to calculate the number of aircraft-on-ground by aircraft size across the day (see illustration in Figure 11 below).

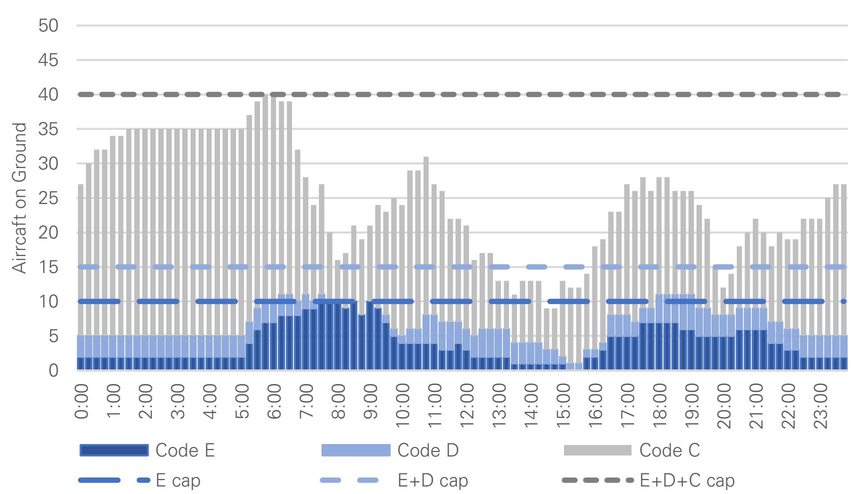
The advantage of the count-in/out method is that it is computationally simple and does not require detailed aircraft linking information – it only requires the scheduled arrival and departure times by aircraft size, plus the starting overnight values.

The disadvantage of count-in/out is that it does not capture the full aircraft integration details. The number of stands required can be larger than the number of aircraft-on-ground due to allocation inefficiencies.

When using the count-in/out method, the declared stand capacity should keep some contingency stands in reserve. For example, if an apron has 45 stands, then only 40 stands might be declared to allow for allocation inefficiencies and stand outages.

Without a detailed parking allocation, the count-in/out method does not have information on the percentage of flights that are allocated pier served versus remote stands, and it cannot model towing of long-stay aircraft.

Figure 11 — Aircraft Count-in/Count-out Method



Source: Mott MacDonald; illustrative chart

[17] *ICAO aircraft/stand size categories:*

	Wingspan	Example
Code A:	<15m	Light aircraft
Code B:	15 - 24m	Beech 1900D, CRJ700
Code C:	24 - 36m	ATR42, A321
Code D:	36 - 52m	B757, B767
Code E:	52 - 65m	A330, B744
Code F:	65 - 80m	A380

Gannt chart allocation method

The alternative to a count-in/out model is to incorporate a full Gannt chart stand allocation within the slot coordination system,[18] as illustrated in Figure 12 below.

The advantage of a Gannt-chart method is that it provides full details of the stand allocation, at least on a planned basis, so it can provide metrics on pier service levels and can model aircraft towing between aprons.

The disadvantages are that the Gantt model requires a full-linked schedule in turnaround format (or equivalent), and it is computationally intensive.

- **Schedule linking** – It is reasonably simple for away-based airlines to submit their schedules in turnaround format (linked arrivals and departures), but a home-based carrier with multiple aircraft will have complex operational links that vary independently from the schedule.[19] Attempting to maintain these operational links represents a large administrative burden for the airlines and coordinators, and leads to fragmentation of the schedule which may make efficient allocation of slots more difficult.

  An alternative to maintaining fully linked schedules is to dynamically link the schedules using a software linking algorithm. Dynamic linking can provide sufficient modelling accuracy while reducing administrative burdens.

- **Computational intensity** – the slot coordination system needs to be able to model and assess new or changed schedules across a full season (up to 31 weeks – 217 days) in a matter of seconds. In general, this means that the stand demand calculation cannot be a fully optimized allocation incorporating complex airline preference and other rules, such as those built into an airport's on-the-day stand allocation system. A simplified approach is required.

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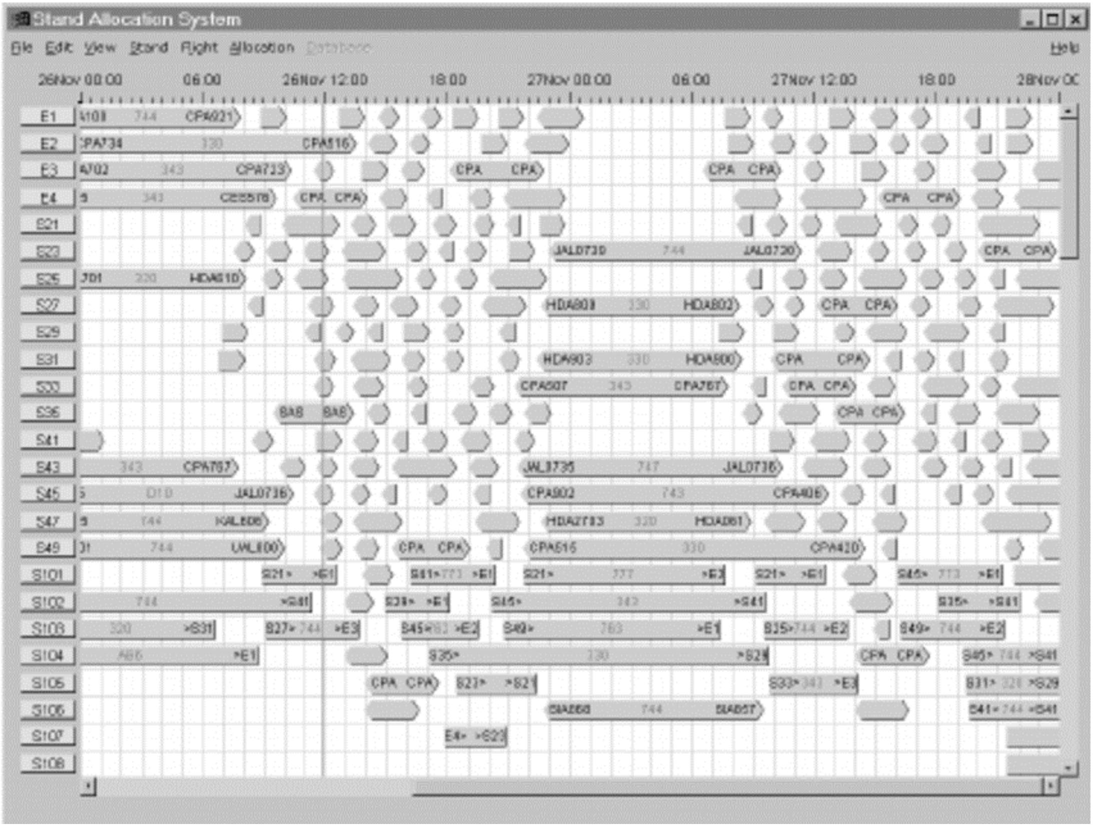
18 Some airports have two-stage slot coordination, where stands are modelled in a separate system (sometimes by a different organization). This two-stage process slows slot request response times and is not as efficient as modelling all capacities within the same slot system.

19 For example, a single daily arrival flight may link to different departures on each day-of-week, and in different weeks in the season.

Figure 12 — Example Gannt-chart Stand Allocation



Source: Illustrative chart

4.2.2 Stand capacity declaration

The declared stand coordination parameters depend on how stands are counted and the modelling methodology.

How to count stands
Determining the number of stands available is not a simple counting exercise. The following factors need to be considered:

- **Stand supply changes during a season** – The number of stands may change during a season (up or down) due to construction projects or planned maintenance. Judgements need to be made on how many stands to declare – a "typical" supply, peak season supply,[20] or variable numbers by date range.

[20] Note that the peak period for stand demand may not be the busiest period for number of flights. When there are fewer flights operating, aircraft may spend more time on the ground and require more stands. This will vary by airport and on the mix of home-based versus away-based aircraft using the airport.

- **MARS** – a Mult-aircraft ramp stand (MARS) can, for example, park two Code C aircraft or one Code E aircraft. Such stands are either declared based on their most common configuration, or the MARS flexibility is explicitly modelled in the coordination system stand model (if the Gannt method is used).

- **Restricted stands** – some stands have operational restrictions, such as adjacency rules[21] or operational restrictions.[22] It is a matter of judgement whether such stands should be included in the declared capacity or held as contingency reserve.

- **Stand outages** – contingency stands may be kept in reserve to allow for unplanned stand outages (e.g., fuel spillages) and allocation inefficiencies.[23]

Having determined how to count the stands available, the input parameters typically required for a stand model are:

- The **count-in/count-out** method:
  - Number of stands by stand size, by apron area (excluding deductions and contingencies)
  - Number of overnighting aircraft by stand size, by apron area
  - Stand buffer times – the time after departure before a stand is free for use by another aircraft

- The **Gannt allocation** method:
  - Number of stands by stand size, by apron area (excluding deductions and contingencies)
  - Stand buffer times – the time after departure before a stand is free for use by another aircraft
  - MARS and stand adjacency rules
  - Airline allocation rules / preferences
  - Towing rules
  - Flight linking or a linking algorithm

4.3 Terminal capacity

Terminal capacity – passenger and baggage processing capacity – is a constraint at some airports. There are several methodologies available for assessing terminal capacity, from simple spreadsheet models to complex simulations with 3D visualizations.

The IATA **ADRM** is a set of industry standard technical guidelines developed in cooperation with ACI. It is used by airlines, airport operators, government authorities, architects, engineers, and planning consultants engaged in planning and assessing the capacity of airport infrastructure.

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[21] Adjacency rules – where the maximum aircraft size on one stand depends on what size aircraft is parked on an adjacent stand.

[22] For example, no engine or APU running during night hours.

[23] Non-standard parking, such as unused runway/taxiways or leased apron areas, is normally kept for operational resilience rather than declared as available for scheduled operations.

These guidelines refer to the ADRM for the technical details of how to assess terminal capacity.

4.3.1 Terminal capacity and level of service

Assessing terminal capacity is undertaken in the context of delivering the desired level of service (LoS). LoS is measured in terms of queue times, space-per-passenger, baggage delivery times and seating requirements.

The ADRM defines three levels of service – over-design, optimum, sub-optimum. The terminal capacity declaration should be assessed based on the “optimum” level of service. An airport operator may have its own local service standards, which may be used instead of these ADRM default values. The objective is to deliver a good level of passenger experience when the terminal is operating under busy conditions.

Figure 13 below summarizes the components of terminal capacity (for a typical terminal) and which processes require space-per-passenger and queue time standards. An airport may have different standards for economy and business/first class passengers, and space requirements can vary depending on whether passengers are queuing, standing, sitting, or circulating in an area, and whether or not passengers have baggage and trolleys.

Figure 13 — Level of Service Metrics

	Space (sqm/pax)	Queue Time
DEPARTURES PROCESSES		
Public Departures Hall	✓	-
Check-in	✓	✓
Security Control	✓	✓
Emigration Control	✓	✓
Gate Hold rooms		
Seating	✓	-
Standing	✓	
ARRIVALS PROCESSES		
Immigration Control	✓	✓
Baggage Reclaim	✓	*First bag, Last Bag times*
Customs Control	✓	✓
Public Arrivals Hall	✓	-

4.3.2 Terminal capacity assessment methodology

The ADRM methodology provides guidance on how to calculate terminal capacity, using a spreadsheet calculation methodology, as illustrated in 14 below.

Terminal facilities can be categorized into two types:

- **Processing facilities**, such as check-in, security, or immigration. Capacity is determined by the number of processing units, transaction times, reporting profiles, and queue standards.

- **Space facilities**, such as concourses, lounges, hold rooms and queue areas. Capacity is determined by the space areas, space-per-pax standards, and dwell times.

  A space facility has a ***static capacity***, which is the number of people it can accommodate at any one time, and a ***dynamic capacity***, which is the hourly throughput taking account of dwell times in the area.

The baggage reclaim hall has characteristics of both a process and a space facility. Its capacity is determined both by the baggage loading process and the passenger space around the belts. Furthermore, for international arrivals, there is a strong interaction between the immigration and baggage reclaim processes,[24] which can require more detailed modelling.

Facility Usage and Airside Transfers

Not all passengers use all facilities. Hand-baggage-only passengers may skip check-in and baggage reclaim processes, premium passengers may use fast-track facilities, and arriving passengers may be able to use automatic boarder control processes. Therefore, the capacity assessment needs to take account of the proportion of passengers using each facility and blend the overall processing rates, assuming an efficient allocation of facilities to meet demand.

Similarly, airside transfer passengers will bypass certain facilities (e.g., check-in, immigration, and baggage reclaim) and use other facilities (e.g., transfers security), so transfer passenger percentages also need to be included in the capacity calculations.

Figure 14 — Capacity Calculation Examples

Process Capacity

Applicable for check-in desks, security and immigration desks

$$C_{Process} = \frac{(\#\ Units) \times (\Delta t + MQT)}{T_{Transaction}}$$

Example, check-in area with 50 desks, 15 min queue standard and 90 sec transaction time

$$C_{Process} = \frac{50 \text{ desks} \times (60 \text{ min} + 15 \text{ min})}{(90 \text{ sec} \div 60)} = 2500 \text{ pax per } 60 \text{ min}$$

24 If immigration is quicker than baggage delivery, then passengers arrive before bags leading to congestion around the belts. If immigration is slower, then belts fill up with bags waiting for the passengers to collect them.

Space Capacity

Applicable for lounge, circulation and queuing areas

$$C_{Space} = \frac{(Area_i \div SP_i) + (Area_j \div SP_j) + \ldots}{T_{Dwell}}$$

Example, gate lounges with 2400 m² seating space and 1560 m² standing space, with a dwell time of 45 min

$$C_{Space} = \frac{(2400m^2 \div 2.0\ m^2/pax) + (1560m^2 \div 1.3\ m^2/pax)}{(45\ min \div 60)} = 3200 \text{ pax per 60 min}$$

Where:
Δt = time interval (e.g., 30 min, 60 min, etc)
MQT = Maximum Queue Time standard (min)
SP = Space-per-pax standard (m^2 per pax)
$T_{Transaction}$ = Transaction time (sec)
T_{Dwell} = Dwell time (min)

Overall Terminal Capacity Declaration
Capacity is assessed for each component of the passenger journey on departures and arrivals. The **declared capacity** is based on the capacity of the limiting process, as illustrated in Figure 15 below.

Figure 15 — Example Terminal Capacity Assessment

Departures Process	Capacity (Pax/Hour)
Check-In:	3,400
Security Screening	3,100
Departure Lounge (Dom & Int)	3,200
▪ Domestic Gates	1,000
▪ International Gates	2,800
Limiting Capacity - Total	**3,100**
Limiting Capacity - Dom	**1,000**
Limiting Capacity - Int	**2,800**

Arrivals Process	Capacity (Pax/Hour)
Immigration (Int)	2,800
Baggage Reclaim:	
▪ International	2,600
▪ Domestic	900
Customs (Int)	3,000
Limiting Capacity - Dom	**900**
Limiting Capacity - Int	**2,600**

Source: Mott MacDonald illustration

In this example, the total departures capacity (for both domestic and international passengers) is 3,100 passengers-per-hour, limited by the common security screening area. Within this 3,100 pph capacity, peaks of up to 1,000 domestic or 2,800 international passengers are possible, limited by the corresponding gate capacity.

4.3.3 Load factor assumptions

Terminal capacity is expressed in terms of “passengers per hour” (or other time intervals). The airline schedules only contain number of seats information. Therefore, when determining terminal capacity, the airport operator should make load factor assumptions.

Capacity is assessed based on meeting optimum levels of service when the terminal is operating at busy times. Therefore, assumed load factors should reflect busy conditions, rather than average or absolute peak conditions.

Busy period load factors can be calculated from historic traffic data, such as the “average load factor in the busiest month” or the “average load factor in the busiest week”, based on the previous equivalent season data.

At some airports, load factors may vary by type of traffic, e.g., low-cost carriers (LCCs) or charter airlines may have higher load factors than full-service carriers. These differences can be reflected in the load factor assumptions.

4.3.4 Data collection and analysis

Terminal capacity assessment requires input data for the calculations, such as:

- **Check-in** – reporting profiles, transaction times (SSK, bag drop, staffed desk), % online, % hand-baggage-only, % use of each type of check-in, desk allocation, and utilization factors

- **Security** – reporting profiles, X-ray trays-per-pax, x-ray throughput times, passenger archway/search times, reject rates, % minimum manual search ratio

- **Lounge and gate areas** – dwell times, % time by facility (shops, F&B, circulation, seating), call to gate and boarding times

- **Immigration** – transaction times (by nationality, staffed desk, automatic boarder control), % passengers by type/nationality, reporting profiles (time distributions from aircraft exit to immigration hall)

- **Baggage Reclaim** – % passengers with baggage, first/last bag times, average wait times

- **Customs** – % passengers searched, transaction times

- **Arrivals Meet & Greet area** – meters-per-passenger ratio, dwell times

The exact data required will depend on details of the facility processes and how the facilities are used.

Terminal capacity assessments should be reviewed on a seasonal basis and some factors, such as load factor assumptions, should be updated each season.

A full terminal capacity assessment should be undertaken at reasonable intervals, such as every two to three years or when there is a material change to the facilities or how the facilities are used. Collection of the necessary input data should coincide with these periodic capacity reviews.

Some input data may be collected from airport systems, such as common-user check-in systems or via passenger tracking and queue monitoring technology. Other data elements, or where automatic data collection is not available, should be collected from survey data. Although collecting survey data takes time and manpower, and therefore has a cost, it is necessary to have accurate and up-to-date information to support the terminal capacity assessments.

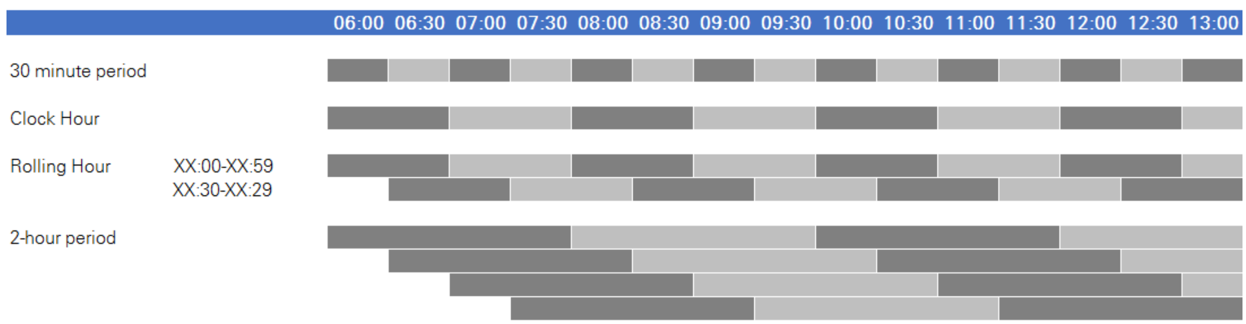
4.3.5 Terminal coordination parameters

Terminal capacity is normally expressed as 60-minute limits. Some airports use 30-minute limits also to avoid flights bunching within the hour.

Some terminal processes such as check-in have passenger reporting profiles over a prolonged period, so flights scheduled in different hours interact. In these cases, the hourly limit can be supplemented by a 2- or 3-hour limit, representing the sustainable capacity of the facility.

Some airports use rolling period constraints to smooth demand. Generally, the coordination parameters should be chosen to manage peaks in unconstrained demand effectively (based on the capacity issues arising in the terminal) while maintaining schedule flexibility where possible.

Figure 16 — Terminal Coordination Parameters



Source: Mott MacDonald illustration

4.4 Environmental capacity

Some airports are subject to environmental limits or regulations designed to control the impact of airport operations on local communities. Although such limits are set by regulation or local rules, the constraints need to be translated into efficient coordination parameters that can be used in the airport coordination process.

4.4.1 Types of environmental limits

Common examples of environmental limits are:

- **Annual caps** on the number of movements or passengers
- **Night restrictions**, annual or seasonal limits on night movements and/or noise points

- **Night curfews**, defining hours with no flights
- **Noise contour limits** defining the area of the airport's noise footprint

Typically, the environmental limits are based on actual operations. This means that the coordination parameters need to apply controls to the ***schedule*** which deliver a level of ***actual traffic*** within limits. This requires analysis of the historic trends and relationship between scheduled and actual operations.

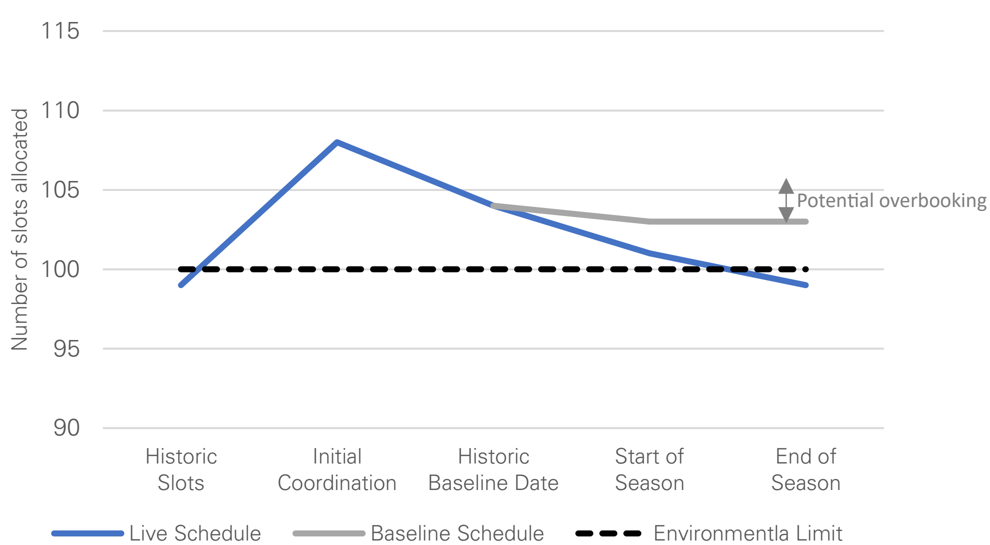
4.4.2 Managing environmental limits

***Annual versus seasonal* limits**
Slots are allocated based on summer and winter seasons. For annual environmental limits, the airport operator should apportion the limits between seasons as part of the capacity declaration. This should be based on historic analysis of the seasonality at the airport. There may also be scope to carry-over unused movements or quota from one season to the next, which can be reflected in the capacity declaration.

Overbooking factors
The number of slots allocated in a season varies during different stages of the slot planning cycle (as illustrated in Figure 17 below). There is also a difference between the number of slots allocated in the *Baseline* view of the schedule (which includes only series of slots, eligible for historic rights) and the *Live* view (which includes ad hoc cancellations and extra flights).

Typically, there is a net cancellation rate at the end of season between the *Baseline* and *Live* schedule views, as airlines cancel flights within their 80% use-it-or-lose-it allowance. To fully utilize an environmental limit, such as a cap on movements, it may be necessary to include an **overbooking factor** to allow more flights to be scheduled in anticipation of these net cancellations.

Figure 17 Seasonal Slot Allocation Pattern



Source: Mott MacDonald illustration

Ad hoc slot pool
The capacity declaration may need to reserve a proportion of the environmental limit for ad hoc flights (that are not part of a regularly scheduled service), such as positioning flights, general and business aviation, etc.

Night restrictions and late-running flights
Night limits are typically based on actual take-offs and landings on the runway, whereas the schedule is based on planned on/off blocks times. Therefore, the times considered *night slots* need to take account of taxi times for departures and arrivals, e.g., assuming a 20-minute outbound taxi time and 10-minute inbound taxi time:

Example night slot times:

- Night period (runway times) 23:30 to 06:00
- Night slots (on/off blocks times)
  - Arrivals 23:40 to 06:10
  - Departures 23:10 to 05:40

Additionally, allowances need to be made for daytime flights spilling into the night – late-running flights in the evening and, possibly, early arrivals in the morning. This can take the form of defining an evening *night shoulder period* to control flights scheduled close to the night period and/or maintaining a pool of night movements for unplanned use.

4.5 Capacity management

4.5.1 Circumstantial capacity declaration

Section 4.1.6 Runway Capacity Optimization, discussed how the airport operator can shape capacity to best meet demand. The circumstantial profiling of capacity can help to support the airport operator's traffic development objectives.

Airports operate in a competitive environment – hub airports compete with other hubs, LCC airports compete for new based-aircraft and new airlines, and destination airports compete for airlines, routes, and passengers to support their local communities.

It is legitimate for the airport operator to take a circumstantial view in determining the airport's capacity and coordination parameters, and to make sure that they align with long-term strategic objectives.

Different airports will have different requirements, depending on the markets they serve, as illustrated in the examples below:

- **Hub airport optimization**
  A hub airport operates in a very competitive environment – competing with other hubs for transfer passengers who can easily switch connecting points.

  Typically, a hub airport relies on its main based airline and their partners to provide competitive connectivity. The hub carrier will often overnight aircraft at outstations to provide inbound connecting feed to the hub.

  Airport operators can optimize their declared capacities for hub operations by:

- Profiling runway capacity and the arrival/departure splits by hour-of-day to match the arrival/departure waves necessary for efficient hub connections.

- Optimizing stand/gate capacity and allocation for efficient connecting flows.

- Balancing terminal capacity and space allocation between O&D and connecting passenger processing facilities.

❖ **LCC base airport optimization**
The LCC business model has captured an increasing share of the short-haul air travel market in the past 20 years. LCCs are demanding customers and usually require facilities tailored to their operational needs, and at discounted fees.

The typical characteristics of an LCC operation are point-to-point services, common narrowbody fleet (A320 / B737 types), high aircraft utilization, quick aircraft turnarounds, high share of leisure passengers, simplified passenger processes with high levels of online check-in, and aircraft/crew that return-to-base at the end of the day (rather than overnighting at outstations).

Airport operators can optimize their declared capacities for such LCC operations by:

- Profiling runway capacity by hour-of-day to match demand.

  For based-aircraft operations, this typically means a first-wave departures peak in the morning (around 06:00), two to four return trips during the day, and a last-arrival in the late evening or midnight period.

- Optimizing stand/gate capacity and allocation for quick aircraft turnaround.

- Optimizing terminal capacity and space allocation for efficient point-to-point services with no frills.

❖ **Destination airport optimization**

A destination airport can be the “spoke” in a hub-and-spoke operation, or the outstation for a point-to-point service. Destination airports operate in a competitive market, and they are vulnerable to airlines cutting routes and frequencies at short notice.

A destination airport may serve a mix of LCCs and traditional scheduled carriers, each of which have their own requirements.

Destination airport operators can optimize their declared capacities by:

- Profiling runway capacity by hour-of-day to match demand, which may be a blend of hub-feed and point-to-point patterns of traffic.

- Optimizing stand/gate capacity for away-based aircraft turnarounds and minimum turnaround times.

- Optimizing terminal capacity and space allocation for O&D operations (whether serving hub-feed or point-to-point flights).

4.5.2 Capacity enhancement

It is notable that the best-in-class capacity airports are those where the airport operator takes ownership and responsibility for enhancing and optimizing capacity. These airports have incentives to challenge current operating procedures and encourage all stakeholders (airlines, ATC providers, control authorities, regulators, handling agents, etc.) to improve operating practices and allow more traffic to be accommodated.

It is also apparent that best-in-class performance has been achieved through years of gradual process improvements, rather than through significant infrastructure development. The leading airports have adopted objective service quality and delay-based approaches to assessing capacity, and to look for season-on-season opportunities to increase capacity and optimize profiles to best meet demand while minimizing congestion and delay.

The kinds of measures that leading airports have implemented as part of a capacity enhancement program to maximize capacity (runways, stands/gates, and terminals) include:

- Improved ATC procedures and wake turbulence categorization to reduce aircraft separations.
- Construction of appropriately placed RATs/RETs[25] to reduce runway occupancy time.
- Regularly measured and monitored KPIs relating to factors such as runway occupancy time, pilot reaction time, aircraft line-up time, runway crossing times, on-time performance, etc.
- Pilot education initiatives to promulgate best practices to maximize performance.
- Airborne and taxiway hold procedures to smooth demand peaks and permit efficient aircraft sequencing.
- Slot performance initiatives to improve slot adherence and punctuality.
- Systematic seasonal capacity reviews and modelling against objective delay criteria, identifying times-of-day when additional slots can be declared.
- Careful design of capacity sub-constraints (e.g., 10- or 15-minute limits, or rolling-hour constraints) to ensure smooth schedule delivery.
- Improved stand allocation and aircraft towing rules to make more efficient use of parking stands.
- Terminal occupancy optimization (for multi-terminal airports) to combine traffic with complimentary peak times and to maximize intra-terminal flight connections.
- Streamlining terminal processing capacity though greater use of online check-in, automatic border controls and new security screening technology.
- Proactive queue management and queue pre-booking via apps.

[25] Rapid Access Taxiways (RATs) and Rapid Exit Taxiways (RETs).

5. GLOSSARY

ACI	Airports Council International
ADRM	Airport Development Reference Manual
ATC	Includes both airport control tower services and en route air navigation services
Capacity	The volume of demand that can be accommodated or processed through an airport facility while delivering desired levels of service • Process capacity, the number of aircraft or passengers that can be processed through an airport facility per unit of time within a given average queue time • Static capacity, the number of passengers that can be held in a given terminal area at any moment in time, based on a given space-per-passenger standard • Dynamic capacity, the throughput of a terminal area based on its static capacity and the passenger dwell times in that area
Capacity declaration	The process of assessing capacity based on the airport's physical and environmental limits, while meeting desired levels of service, and the declaration of appropriate coordination parameters
Control authorities	Public agencies responsible for policing, security screening, immigration, or custom controls
Consultation	The process by which airport operators inform the Coordination Committee and other relevant stakeholders about the capacity declaration, to get their advice and views
Coordination Committee	A committee established at a Level 3 airport to advise the coordinator on matters relating to capacity, slot allocation and monitoring the use of slots at the airport. Any references to a Coordination Committee in these guidelines also apply to any sub-group that the Coordination Committee may have created to address the relevant matters
Coordination parameters	The maximum capacity available for allocation at an airport considering the functional limitations at the airport such as runway, apron, terminal, airspace, and environmental restrictions declared by the airport or other competent body
Delay	The time that an aircraft spends queuing to use the runway: • For departures, delay is additional outbound taxi time (compared with an undelayed standard) plus any time spent queuing at the runway holding point • For arrivals, delay is any additional flying time and/or stack holding used by ATC to smooth and sequence arrivals demand
F&B	Food and beverages

Fire break	A period of lower runway capacity designed to allow any built-up delay from the peak morning period to dissipate before the evening peak
IATA	International Air Transport Association
Level 1 airport	An airport where the capacities of all infrastructure at the airport are generally adequate to meet the demands of users at all times
Level 2 airport	An airport where there is potential for congestion during some periods of the day, week, or season which can be resolved by schedule adjustments mutually agreed between the airlines and facilitator
Level 3 airport	An airport where it is necessary for all airlines and other aircraft operators to have a slot allocated by a coordinator to arrive or depart at the airport during the periods when slot allocation occurs
Line up time	The time a departing aircraft takes to manoeuvre from the holding point to become lined up on the runway
Load factor	The percentage of scheduled seats occupied by passengers
MARS	Mult-aircraft ramp stand, e.g., a stand that can park two Code C aircraft or one Code E aircraft
Operational resilience	The ability of the airport system to recover from an operational disruption
Pilot reaction time	The time between a departing aircraft being given an ATC instruction to line-up on the runway or commence take-off and the aircraft beginning to move
Punctuality	The difference between the scheduled and actual times of operation
RAT	Rapid Access Taxiway
RET	Rapid Exit Taxiway
Runway occupancy time	The time taken by an arriving aircraft from the time it crosses the threshold until it turns off the runway, or the time taken by a departing aircraft from the moment it enters an active runway until it clears the departure end
Service rate	The number of movements per hour that can be handled for a given traffic mix and operational conditions
SID	Standard Instrument Departure Route
Slot	A permission given by a coordinator for a planned operation to use the full range of airport infrastructure necessary to arrive or depart at a Level 3 airport on a specific date and time
SSK	Self-service kiosk
STAR	Standard Arrival Route
WASB	Worldwide Airport Slot Board

WASG	Worldwide Airport Slot Guidelines
Wish list	A list of new slots and/or capacity changes designed to meet airline and passenger demand, used as an input into the runway capacity modelling scenarios

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