






North Runway

Dublin Airport Operating Restrictions

Quantification of Impacts on Future Growth

Updated analysis in response to the ANCA RFI

daa

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1.3	24/06/2021	JC	NR	JR
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Executive summary

Introduction

- daa is developing a new North Runway with operations planned for 2022. The runway's planning permission granted in 2007 contains 31 conditions. Condition 3d requires that that the new North Runway will not be used between the hours of 23:00-07:00 local time, and Condition 5 limits the number of 23:00-07:00 operations to 65/night on average when the new runway is in operation.
- The airport is also subject to a planning condition related to the development of Terminal 2 (which opened in 2010) which caps DUB's annual terminal passenger throughput at 32 million.
- From March 2020, the global aviation industry has been impacted by the COVID-19 pandemic and associated air travel restrictions, leading to large reductions in airport throughput in 2020, with only partial recovery expected in 2021.
- This updated assesses the impact of the proposed North Runway operating restrictions during the period from 2022 until the airport's unconstrained demand returns to the 32 million annual passenger level, expected in 2025.
- Longer term forecast scenarios (unconstrained and constrained) are also presented for the period from 2025 to 2040.

Demand

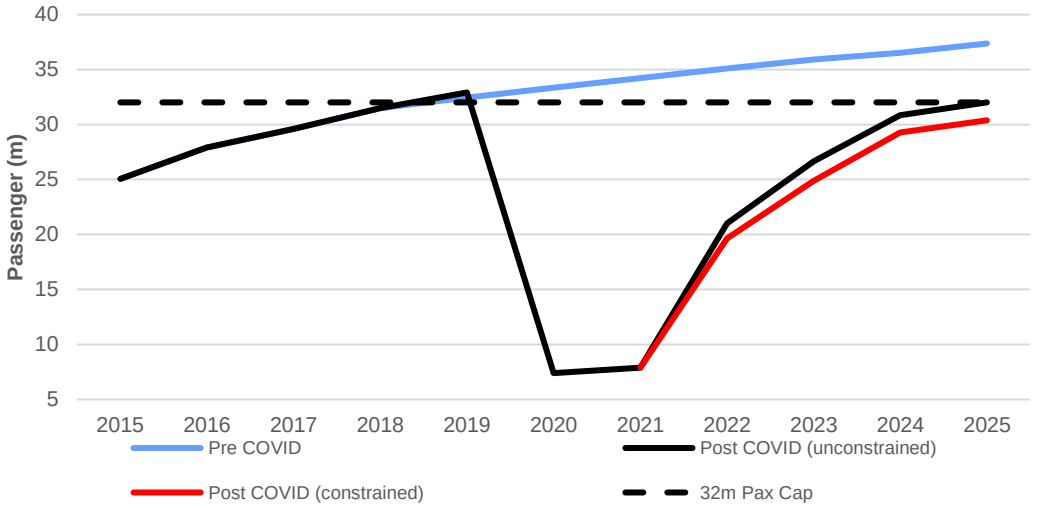
- Dublin Airport (DUB) saw strong traffic growth during the 2009-2019 period to a peak of 32.9m passengers in 2019. Ireland's island status means that air connectivity is critical to its economic development.
- The airport has two main airlines providing the majority of flights: Ryanair (35% share) and Aer Lingus (29% share), based on the Summer 2019 schedule. The airport serves mostly short haul services (90% of flights) to points in the UK and Europe. Long haul services are mainly to North America, plus some services to the Middle East, Asia and Africa.
- Demand for night flights between 23:00-07:00 is driven mainly by short haul services operated by aircraft based at DUB. In order to achieve the high levels of aircraft utilisation necessary for airline competitiveness, based aircraft tend to operate with first departure between 06:00-07:00 and last arrival after 23:00. Other 23:00-07:00 period flights are long haul arrivals in the early morning, and a small number of cargo flights mainly operated by the time-critical package delivery integrators (FedEx, DHL, TNT and UPS).
- The 1h time difference between Ireland and mainland Europe means that flights need to leave early (before 07:00) to arrive in time for business passengers to have a full working day at their destination. The geographical position of DUB means that there are longer sector distances to many European destinations than from other competing airports. This means that DUB requires longer operating days than competing European hubs. Similarly, DUB's proximity to North America compared to the rest of Europe means that transatlantic flights arrive earlier in DUB than at other European airports.
- The duration of the proposed DUB night time restrictions period, spanning 8h from 23:00 to 07:00, is unusually broad compared to other airports with such restrictions. The average night restrictions periods are 6h to 6.5h in duration. For example, the London airports night restrictions period is 23:30 to 06:00 local time.
- The DUB night restrictions period is also unusual in that it includes a peak hour of demand at the airport – 06:00-07:00. Therefore, the impact of the restriction on future growth is very significant.
- Pre-COVID levels of demand for night flights (23:00-07:00) is over 100/night, with 113/night associated with regularly scheduled services on a typical busy day in Summer 2019. This is far in excess of the proposed limit of 65/night (measured as an average over the 92 day modelling period).
- Demand for 23:00-07:00 night flights is not expected to reduce significantly during the post COVID recovery. As traffic recovers to pre-COVID levels by 2025, the forecast schedules analysed for this study require 116/night movements for regularly scheduled services (excluding ad hoc flights).
- The need for night flights at DUB – driven by the need for airlines to achieve competitive levels of aircraft utilisation, flight connection connectivity, and to support timely air freight services into Ireland – is not diminished for the post COVID air transport scenario.

Executive summary

Impact of Operating Restrictions

- The chart opposite shows the post COVID recovery scenario (unconstrained) compared with the daa's pre COVID centreline forecast scenario. After the severe disruption to air travel in 2020 and partial recovery in 2021, demand is forecast to recover to 64% of 2019 levels by 2022 and grow to 32m annual passengers by 2025.
- This study simulated the slot coordination process to create constrained busy day schedules from 2022 (representing the first year of operations of the new runway) to 2025 (when the 32m passenger level is expected to be reached).
- It modelled the impact of the North Runway night operating restrictions (Conditions 3d and 5) and overall runway capacity (operating in compliance with the planning conditions) on airline schedules, taking into account the impacts on aircraft rotations throughout the day.
- The assessed impact of the night operating restrictions is a loss of 6.3m passengers (-5.7%) over the 4-year period 2022-2025. It should be noted that this estimated impact assumes that airlines are willing and able to accept alternative slot times outside of the 23:00-07:00 night period, which would be commercially and/or operationally suboptimal. In a post-COVID crisis environment, weak passenger demand is likely to mean that airline flexibility may be reduced, and the actual impact of the operating restrictions could be higher.
- The burden of the night restrictions falls mainly on the DUB-based Irish carriers Aer Lingus and Ryanair. The DUB-based carriers require early morning departures and late evening arrivals for their short haul operations, and Aer Lingus requires early morning arrivals for its transatlantic operations. Non-Irish carriers are less affected by the restrictions as they have proportionately fewer operations in the restricted 23:00-07:00 period.
- The operating restrictions constrain growth in short haul operations throughout the day, as the lack of night slots limits the number of DUB-based aircraft that can be accommodated, with each aircraft performing multiple flights during the operating day.
- Condition 3d (limiting night operations to a single runway) does not in itself act as an additional constraint, as it provides sufficient capacity for a 65/night limited schedule. However, in the absence of the Condition 5 night movement limit, there is a requirement for dual runway operations between 06:00-07:00 to meet demand.

DUB Annual Passenger Forecasts Unconstrained v Constrained



Annual Traffic Impact Summary (millions of passengers)

	2022	2023	2024	2025	2022-2025 Total
Unconstrained	21.0	26.7	30.8	32.0	110.5
Constrained	19.6	24.9	29.3	30.4	104.2
Difference	-1.4	-1.8	-1.6	-1.6	-6.3

Source: Mott MacDonald analysis

Note:
***Unconstrained** is Scenario D – without Conditions 3d and 5 in place and with 32m annual passenger cap **(Proposed scenario)**; **Constrained** is Scenario E – with Condition 3d and 5 in place and the 32m annual passenger cap **(Permitted scenario)**, as referred to in the planning application and Environmental Impact Assessment Report (EIAR)*

Annual Traffic Impact

Impact of Operating Restriction Scenarios

- This study has developed busy day forecast schedules and analysed the impacts of operating restrictions for four scenarios, in addition to the original daa input schedule, as summarised in the tables opposite.
  - **Scenario A** is the daa input busy day forecast schedules, aligned with the Centreline annual forecast case. Flights are timed at commercially and operationally 'ideal' timings and are not smoothed to fit within airport capacities
  - **Scenario B** applies the current North Runway night operating restrictions (the 65/night limit and no use of the North Runway 23:00-07:00), but does not apply the 32m annual passenger cap

    The night restrictions severely limit traffic growth, delaying post-Covid recovery to 2019 traffic levels by around 2 years (from 2025 to 2027).
  - **Scenario C** is an unconstrained schedule with no night limits or annual passenger cap. The daa input schedule (Scenario A) has been coordinated within the physical runway capacity constraints, adjusting flight times to smooth demand, but Scenario C has the same volume of flights as the daa input schedule. The runways are assumed to operate in mode Option 7b (see page 8) and according to the capacities discussed in Section 3 (page 20) of this report.

    Runway capacity is sufficient to accommodate the full daa input forecast schedule with relatively minor schedule timing adjustments. Unconstrained annual forecast passengers can be accommodated
  - **Scenario D** applies the 32m annual passenger cap to the runway capacity coordinated schedules of Scenario C, but does not apply the night operating restrictions (Conditions 3d and 5)

    The 32m passenger level is reached in 2025. The 32m cap begins to have an impact from 2024 as traffic growth approaches the 32m capped level asymptotically
  - **Scenario E** applies the 32m annual passenger cap to the night operating constrained schedule of Scenario B.

    The 32m passenger level is reached around 2027
  - **Scenario F** applies the restriction to operate one runway only 23:00-07:00, but without the 65/night movement cap and without the 32m annual passenger cap.

    Constrained runway capacity in the 06:00-07:00 hour for first-wave departures limits growth in DUB-based aircraft flying

Scenario	Condition 3d (single runway)	Condition 5 (night limits)	32m cap	Description
A	na	None	No	*daa input schedule*
B	2300-0700	65/night	No	*Night limit constraints*
C	2300-0600	None	No	*Unconstrained (runway capacity only)*
D	2300-0600	None	Yes	*32m cap only*
E	2300-0700	65/night	Yes	*Night limits + 32m cap*
F	2300-0700	None	No	*Single runway 2300-0700 only*

Scenarios	A	B	C	D	E	F
2015	25.0					
2016	27.9					
2017	29.6					
2018	31.5					
2019	32.9	32.9	32.9	32.9	32.9	32.9
2020	7.4	7.4	7.4	7.4	7.4	7.4
2021	7.9	7.9	7.9	7.9	7.9	7.9
2022	21.0	19.6	21.0	21.0	19.6	20.6
2023	26.7	24.9	26.7	26.7	24.9	26.2
2024	31.2	29.3	31.2	30.8	29.3	30.8
2025	32.3	30.4	32.3	32	30.4	31.9
2026	34.0	31.6	34.0	32	31.2	33.3
2027	35.6	32.8	35.6	32	32	34.7
2028	37.0	33.9	37.0	32	32	36.2
2029	38.4	35.1	38.4	32	32	37.6
2030	39.6	36.3	39.6	32	32	39.0
2031	40.5	37.0	40.5	32	32	39.7
2032	41.3	37.6	41.3	32	32	40.4
2033	42.1	38.2	42.1	32	32	41.0
2034	42.7	38.9	42.7	32	32	41.7
2035	43.4	39.5	43.4	32	32	42.4
2036	44.0	40.0	44.0	32	32	43.0
2037	44.7	40.5	44.7	32	32	43.6
2038	45.3	41.0	45.3	32	32	44.2
2039	46.0	41.5	46.0	32	32	44.7
2040	46.6	42.0	46.6	32	32	45.3
Traffic Impact						
2022-2025	-	-7.0	0.0	-0.7	-7.0	-1.7

Source: Mott MacDonald analysis, based on daa Centreline *forecast scenario*

Introduction

Introduction

Introduction

- This report quantifies the expected impacts of runway operating restrictions after the opening of the North Runway on traffic growth at Dublin Airport (DUB) during the period from 2022-2025 and in the long term to 2040.
- Dublin Airport traffic is forecast to return to 2019 (pre COVID) levels of around 32m passengers by 2025, and to grow to just over 46m passengers by 2040, based on unconstrained demand projections.
- The study assesses unconstrained patterns of demand and various capacity constrained scenarios reflecting different assumptions related to the North Runway planning conditions. These scenarios are described in Sections 3 and 5.

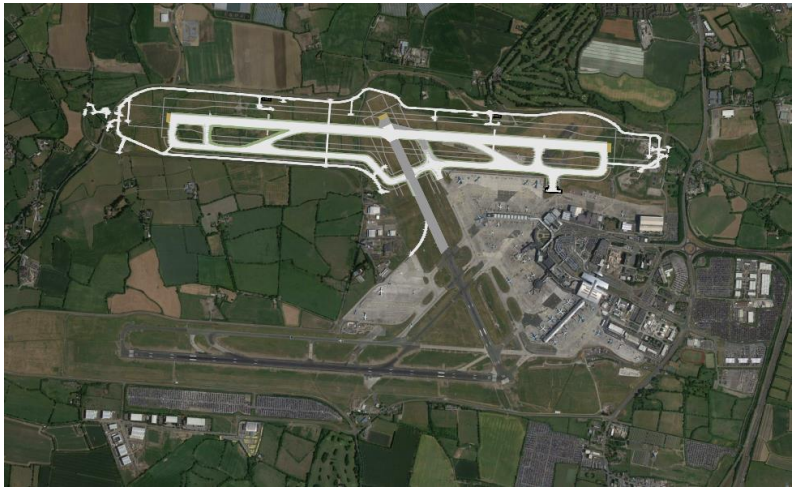
North Runway Planning Conditions

- daa is investing around €320 million to develop a new 3,110m runway for Dublin Airport, located 1.7km north and parallel to the existing main runway. The new runway is expected to be operational in 2022.
- The planning permission granted in 2007 contains 31 conditions. Two of these conditions (Conditions 3d and 5) relate to operating restrictions on the use of the runways and overall airport operations at night.
  - Limiting 23:00-07:00 night movements to 65/night
  - Restricting use of the new North Runway to daytime hours 07:00-23:00

Terminal 2 Planning Condition

- Dublin Airport is also subject to a planning condition linked to the development of Terminal 2 (which opened in 2010), which limits the annual number of passengers using the airport's terminals to 32 million.

New North Runway Layout



Source: daa

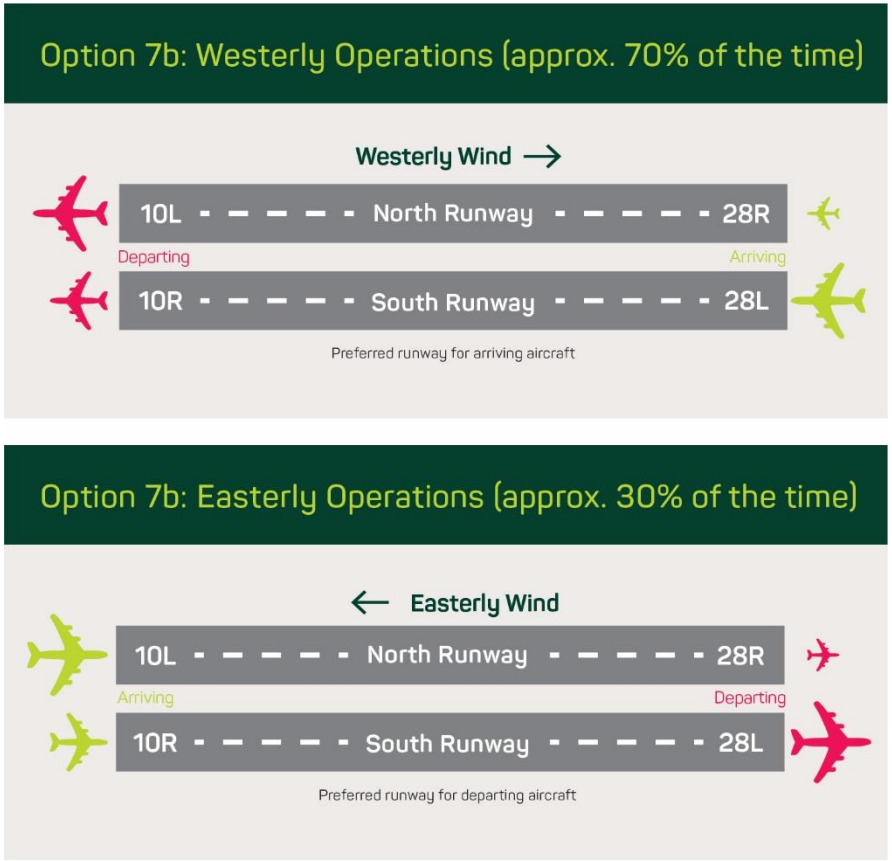
Introduction

Runway Planning Conditions

- The North Runway planning permission(1) contains the following conditions to take effect from completion of the new runway:
  - Condition 3(d) states that: *Runway 10L-28R shall not be used for take-off or landing between 2300 hours and 0700 hours*(2).
  - Condition 5 states that: *the average number of night time aircraft movements at the airport shall not exceed 65/night (between 2300 hours and 0700 hours) when measured over the 92 day modelling period.*

- This study interprets Condition 5 as follows:
  - Night movements are based on actual aircraft landing or taking-off times.
  - The 65/night limit is based on the average over the 92 day modelling period (16 June to 15 September).
  - All night operations, including ad hoc operations and unplanned operations (e.g., delayed daytime flights), as well as regularly scheduled night flights are taken into account.
  - Therefore, scheduling limits to ensure compliance must take account of aircraft taxi times and make reasonable allowances for delayed flights.

Runway Modes of Operation



Source: daa

(1) An Bord Pleanála decision 2007, Reference Number: PL06F.217429

(2) except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports

Introduction

Irish National Aviation Policy

- The Department of Transport, Tourism and Sport published a National Aviation Policy (NAP) for Ireland in August 2015. The goals of the NAP are:
  - to enhance Ireland's connectivity by ensuring safe, secure and competitive access responsive to the needs of business, tourism and consumers;
  - to foster the growth of aviation enterprise in Ireland to support job creation and position Ireland as a recognised global leader in aviation; and
  - to maximise the contribution of the aviation sector to Ireland's economic growth and development.
- The NAP identified the opportunity to develop Dublin Airport as a secondary hub, competing effectively with the UK and other European airports for the expanding global aviation services market. This is seen as an important means of maximising air access for the Irish economy. The NAP also identified importance of ensuring that Dublin Airport has sufficient capacity, including a second, parallel runway, to facilitate its development as a hub.
- The commitments of the NAP include:
  - Creating conditions to encourage the development of new routes and services, particularly to new and emerging markets;
  - Ensuring a high level of competition among airlines operating in the Irish market;
  - Optimising the operation of the Irish airport network to ensure maximum connectivity to the rest of the world;
  - Ensuring that the regulatory framework for aviation reflects best international practice and that economic regulation facilitates continued investment in aviation infrastructure at Irish airports to support traffic growth
- The proposed night restrictions at DUB run counter to these policy objectives in that they limit growth at the airport, reduce potential new routes and services (especially to emerging markets), and do not serve to maximise connectivity.

Patterns of Demand

Patterns of Demand

Pre COVID-19 Traffic

- In 2019, prior to the COVID-19 pandemic, the Dublin schedule was dominated by short haul services to the UK and other parts of Europe (87% of flights), operated primarily by the based-carriers: Ryanair, Aer Lingus, and Aer Lingus Regional (Stobart Air). Together these carriers made up 72% of operations.
- Long-haul operations accounted for approximately 18% of total seat capacity offered out of DUB, primarily on Transatlantic routes as well as services to the Middle East, Africa and China.

Aer Lingus

- Aer Lingus had a fleet of 27 Airbus 320/321 aircraft based in DUB, 2 A320s that overnight at Heathrow, plus 2 Embraer 190 aircraft serving London City Airport. Its long haul fleet consisted of 13 Airbus 330s, 1 Airbus 321LRs and 2 B757s, serving 13 destinations in the US and Canada. The B757s were being replaced with A321LRs in 2020.
- Aer Lingus operates a hybrid business model, blending aspects of full service and low cost carrier strategies. In particular, it seeks to maximise aircraft utilisation from its DUB based fleet.
- Aer Lingus has been growing its transatlantic services in recent years, and developing DUB as a gateway Transatlantic-European hub.

Ryanair

- Ryanair operated 32 DUB-based Boeing 737-800 aircraft, and also served DUB from its other European bases with away-based flights representing 25% of its DUB operations.
- In 2019, Ryanair operated from 84 bases throughout Europe and serves 234 airports. DUB is its second largest base after Stansted. It had a total fleet of 438 aircraft in 2019, and has orders and options for 210 Boeing 737-8Max 200 airrcaft[1)].
- The Ryanair LCC business model is built on achieving high aircraft utilisation, with long operating days and quick aircraft turnarounds.

(1) Ryanair 2019 Q3 report

2019 market share & capacity summary table by main DUB carrier

Main DUB Carriers	ATMs (Pax only)	Seats	Seats/ATM
Ryanair	35%	38%	189
Aer Lingus	29%	30%	189
Aer Lingus Regional	8%	3%	69
British Airways	2%	2%	167
Other Scheduled Carriers	24%	25%	186
Charter Carriers	1%	1%	189

Source: Mott MacDonald analysis of Summer 2019 schedule

2019 market share & capacity summary table by main DUB market segment

Markets	ATMs (Pax only)	Seats	Seats/ATM
1. UK London	15.5%	14.2%	166
2. UK Provincial	19.8%	14.9%	135
3. Eastern Europe	7.3%	7.7%	189
4. Western Europe	25.2%	24.5%	175
5. Southern Europe	19.4%	20.5%	190
6. North America	9.5%	13.7%	261
7. Other Regions	2.2%	4.2%	350
8. Domestic	1.1%	0.4%	59
TOTAL	100%	100%	180

Source: Mott MacDonald analysis of Summer 2019 schedule

Patterns of Demand

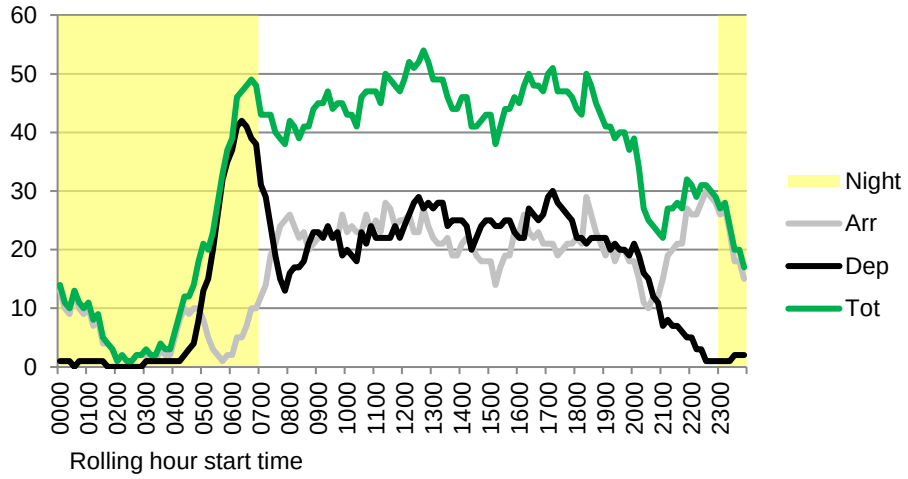
2019 Patterns of Demand

- The schedule structure at DUB reflects the business models of both Aer Lingus and Ryanair, with a high proportion of DUB based aircraft operating high utilisation short haul services.
- There is a sharp departures peak in the 06:00 hour and a broader arrivals peak between 22:00 and 00:00 associated with the first departures and last arrivals of DUB based aircraft.
- Long haul arrivals are concentrated in the morning period, with an early peak in the 05:00 hour and a broader peak around 08:00. Departures are spread from the mid-morning to early afternoon. This pattern of demand is typical of transatlantic services, where evening departures from North America fly overnight to arrive in DUB in the morning. Arrival times in DUB tend to be earlier than at other European airports due to Ireland's close proximity to North America and its time zone being 1h earlier than Central European Time.
- Between 02:00 and 05:00 there are few regularly scheduled flights – only a small number of freighter flights and some ad hoc charter flights.

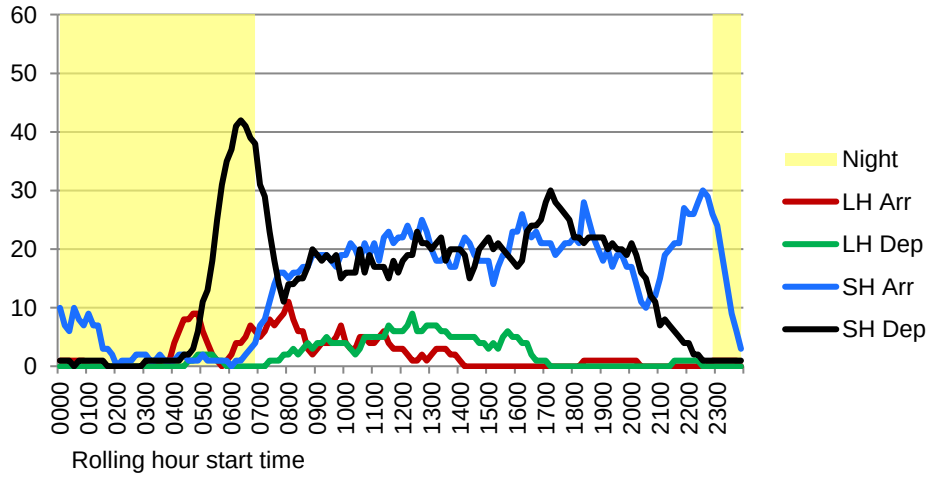
Flight Connections

- Development of DUB as a transatlantic hub requires efficient flight connections. The early morning long haul arrivals connect with a large number of first-wave short haul departures operated by DUB based aircraft. These short haul aircraft return to DUB from around 09:00 and connect with the transatlantic departures, departing between 10:00 and 17:00.
- Maintaining this hub connectivity requires early morning transatlantic arrivals from 05:00 local time to facilitate Eastbound connections with short haul services departing from around 06:00. Early first-wave short haul departures are required to ensure that the returning inbound arriving flight can provide Westbound connections with the long haul departures in the mid to late morning.

Demand Profile 2019 Busy Day Schedule



Demand Profile 2019 Busy Day - Longhaul/Shorthaul

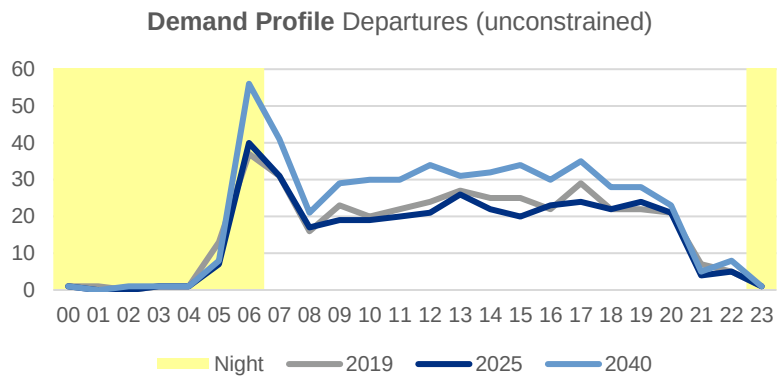


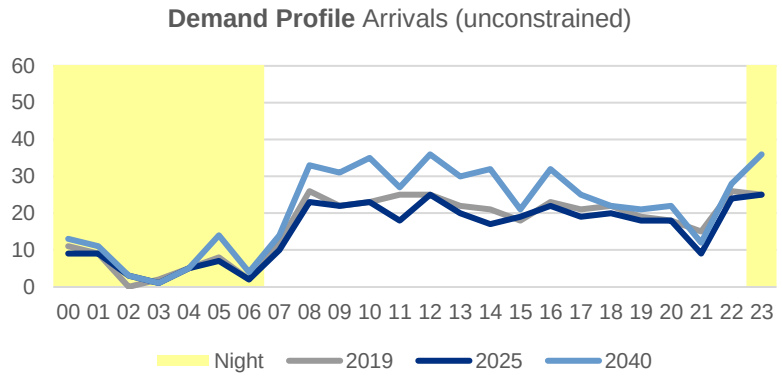
Source: Mott MacDonald analysis

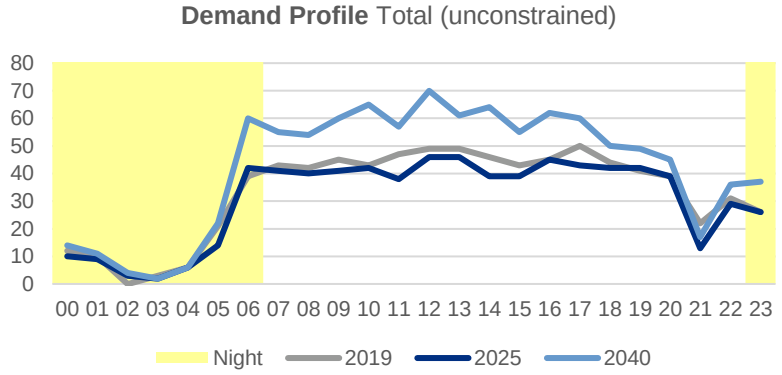
Patterns of Demand

Patterns of Demand

- The analyses of this study are based on unconstrained forecast busy day schedules. The forecast schedules represent annual throughputs during the post-Covid recovery period 2022-2025, when traffic is expected to return to the 32m annual passenger level, similar to pre-Covid levels. Long term forecast schedules are developed and analysed at 5-year increments to 2040 (ie, 2025, 2030, 2035, 2040).
- The general pattern of demand is expected to develop along similar patterns to today, with a large peak of departures demand in the 06:00 hour, representing first-wave departures on DUB-based aircraft. Arrivals is less peaky, but there is a peak of arrivals in the late evening (22:00 onwards) corresponding to the return of DUB-based aircraft. Longhaul arrivals are concentrated in the early morning period, particularly in the 05:00 hour.
- This pattern of demand provides improved connectivity for the development of DUB as a secondary hub airport, as well as providing for efficient point-to-point short haul services.
- Current (2019) schedules are constrained by the airport's single runway capacity. With the opening of the North Runway, a peakier pattern of demand is expected in the peak 06:00 departures hour (reflecting airlines' commercially and operationally ideal operating times).
- Meeting the level of departure demand in the 06:00 hour, which exceeds single-runway capacity, requires use of the North Runway in the 06:00-06:59 hour.







Source: Mott MacDonald analysis

Night Movement Demand (23:00 – 07:00 period)

Current Night Movements

- In Summer 2019, there were 113 regularly scheduled flights during the 23:00-07:00 period(1). Short haul scheduled services make up the bulk of these night flights, with departures between 06:00-07:00 and arrivals after 23:00. There are 17 long haul night arrivals in the early morning.
- The night cargo operations are primarily flights by the package integrators DHL, FedEx, TNT and UPS operating to their main sortation hubs. These operations are very time-critical in order to connect at these hubs and to achieve an overnight package delivery service.

Future Night Movement Demand

- Busy day night movements is expected to recover to levels similar to 2019 levels with the post COVID traffic recovery by 2025.
- The table opposite also shows the degree of reduction in daily night movements that would be required to meet the 65/night operating restriction (23:00 – 07:00 period).

Dublin Forecast Night Movement Demand 23:00 – 07:00 (based on busy day schedules)

Flight Type	2019	2025	Constrained
Pax Scheduled	101	105	54
Short haul	*84*	*91*	*48*
Long haul	*17*	*14*	*6*
Pax Charter	3	2	2
Cargo	9	9	9
Scheduled sub-total	**113**	**116**	**65**
Other (ad hoc)	3	5	0
Total	**116**	**121**	**65**

(1) Based on the busy day schedule for 22 July 2019 analysed. Number of ad hoc night flights in particular will vary.

Drivers of Night Movement Demand

There are a number of reasons why airlines need to schedule services during the 23:00-07:00 night period:

Aircraft Utilisation

- A key driver of airline cost efficiency and competiveness is the ability to achieve high levels of utilisation of their aircraft assets. The chart below illustrates the lines-of-flying (flights throughout the day) for representative DUB based aircraft.
- If airlines were restricted to a 16h operating day (07:00-23:00) then the necessary level of utilisation would not be achievable, impacting on the economic viability of aircraft based at DUB. Ryanair, for example, has operating bases at a number of airports and if it could not operate profitably at DUB then it would likely choose to base more of its aircraft at other airports.
- In this case, the traffic lost is not just the night period flights but also the daytime flights that the based aircraft would have operated throughout the day.
- If high aircraft utilisation cannot be achieved due to the reduced operating day resulting from the night restrictions, then the consequence is also likely to be higher fares for passengers' on remaining services.

Time Zone Differences and Geographical location

- The 1h time difference between Ireland and mainland Europe means that flights need to leave early (before 07:00) to arrive in time for business passengers to have full working day at their destination(1).
- The geographical position of DUB means that there are longer sector distances to many European destinations than from other competing hub airports. This means that DUB requires longer operating days than competing European hubs. Similarly, DUB's proximity to North America compared to the rest of Europe means that transatlantic flights arrive earlier in DUB than at other European airports.

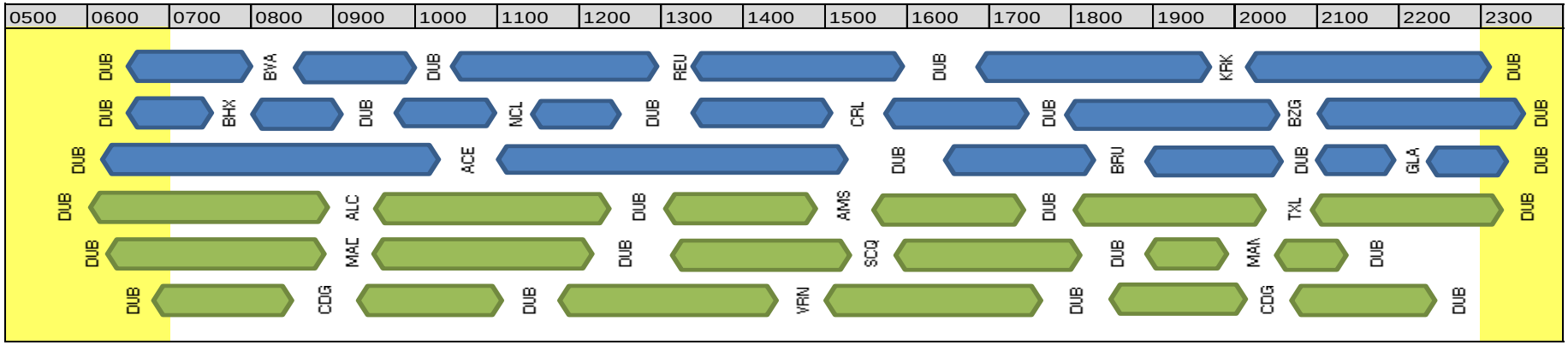
Hub Connections

- The DUB hub connecting model is predicated on early morning long haul arrivals and early short haul departures able to return to connect with the long haul departures. Without this connecting traffic, the Irish point-to-point market would be too small on its own to support many transatlantic services.

Punctuality and Resilience

- If aircraft lines-of-flying are squeezed into a shorter operating day there will be less flexibility in the schedule to cope with delays and disruption.

Illustration of Airline Airrcaft Utilisation



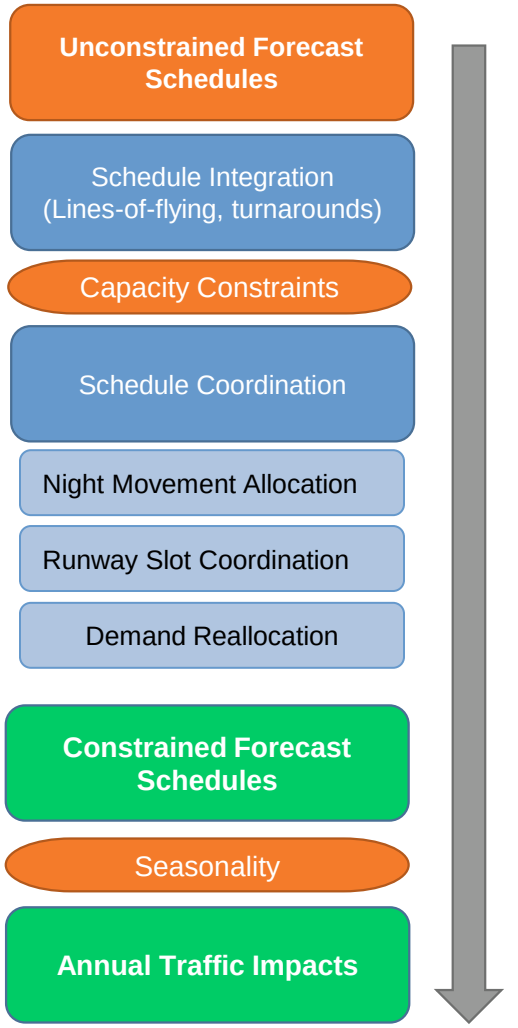
(1) From the Behaviours & Attitudes Business Barometer Survey Results 2016, 70% of business owners believe that a flight schedule facilitating arriving in time for the start of the business day is important

Constrained Case Analysis

Constrained Case Analysis

Methodology

- Quantification of the impacts of the DUB night restrictions involved development of detailed constrained busy day forecast schedules.
- The schedules assessed were unconstrained busy day forecast schedules for the period 2022 to 2040, aligned with the daa's *Centreline* annual forecast case(1). The 'unconstrained' schedules represent growth rates in line with expected passenger demand, with flights times unadjusted for any operating restrictions (ie, night restrictions or runway operating hours).
- All arriving and departure flights were linked into turnarounds, and DUB based aircraft lines-of-flying were integrated. This allowed modelling of the full impact of the night restrictions on other rotations of the same aircraft during the day.
- The schedules were coordinated within the airport's night limits and runway capacity constraints in a simulation of the slot coordination process, allocating slots in accordance with EU slot allocation rules. The coordination process sought to optimise schedules within available capacity and to ensure operationally feasible schedules.
- In applying the 23:00-07:00 night operating constraints (Condition 3d limiting to single runway operations 23:00-07:00 and Condition 5 capping night flights at 65/night), some demand for new flights could not be accommodated within capacity and were removed from the schedule. Where feasible, alternative flights were added to the schedule so as not to overstate the impact of the night restrictions being assessed.
- The process included a qualitative assessment as to how the constraints impacted on hub connectivity. Loss of connectivity could render assumed new services and routes unviable and/or delay their introduction.
- The outputs of the simulated slot coordination process were realistically constrained busy day schedules. The busy day traffic was then converted in annual equivalents in order to assess the overall impact of constraints on airport throughput.



(1) daa annual forecasts include Centreline, High and Low cases.

Constrained Case Analysis

Approach to Applying Schedule Constraints

- The process of constraining the schedule for night operating restrictions was:
  - STEP 1: the 32m / 2025 forecast schedule was constrained within the 65/night limit, allocating night slots based on the pro rata methodology discussed in the section 'Initial Night Movement Allocation' on page 21. Excess night slots were retimed into the day period where possible with adjustments made to the corresponding flights operated by the same aircraft as required. Where retimes were not possible, flights associated with the night movement (including subsequent flights operated by the same aircraft) were removed from the schedule.
  - STEP 2: the constrained 2025 schedule was treated as 'historic slots', and new flights for schedule years 2030, 2035 and 2040 were added in stages and assigned slots within remaining available capacity. Flights were retimed where necessary and where feasible. For each year, the previously coordinated years' flights were treated as 'historic slots' to provide a realistic simulation of the slot coordination process.
  - STEP 3: if flights could not be accommodated due to the operating restrictions and no feasible alternative slot times were available, they were removed from the schedule. The corresponding arrival or departure flights associated with the same aircraft rotation or line-of-flying were also removed from the schedule.
  - Given that the 65/night limit was fully used under the constrained 2025 schedule, no new night slots were assigned in subsequent years.

- For scenarios with the 32m passenger cap, schedule growth was capped at the busy day equivalent of 32m annual passengers, following the growth trajectory of the equivalent uncapped scenario (ie, with or without night restrictions) up to the 32m traffic level.
- For all scenarios (except for Scenario A – daa input schedules), flights are coordinated to fit within the physical runway capacity of the airport, expressed as hourly and 10-minute limits

Retiming Criteria

- For short-haul, the criteria for retimes was based on operationally and commercially feasible timings, considering the whole line-of-flying for each based aircraft. If it was not possible to accommodate the full number of aircraft rotations and maintain aircraft utilisation, all aircraft rotations associated with the line of flying were removed from the schedule.
- For long haul services, retimes of up to 90 minutes were generally considered possible, but feasibility was checked against the timings at the other end of the route. Where retiming was not possible, the affected arrival/departure flight pairs were removed from the schedule.
- The timing adjustments were checked for their feasibility in terms of commercial timings for the route, considering benchmark operations at both DUB and at comparable European airports.
- Timing adjustments also ensured that airline minimum turnaround times for the specific aircraft type were respected.

Airline Engagement

- As part of earlier iterations of this study, meetings were held with Aer Lingus and Ryanair to understand their strategies with regard to network, route and fleet development, the key criteria for scheduling services at DUB, and understanding the importance of night operations to their businesses.
- This input has been incorporated into the approach to constraining the forecast DUB schedules to make them as realistic as possible. The constrained schedules were developed by Mott MacDonald in a simulation of the slot coordination process.

Capacity Constraints

Night Restrictions (23:00 – 07:00 night period)

- The 23:00-07:00 night restrictions period applies to landing and takeoff times. Schedules are based on on/off stand times, so an allowance needs to be made for taxi times.
- The 65/night limit applies to actual runway operations, including unplanned night flights (e.g., delayed flights). Therefore it is prudent to apply buffers to the night restrictions period to allow for modest delays. This will not prevent excessive night use on disrupted days, but will minimise such occurrences. These buffer times have been benchmarked against other airports with night restricted periods, and incorporate the views of the DUB-based carriers consulted as part of this study regarding prudent scheduling buffers for night-restricted airport operations.

Night Slot Periods:

Arrivals	22:45 to 07:10 on blocks time
Departures	22:30 to 06:45 off blocks time

Note:

The above night-slot definition means that the latest arrival day-slot is 22:40 on block time (equivalent to a 22:30 landing time), giving a 30 minute buffer for operational delays. The earliest arrival day-slot is 07:15 on block time to ensure landing after 07:00.

The latest departure day-slot is 22:25 off blocks time, giving approximately a 30 minute buffer for operational delays. The earliest departure day-slot is 06:50, with takeoff after 07:00, accounting for the outbound taxi time.

Capacity Constraints

Runway Capacities

- The table opposite details the runway capacities assumed for this study.
- The hourly capacities are based on:
  - Single runway mixed mode operations at night
  - Segregated mode (separate arrival and departure runways) during non-peak daytime hours
  - Semi mixed mode at peak times, with one runway operating in mixed mode (both arrivals and departures) and the other runway handling either arrivals or departures depending on the demand peak.
- In addition to hourly limits, a 10 minute scheduling constraint is applied to smooth demand within each hour.

Assumed Runway Capacities

	Arrivals	Departures	2-way
Single Runway – Night (3)			
60 minute	27	27	45
10 minute	6	6	9
Segregated Mode – Daytime except peaks			
60 minute	35	44	79
10 minute	7	8	15
Semi Mixed Mode – Departures Peak (1)			
60 minute	27	71	89
10 minute	5	12	15
Semi Mixed Mode – Arrivals Peak (2)			
60 minute	62	27	80
10 minute	11	5	15

Notes:
(1) For scenarios with Condition 3d – 23:00-07:00 single runway operations (Scenarios B, and E), the departures peak is 07:00-07:59; for scenarios without Condition 3d (Scenarios A, C, D), the departures peak is 06:00-06:59
(2) For all scenarios, the arrivals peak is 22:00-22:59

Night Movement Allocation

Initial Night Movement Allocation

- The number of regularly scheduled night flights on a typical busy day for 2025 (based on a Summer 2020 pre COVID impact busy day) is 116 flights (plus ad hoc non-scheduled movements). Implementing the 65/night restriction requires a 44% reduction in current scheduled demand.
- The assumed demand reductions were made by applying pro rata reductions by airline of up to 50%, with an exemption for airlines with only 1 night flight. An exception to this general rule applies to airlines with flights scheduled close to the edge of the night restrictions period and where a retiming out of the night was assumed to minimise overall impacts.
- The consequence of this approach is that the demand reduction falls primarily on the Irish based carriers with night movements:, Aer Lingus and Ryanair.
- Flights were chosen in order to minimise the amount of timing adjustment required, for example, by moving flights from the edge of the night restrictions period into the daytime period. Consideration was given to the aircraft lines-of-flying to ensure operational feasibility and to ensure that minimum ground times for aircraft turnarounds were respected.
- Since demand in 2025 is already in excess of 65/night, any new demand for night flights arising after the 2025 night allocation cannot be offered a night slot.

Dublin Baseline Night Movement Allocation

Carrier	Flight Type	2025 Demand	2025 Allocation	Reduction	
Aer Lingus	Pax Scheduled	41	21	-49%	
Ryanair	Pax Scheduled	47	23	-51%	
Stobart	Pax Scheduled	2	0	-100%*	Minor retime
Air Moldova	Pax Scheduled	1	1	0%	
Aegean	Pax Scheduled	2	1	-50%	
Air France	Pax Scheduled	1	1	0%	
Cathay Pacific	Pax Scheduled	1	0	-100%*	New after 2022
Ethiopian Airlines	Pax Scheduled	4	3	-25%	
KLM	Pax Scheduled	1	1	0%	
Lufthansa	Pax Scheduled	3	2	-33%	
Aeroflot	Pax Scheduled	1	1	0%	
United Airlines	Pax Scheduled	1	0	-100%*	10min retime
Tomsonfly	Pax Charter	2	2	0%	
TNT	Cargo	1	1	0%	
Bluebird Cargo	Cargo	1	1	0%	
FedEx	Cargo	1	1	0%	
DHL	Cargo	2	2	0%*	Retime not possible
UPS	Cargo	2	2	0%*	Retime not possible
XM Cargo	Cargo	2	2	0%*	Retime not possible
Total		**116**	**65**	**-44%**	
GA/Positioning		5			
Total		**121**			

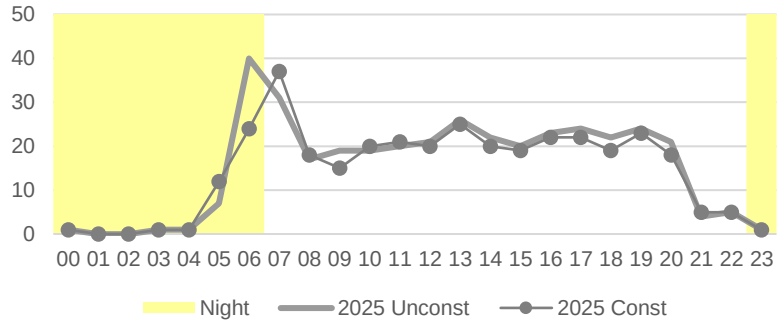
Scenario Summaries

Constrained Case Summary

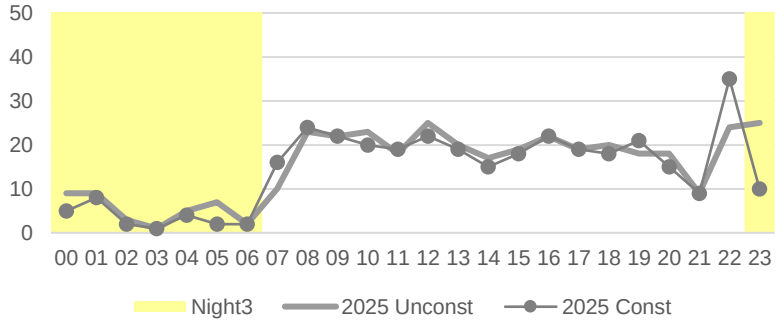
Slot Allocation Summary

- The charts opposite show Constrained schedule – Scenario E applying both the night operating restrictions (Conditions 3d and 5) compared with the unconstrained pattern of demand, but limited to 32m annual passengers in 2025 (Scenario D).
- The 65/night limit requires flights to move out of the 23:00-07:00 period. This shifts the arrivals peak from the 23:00 hour into the 22:00 hour, creating a more pronounced peak overall.
- The departures peak shifts from the 06:00 hour to the 07:00 hour. There is also a peak in total movements in the 07:00 hour, in excess of unconstrained demand, due to flight bunching outside the night period.
- Overall the night operating restrictions constrained case has 40 fewer busy day flights (-5.4%) in 2025 as a result of impacted night flights that could not be realistically retimed.

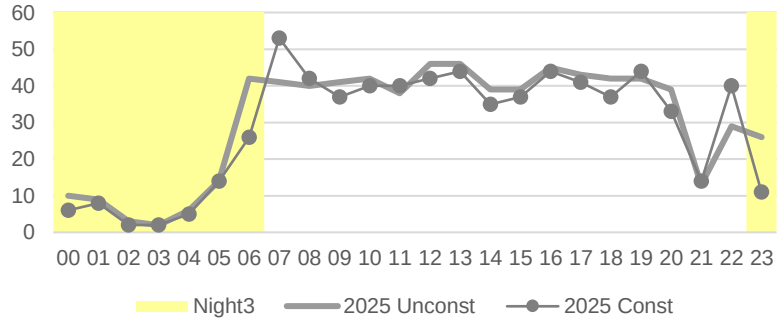
Unconstrained v Constrained Departures (2025)



Unconstrained v Constrained Arrivals (2025)



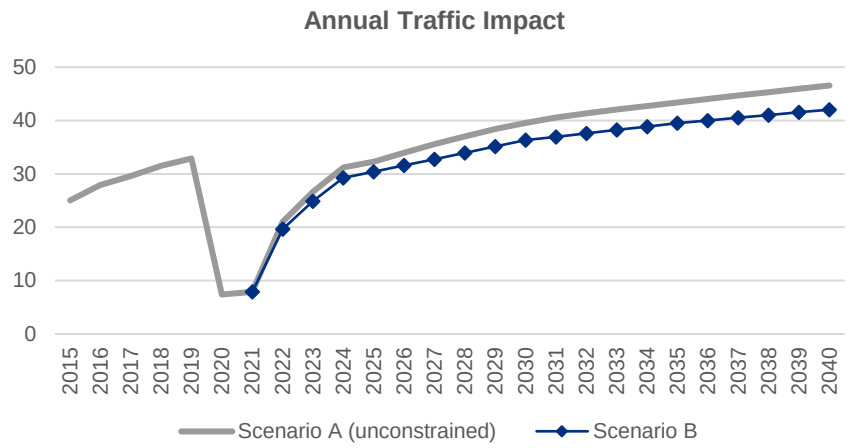
Unconstrained v Constrained Total (2025)

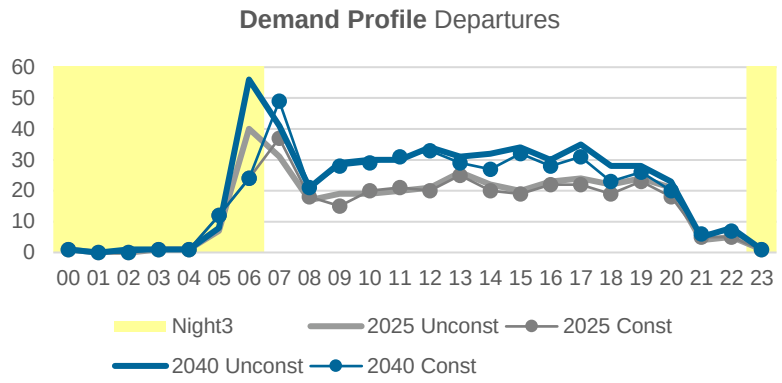


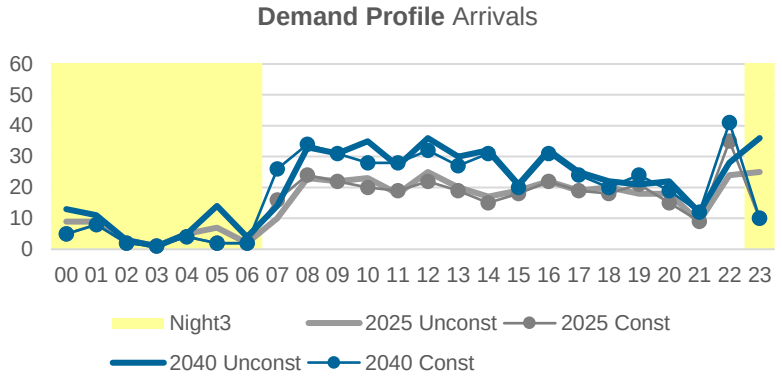
Source: Mott MacDonald analysis

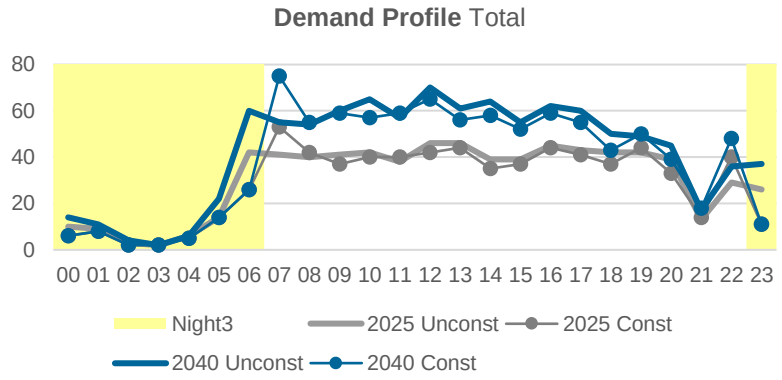
Scenario B Summary
2300-0700 65/night limit – no passenger cap

- The charts opposite show the effect of the slot coordination exercise on patterns of demand for the 2025 and 2040 forecast schedules, compared with the daa input schedules (Scenario A).
- Condition 3d and 5 night planning conditions result in a shift of the peak departures from the 0600h to the 0700h, and of arrivals from the 2300h to the 2200h.
- The overall size of the schedule is 10% smaller in 2040 due to the effect of the night restrictions





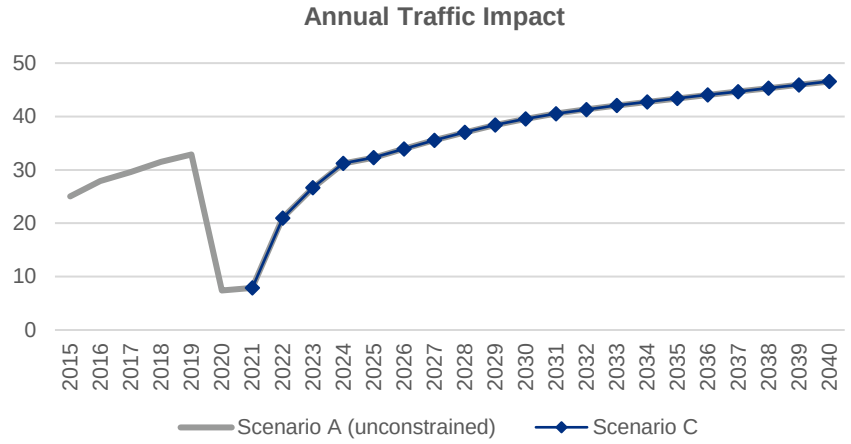


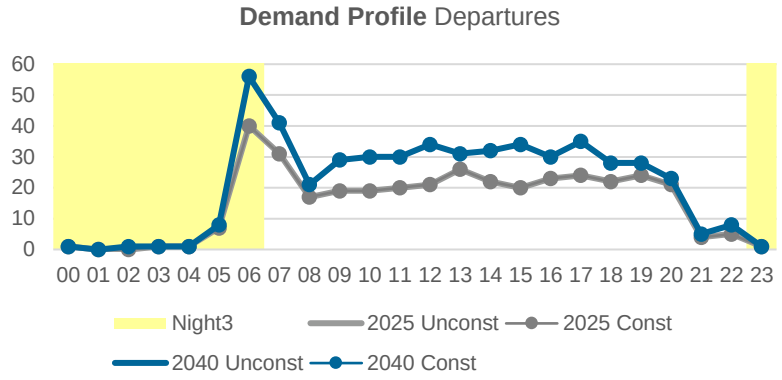


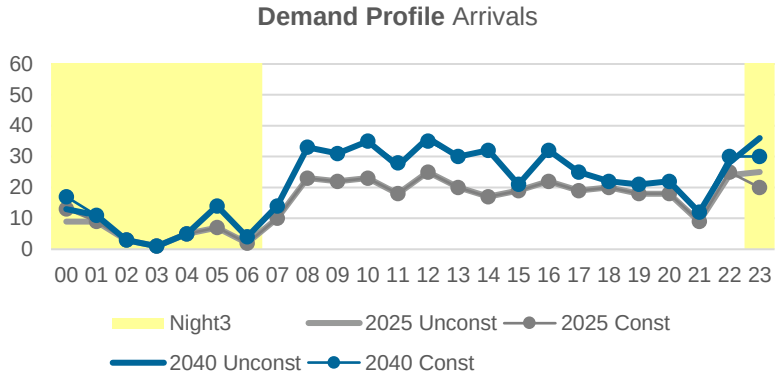
Source: Mott MacDonald analysis

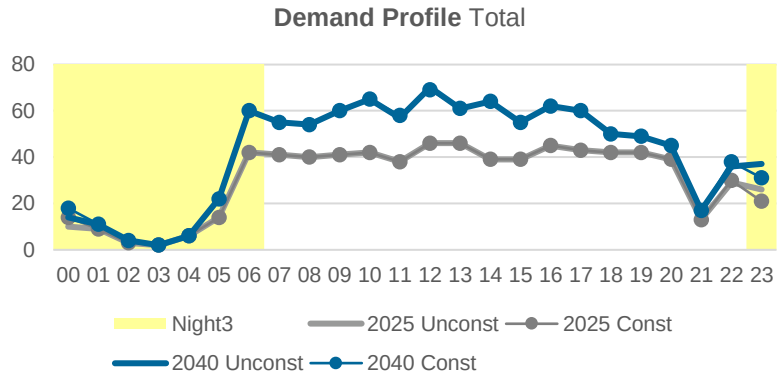
Scenario C Summary
Runway limits only, no planning conditions

- The charts opposite show the effect of the slot coordination exercise on patterns of demand for the 2025 and 2040 forecast schedules , compared with the daa input schedules (Scenario A).
- Without the Condition 3d and 5 night planning conditions, the capacity-coordinated schedules are in line with daa input schedule demand. Runway capacity is sufficient to meet demand, with only minor schedule adjustments to smooth schedules within the 10-minute slot constraints.





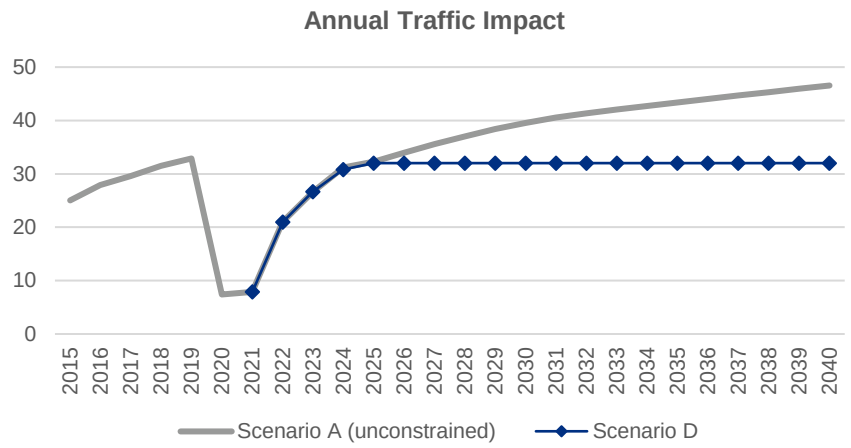


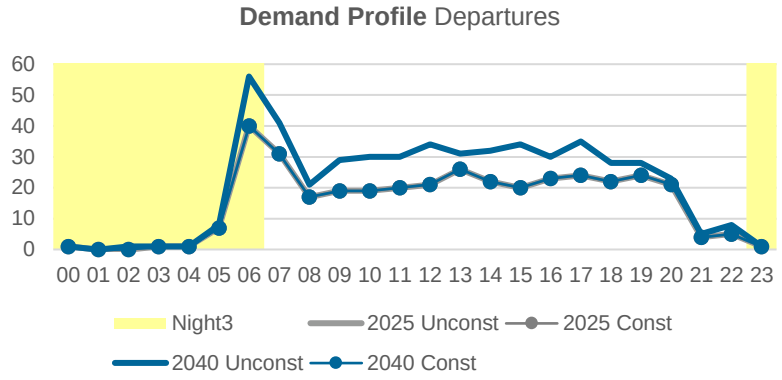


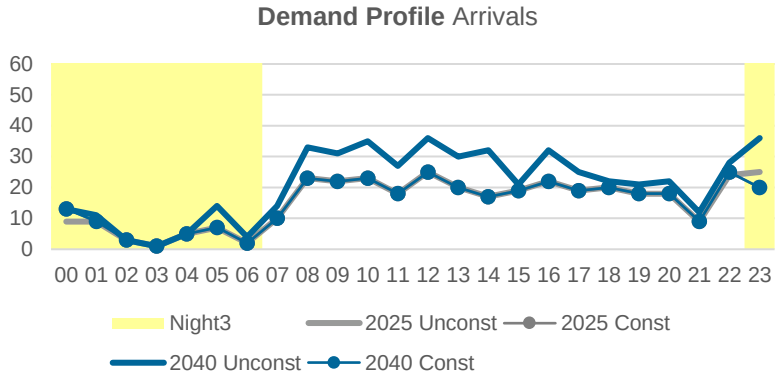
Source: Mott MacDonald analysis

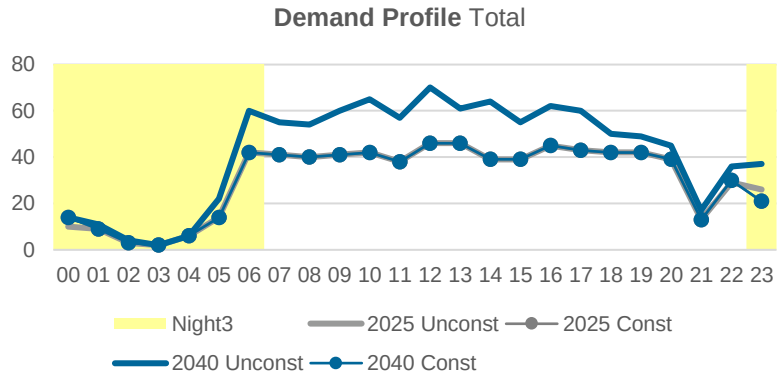
Scenario D Summary
32m pax cap, no night limits

- The charts opposite show the effect of the slot coordination exercise on patterns of demand for the 2025 and 2040 forecast schedules , compared with the daa input schedules (Scenario A).
- The effect of the 32m passenger limit is to cap the schedules at approximately 2025 levels (post Covid recovery).
- The overall size of the schedule is 31% smaller in 2040 due to the effect of the passenger cap





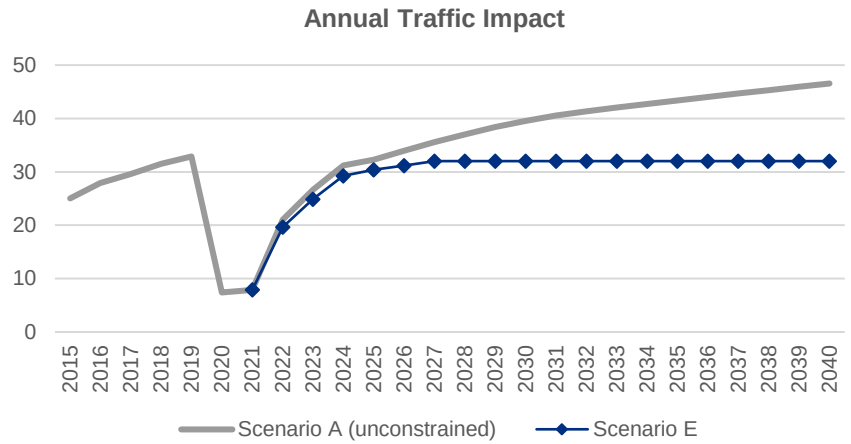


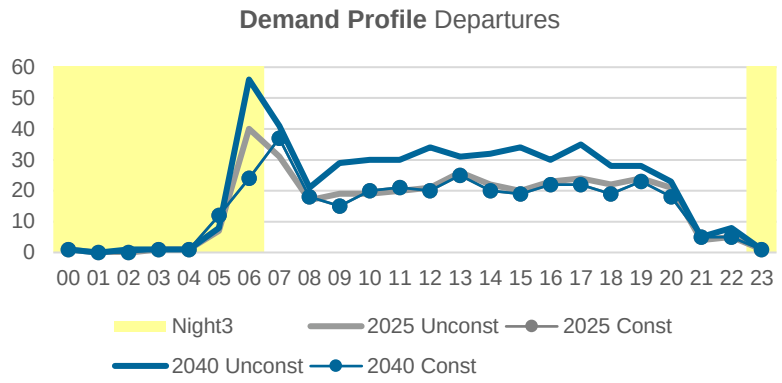


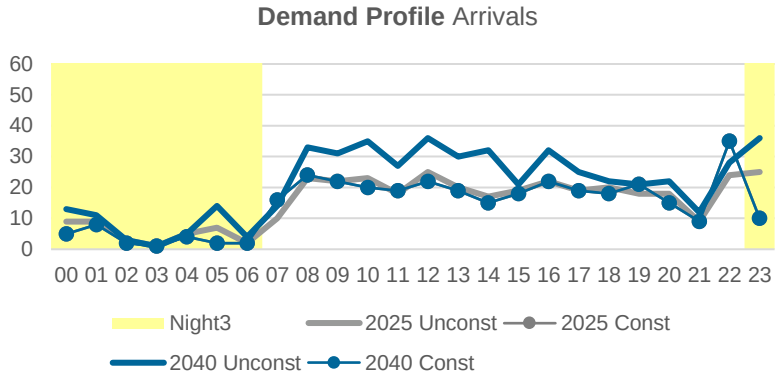
Source: Mott MacDonald analysis

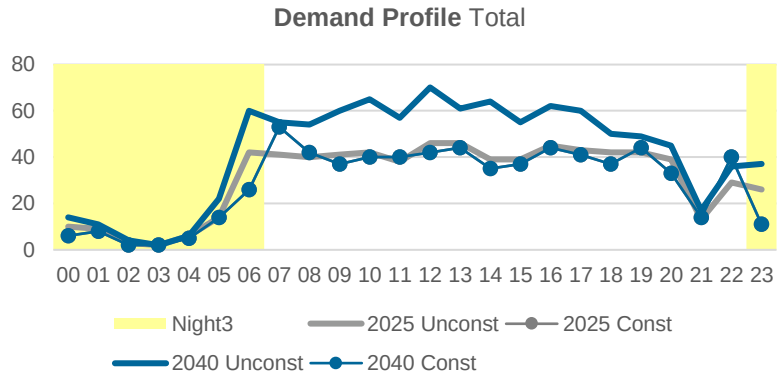
Scenario E Summary
2300-0700 65/night limit – 32m pax cap

- The charts opposite show the effect of the slot coordination exercise on patterns of demand for the 2025 and 2040 forecast schedules , compared with the daa input schedules (Scenario A).
- Condition 3d and 5 night planning conditions result in a shift of the peak departures from the 0600h to the 0700h, and of arrivals from the 2300h to the 2200h.
- The effect of the 32m passenger limit is to cap the schedules at approximately 2025 levels (post Covid recovery).





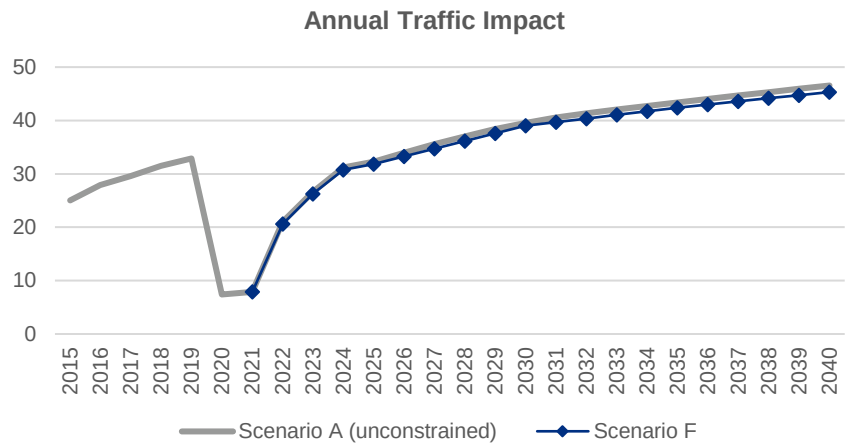


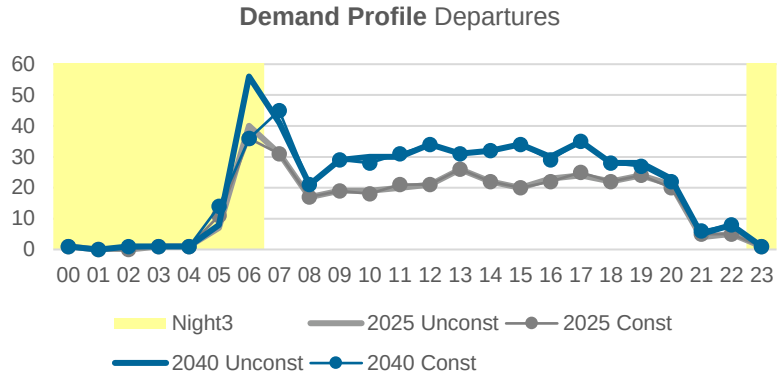


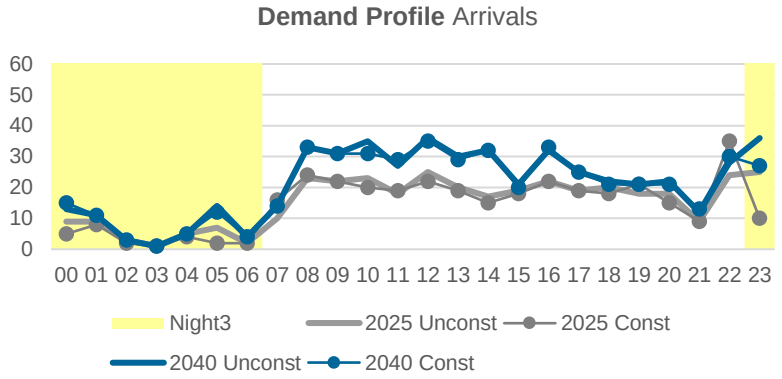
Source: Mott MacDonald analysis

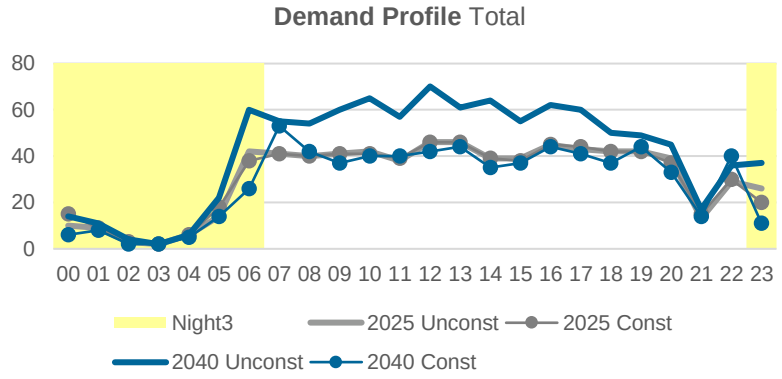
Scenario F Summary
2300-0700 Single Runway
(no 65/night or 32m pax limits)

- The charts opposite show the effect of the slot coordination exercise on patterns of demand for the 2025 and 2040 forecast schedules , compared with the daa input schedules (Scenario A).
- Condition 3d and 5 night planning conditions result in a shift of the peak departures from the 0600h to the 0700h, and of arrivals from the 2300h to the 2200h.
- The effect of the 32m passenger limit is to cap the schedules at approximately 2025 levels (post Covid recovery).









Source: Mott MacDonald analysis

Fleet Modernisation

Fleet Modernisation

Introduction

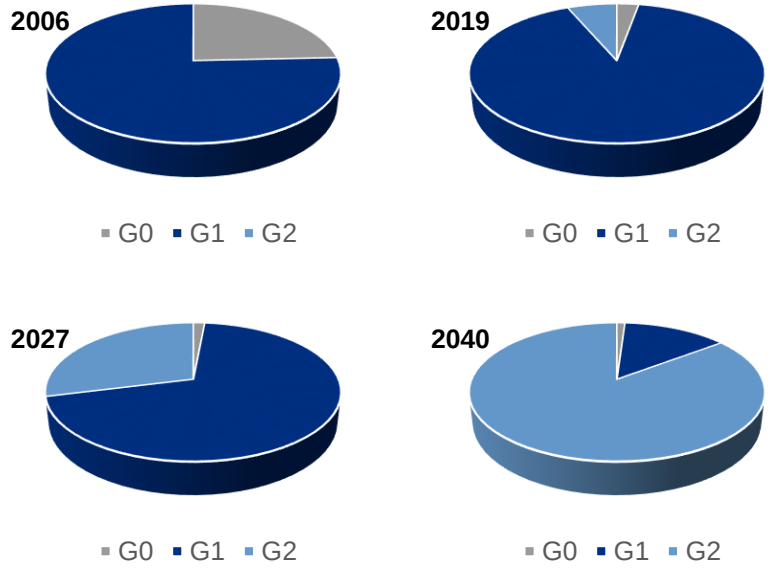
In 2019, around 91% of DUB operations use the current generation (G1) aircraft types, with 3% of movements operated by older aircraft (G0) and 6% of movements operated by the most modern (G2) types.

Our study predicts that the current G1 aircraft types will be largely replaced on a phased basis by next generation G2 types by 2040.

The main period for fleet renewal is between 2027 and 2040, although this analysis is sensitive to the timing of Ryanair's replacement of its current DUB fleet of B737-800s with new B737-8 MAX 200s.

This study analyses the expected evolution of the DUB fleet during the 2025 – 2031 time horizon, taking account of the impacts of the COVID-19 pandemic on the aviation industry. Fleet evolution is extended to 2037 for the 40m annual passenger schedule with 23:00-07:00 night operating constraints (under Constrained Scenario 1).

DUB Fleet Evolution 2006 - 2040



Source: Mott MacDonald analysis of daa data and schedules (2006, 2019), Mott MacDonald projections (2027, 2040)

Note on Aircraft Generation Categorisation
For the purposes of these analyses, aircraft have been categorised into generations of aircraft technology:

- **Generation 0 (G0) –** Older aircraft types, typically developed in the 1970s or 1980s and now generally out of production, eg, B737 Classic (300/400/500), B757, B767, A300, A310
- **Generation 1 (G1)** – Current aircraft types, typically developed in the 1990s or 2000s and still in production, eg, B737NG (700/800/900), B777, A320 series, A330, A340, A380, Bombardier CRJ, Embraer EJets, Avro RJ, Bombardier Q400, ATR42/72
- **Generation 2 (G2)** – Latest aircraft types recently entering production or under development, eg, B737MAX, B787, B777X, A320neo, A330neo, A350, Bombardier Cseries/Airbus A220, Embraer Ejet-E2, Sukoi Superjet
- **Generation 3 (G3)** – Further new-generation aircraft types not yet in development.

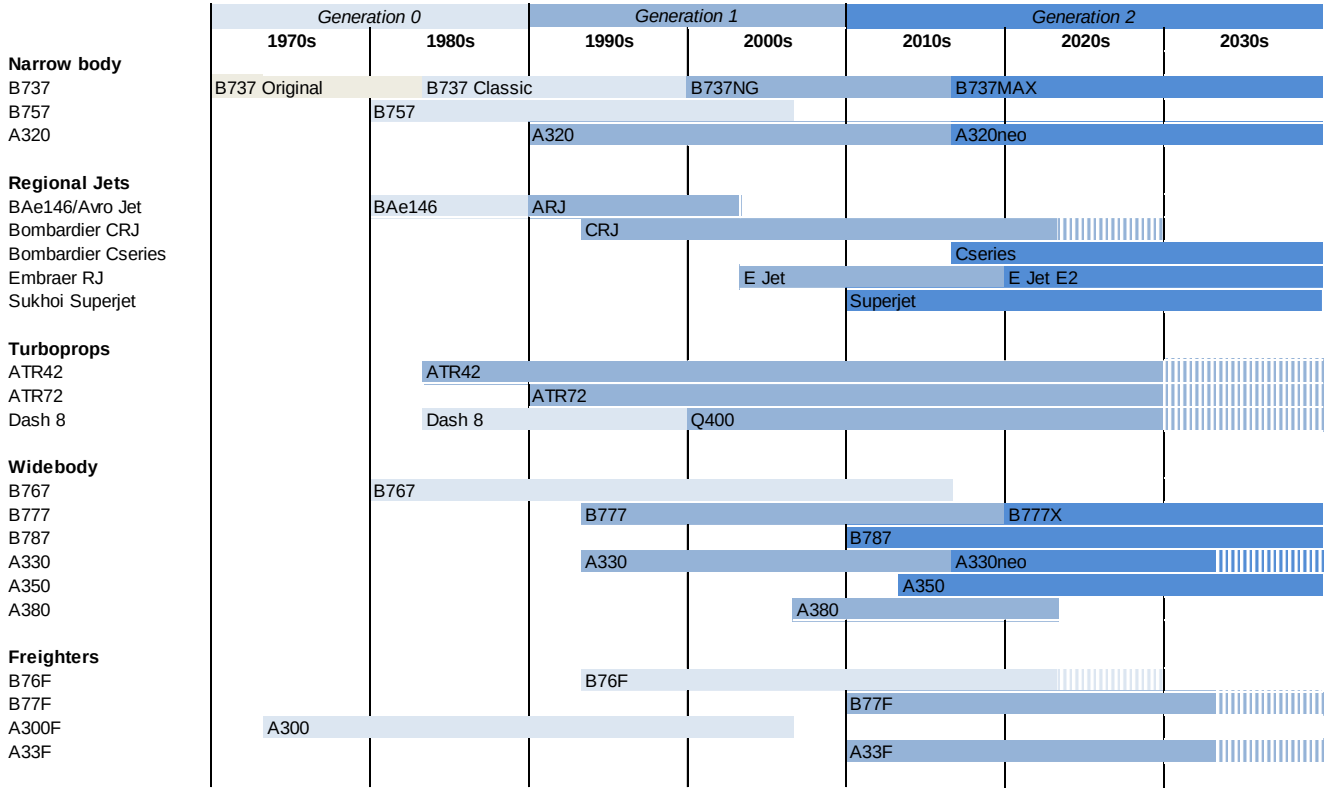
Aircraft Manufacturers' Development and Production Cycle

Aircraft development cycle

- The development of commercial transport aircraft represents large capital investments for the aircraft manufacturers, and typically follows a 20-30 year cycle between generations of aircraft types.
- The pace of aircraft development depends on the rate of improvement in technology (eg, engine efficiency), with new types typically seeking to achieve a 20% improvement in seat-kilometre costs over previous generation competitors.
- Another factor which influences manufactures' commitment to new aircraft development is competition between manufactures. For example, Airbus' development of the A350 and A330neo was spurred by the sales success of Boeing's B787. Similarly, Boeing's launch of the B737MAX was a response to Airbus' A320neo programme.
- Once in service, aircraft have an operational lifespan of around 25 years in mainline service, and longer as freighter conversions and as niche charter aircraft. In times of low oil prices, the life of older aircraft types may be extended.
- As a consequence, an aircraft type may be in active service over 50 years after its initial development. For example, the A320 first went into service in 1988, and is still in production. A newly-manufactured A320 entering airline service now is likely to still be flying until the early 2040s.

Commercial Aircraft Production Cycle

Dates of aircraft types in production by generation



Source: Mott MacDonald analysis, select aircraft types relevant to DUB

DUB Fleet renewal

COVID-19 Impacts

The worldwide spread of the COVID-19 pandemic in March 2020, lockdowns and restrictions on air travel has led to a crisis in the aviation industry and a recession in the general economy. The DUB recovery scenario for this study assumes traffic returns to 2019 levels of around 32m by 2025.

Global Impacts

The demand/capacity and financial aspects of the COVID-19 crisis is having two types of impact on airline fleets:

- Firstly, some airlines are accelerating the retirement of older aircraft, which tend to be less fuel efficient and noisier
- Secondly, some airlines are deferring the ordering and delivery of new aircraft types(*), which tend to have better environmental performance

Therefore, compared with pre-crisis projections, there is likely to be a short-term improvement in average environmental performance of global airline fleets due to early retirement of older aircraft, but a slower medium-term (next 5 years) improvement due to fewer latest-generation aircraft type deliveries.

(*) Note: the deferral of new aircraft deliveries is due mainly to slower airline growth in the next few years. Airlines are still expected to replace older, life-expired aircraft at the end of their economic life (around 20-30 years' of service).

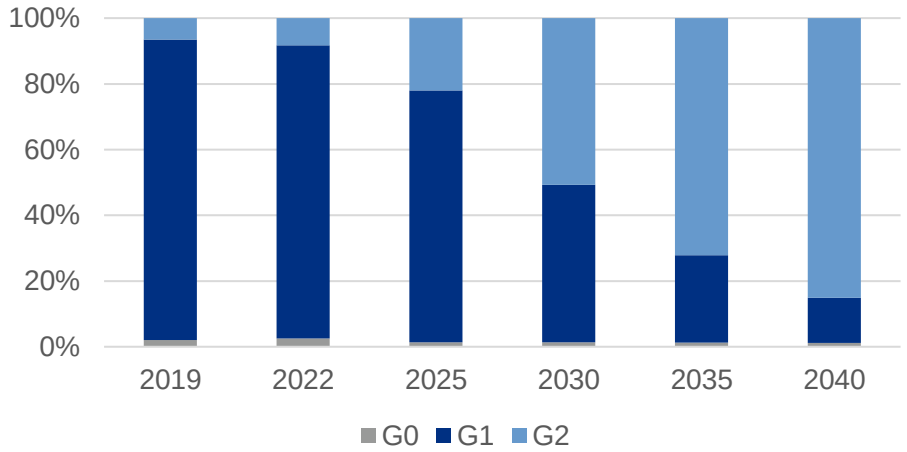
Dublin Airport Fleet Renewal

The chart below shows the evolution of DUB fleet during the period to 2040 considered in this study.

Overall, there is modest modernisation of the DUB fleet by 2025, with the proportion of latest generation aircraft types (G2) increasing from 7% in 2019 to 22% in 2025 due to the replacement of life-expired aircraft types.

The bulk of the modernisation is expected to occur after 2025. The fleet renewal analysis and assumptions of this study take into account the reduced new aircraft production expected as a consequence of the COVID-19 pandemic and its impact on the aviation industry.

DUB Fleet Evolution 2019 - 2040



Source: Mott MacDonald analysis of daa data and schedules (2019), Mott MacDonald projections (2022 onwards)

Airline Fleet Renewal

Aer Lingus

Shorthaul fleet

- The Aer Lingus (EI) current shorthaul fleet of A320/321 aircraft are expected to be replaced with A320/321neos on a phased basis as they reach 24 years in service(1). This replacement cycle is not expected to be impacted by the COVID-19 crisis.
- Six of EI's shorthaul aircraft (16% of the fleet) were delivered 1998-2001, so are due for replacement by 2025. The remainder were delivered 2004-2011, so will be replaced on a phased basis between 2028-2035.

Longhaul Fleet

- EI currently operate A330 widebody and A321neo LR narrowbody aircraft types for their longhaul services.
- Three of the A330s were delivered 1999-2001, so are due to be replaced at 24 years' service by 2025. The remainder were delivered 2007-2017, so are not due to be replaced until the 2030s. The A321neo LRs are new aircraft (from 2019), so will not be replaced before 2040.
- Our April 2019 analysis assumed EI's future longhaul fleet would be evenly split between narrowbody (A321neo LR) and widebody (A330neo/A350) aircraft types by 2040. In general, the impact of the COVID-19 crisis and general trends in the aviation industry is likely to favour greater use of narrowbody aircraft on transatlantic routes from DUB, so the A321LR share of EI's fleet may be higher than 50% in future. More use of smaller A321LR aircraft would reduce environmental impacts (CO2 and noise) compared with the 50/50 assumption of this study.

(1) Aer Lingus advised to assume 24 year service life for A320/321s and A330s

Ryanair

- In 2019, Ryanair had a fleet of over 450 B737-800s and 1 B737-700, with 32 of the B737-800s (7%) based at DUB. The B737-800s were delivered between 2002-2018 and are assumed to retire after 20 years' service(1).
- Ryanair has orders and options for 210 of the new B737-8 MAX 200s, due for delivery over a 5-year period.
- The B737MAX has been grounded since March 2019 following two accidents related to its flight control systems. However, the B737MAX has now been approved by the FAA and resumed operations in early 2021.
- Ryanair has stated publicly that it still intends to take delivery of its full order of B737MAX aircraft.
- Our fleet modernisation analysis assumes that Ryanair will switch its DUB base to B737MAX mainly after 2025 (but before 2030). Even with two-year delayed MAX deliveries, Ryanair could have enough MAX in its fleet to switch DUB as early as 2023, but a post-2025 fleet renewal was deemed consistent with a 'centreline' forecast case.
- If Ryanair were to upgrade to MAX aircraft by 2025, this would result in a 1.5% uplift in seat capacity at the airport, potentially increasing annual throughput in 2025 from 32.3m to about 32.8m

Other Airlines

- Fleet renewal assumptions for other airlines were based on replacement at around 25 years' service for passenger aircraft and around 30 years' service for freighter aircraft.
- These assumptions are not likely to be significantly affected by the COVID-19 crisis and are consistent with a 'centreline' case forecast.

(1) Ryanair operates a young fleet to reduce maintenance costs, hence the shorter 20 year service life assumed for the B737-800s. The B737-700 is used as a corporate charter aircraft in winter and training/backup aircraft in summer. It therefore achieves less annual utilisation and a longer in-service life is assumed.

Annual Traffic Impact

Annual Traffic Impact

Impact of Operating Restriction Scenarios

- This study has developed busy day forecast schedules and analysed the impacts of operating restrictions for four scenarios, in addition to the original daa input schedule, as summarised in the tables opposite.
  - **Scenario A** is the daa input busy day forecast schedules, aligned with the Centreline annual forecast case. Flights are timed at commercially and operationally 'ideal' timings and are not smoothed to fit within airport capacities
  - **Scenario B** applies the current North Runway night operating restrictions (the 65/night limit and no use of the North Runway 23:00-07:00), but does not apply the 32m annual passenger cap

    The night restrictions severely limit traffic growth, delaying post-Covid recovery to 2019 traffic levels by around 2 years (from 2025 to 2027).
  - **Scenario C** is an unconstrained schedule with no night limits or annual passenger cap. The daa input schedule (Scenario A) has been coordinated within the physical runway capacity constraints, adjusting flight times to smooth demand, but Scenario C has the same volume of flights as the daa input schedule. The runways are assumed to operate in mode Option 7b (see page 8) and according to the capacities discussed in Section 3 (page 20) of this report.

    Runway capacity is sufficient to accommodate the full daa input forecast schedule with relatively minor schedule timing adjustments. Unconstrained annual forecast passengers can be accommodated
  - **Scenario D** applies the 32m annual passenger cap to the runway capacity coordinated schedules of Scenario C, but does not apply the night operating restrictions (Conditions 3d and 5)

    The 32m passenger level is reached in 2025. The 32m cap begins to have an impact from 2024 as traffic growth approaches the 32m capped level asymptotically
  - **Scenario E** applies the 32m annual passenger cap to the night operating constrained schedule of Scenario B.

    The 32m passenger level is reached around 2027
  - **Scenario F** applies the restriction to operate one runway only 23:00-07:00, but without the 65/night movement cap and without the 32m annual passenger cap.

    Constrained runway capacity in the 06:00-07:00 hour for first-wave departures limits growth in DUB-based aircraft flying

Scenario	Condition 3d (single runway)	Condition 5 (night limits)	32m cap	Description
A	na	None	No	*daa input schedule*
B	2300-0700	65/night	No	*Night limit constraints*
C	2300-0600	None	No	*Unconstrained (runway capacity only)*
D	2300-0600	None	Yes	*32m cap only*
E	2300-0700	65/night	Yes	*Night limits + 32m cap*
F	2300-0700	None	No	*Single runway 2300-0700 only*

Scenarios	A	B	C	D	E	F
2015	25.0					
2016	27.9					
2017	29.6					
2018	31.5					
2019	32.9	32.9	32.9	32.9	32.9	32.9
2020	7.4	7.4	7.4	7.4	7.4	7.4
2021	7.9	7.9	7.9	7.9	7.9	7.9
2022	21.0	19.6	21.0	21.0	19.6	20.6
2023	26.7	24.9	26.7	26.7	24.9	26.2
2024	31.2	29.3	31.2	30.8	29.3	30.8
2025	32.3	30.4	32.3	32	30.4	31.9
2026	34.0	31.6	34.0	32	31.2	33.3
2027	35.6	32.8	35.6	32	32	34.7
2028	37.0	33.9	37.0	32	32	36.2
2029	38.4	35.1	38.4	32	32	37.6
2030	39.6	36.3	39.6	32	32	39.0
2031	40.5	37.0	40.5	32	32	39.7
2032	41.3	37.6	41.3	32	32	40.4
2033	42.1	38.2	42.1	32	32	41.0
2034	42.7	38.9	42.7	32	32	41.7
2035	43.4	39.5	43.4	32	32	42.4
2036	44.0	40.0	44.0	32	32	43.0
2037	44.7	40.5	44.7	32	32	43.6
2038	45.3	41.0	45.3	32	32	44.2
2039	46.0	41.5	46.0	32	32	44.7
2040	46.6	42.0	46.6	32	32	45.3
Traffic Impact						
2022-2025	-	-7.0	0.0	-0.7	-7.0	-1.7

Source: Mott MacDonald analysis, based on daa Centreline *forecast scenario*

Annual Traffic Impact

Impact of Operating Restrictions

- It should be noted that the estimated impacts of the capacity and planning constraint scenarios discussed above were developed to be as realistic as possible, and to simulate the normal seasonal slot coordination process. It seeks to provide a 'mid case' or 'most likely case' impact assessment, neither overstating nor understating likely impacts.
- The assessments assume that airlines are willing and able to accept alternative slot times outside of the 23:00-07:00 night period, which would be commercially and/or operationally suboptimal. In the post-Covid recovery period, weak passenger demand is likely to mean that airline flexibility is reduced – when demand is weak, airlines are able to accept fewer suboptimal flight timings before services are no longer profitable. Dublin Airport operates in a competitive environment, so if services at DUB are less profitable than alternative airports in the UK and EU, due to onerous planning constraints, airlines will redeploy their aircraft capacity elsewhere.
- The burden of the night restrictions falls mainly on the DUB-based Irish carriers Aer Lingus and Ryanair. The DUB-based carriers require early morning departures and late evening arrivals for their short haul operations, and Aer Lingus requires early morning arrivals for its transatlantic operations. Non-Irish carriers are less affected by the restrictions as they have proportionately fewer operations in the restricted 23:00-07:00 period.
- The operating restrictions constrain growth in short haul operations throughout the day, as the lack of night slots limits the number of DUB-based aircraft that can be accommodated, with each aircraft performing multiple flights during the operating day.
- Without constraining night operating restrictions and if dual runway operations are possible 06:00-23:00, then the runway capacity limits are sufficient to accommodate unconstrained demand up to the 46m annual passengers analysed for 2040, with only minor schedule timing adjustments (see Scenario C).

Note: Annualised traffic impacts for each scenario are derived from each constrained scenario's busy day forecast schedule, where flights have been 'coordinated' within available capacity in a simulation of the slot coordination process. The busy day in annualised by applying the 'busy day to annual' ratios and load factor assumptions, derived from the daa-provided Centreline case unconstrained busy day forecast schedules. The schedules adopt common annualisation factors, and airline fleet modernisation is a function of aircraft replacement cycles, so do not vary with constraint scenario.

Appendix A: Annual Passenger and ATM Tables

Annual Traffic – daa Input Forecasts

Centreline case used for busy day forecast schedule analysis

Annual Passengers (m)

DUBF20-01 Passengers (mppa)			
Year	Centreline	Low	High
2011	18.7	18.7	18.7
2012	19.1	19.1	19.1
2013	20.2	20.2	20.2
2014	21.7	21.7	21.7
2015	25.0	25.0	25.0
2016	27.9	27.9	27.9
2017	29.6	29.6	29.6
2018	31.5	31.5	31.5
2019	32.9	32.9	32.9
2020	7.4	7.4	7.4
2021	7.9	6.0	10.0
2022	21.0	14.0	26.3
2023	26.7	21.0	32.0
2024	31.2	25.7	34.4
2025	32.3	27.7	37.6
2026	34.0	28.8	38.7
2027	35.6	29.8	39.9
2028	37.0	30.7	41.1
2029	38.4	31.6	42.4
2030	39.6	32.5	43.7
2031	40.5	33.3	44.7
2032	41.3	34.1	45.7
2033	42.1	34.9	46.7
2034	42.7	35.6	47.6
2035	43.4	36.3	48.4
2036	44.0	37.0	49.3
2037	44.7	37.7	50.1
2038	45.3	38.4	50.9
2039	46.0	39.1	51.6
2040	46.6	39.8	52.3
2041	47.2	40.3	53.0
2042	47.8	40.8	53.7
2043	48.4	41.3	54.4
2044	49.0	41.8	55.0
2045	49.5	42.4	55.7
2046	50.1	42.9	56.4
2047	50.7	43.3	57.0
2048	51.2	43.8	57.7
2049	51.8	44.3	58.3
2050	52.3	44.7	58.9

Annual ATMs (000s)

DUBF20-01 Movements (000's)			
Year	Centreline	Low	High
2011	162	162	162
2012	164	164	164
2013	170	170	170
2014	180	180	180
2015	198	198	198
2016	215	215	215
2017	223	223	223
2018	233	233	233
2019	239	239	248
2020	93	91	95
2021	133	112	182
2022	176	143	205
2023	208	176	238
2024	232	208	251
2025	240	213	265
2026	249	219	271
2027	256	224	278
2028	263	230	285
2029	270	236	293
2030	276	242	300
2031	282	246	306
2032	286	250	313
2033	291	253	318
2034	295	257	324
2035	299	260	330
2036	302	264	335
2037	306	267	340
2038	310	270	345
2039	314	273	349
2040	318	277	354
2041	322	280	358
2042	325	283	362
2043	329	286	366
2044	333	289	370
2045	336	292	375
2046	340	295	379
2047	344	298	383
2048	347	301	387
2049	350	304	390
2050	354	307	394

Source: daa

Annual Traffic Impact – Constrained Scenarios

Annual Passengers (m)

Scenarios	A	B	C	D	E	F
2015	25.0					
2016	27.9					
2017	29.6					
2018	31.5					
2019	32.9	32.9	32.9	32.9	32.9	32.9
2020	7.4	7.4	7.4	7.4	7.4	7.4
2021	7.9	7.9	7.9	7.9	7.9	7.9
2022	21.0	19.6	21.0	21.0	19.6	20.6
2023	26.7	24.9	26.7	26.7	24.9	26.2
2024	31.2	29.3	31.2	30.8	29.3	30.8
2025	32.3	30.4	32.3	32	30.4	31.9
2026	34.0	31.6	34.0	32	31.2	33.3
2027	35.6	32.8	35.6	32	32	34.7
2028	37.0	33.9	37.0	32	32	36.2
2029	38.4	35.1	38.4	32	32	37.6
2030	39.6	36.3	39.6	32	32	39.0
2031	40.5	37.0	40.5	32	32	39.7
2032	41.3	37.6	41.3	32	32	40.4
2033	42.1	38.2	42.1	32	32	41.0
2034	42.7	38.9	42.7	32	32	41.7
2035	43.4	39.5	43.4	32	32	42.4
2036	44.0	40.0	44.0	32	32	43.0
2037	44.7	40.5	44.7	32	32	43.6
2038	45.3	41.0	45.3	32	32	44.2
2039	46.0	41.5	46.0	32	32	44.7
2040	46.6	42.0	46.6	32	32	45.3
Traffic Impact						
2022-2025	-	-7.0	0.0	-0.7	-7.0	-1.7

Annual ATMs (000s)

Scenarios	A	B	C	D	E	
2015	198					
2016	215					
2017	223					
2018	233					
2019	239	239	239	239	239	239
2020	93	93	93	93	93	93
2021	133	133	133	133	133	133
2022	176	166	176	176	166	173
2023	208	195	208	208	195	204
2024	232	219	232	229	219	228
2025	240	227	240	236	227	237
2026	249	232	249	236	233	246
2027	256	238	256	236	236	253
2028	263	244	263	236	236	260
2029	270	249	270	236	236	267
2030	276	255	276	236	236	272
2031	282	259	282	236	236	278
2032	286	262	286	236	236	282
2033	291	266	291	236	236	286
2034	295	270	295	236	236	289
2035	299	273	299	236	236	292
2036	302	276	302	236	236	296
2037	306	279	306	236	236	300
2038	310	282	310	236	236	303
2039	314	285	314	236	236	307
2040	318	289	318	236	236	310
Traffic Impact						
2022-2025	-	-48	-	-6	-48	-13

Appendix B: EU Slot Regulation and Precedents Analysis

Executive summary

Introduction

- This in an annex to the report prepared by Mott MacDonald for daa entitled:
  - **Dublin Airport Operating Restrictions –** Quantification of Impacts on Future Growth (September 2020 Update – 2022-2025 Period) version 5.3
- daa is developing a new North Runway. Construction is due to be complete by the end of 2020, with commissioning occurring during 2021 and full operation by 2022. The runway's planning permission granted in 2007 contains 31 conditions. Condition 3d requires that that the new North Runway will not be used between the hours of 23:00-07:00 local time, and Condition 5 limits the number of 23:00-07:00 operations to 65/night on average when the new runway is complete.
- This annex benchmarks the proposed night restrictions for Dublin Airport (DUB) against comparable airports in Europe and worldwide, and explores the issues arising from implementation of the proposed night restrictions in ways compliant with the EU Slot Regulation.

EU Slot Regulation Summary

- The EU Slot Regulation governs the allocation of scarce capacity at airports. DUB is designated as a 'coordinated airport' under the EU Slot Regulation. This means that operators must be allocated a 'slot' to operate at the airport by an independent slot coordinator, within capacities declared by the Commission for Aviation Regulation following consultation with the airport's Coordination Committee.
- A key principle of the slot process is that airlines have 'historic rights' to slots, whereby they have a legal entitlement to slots allocated and operated at least 80% of the time in the previous equivalent season (the *use-it-or-lose-it* rule).
- In response to the COVID-19 pandemic and disruption to air services from March 2020, the European Commission and Parliament adopted an amendment to the EU Slot Regulation to waive the *use-it-or-lose-it* rules for the Summer 2020 season. This waiver was subsequently extended to the end of the Winter 2020/21 season. As a consequence, airlines retain their historic rights to slots (including night slots) at levels equivalent to their 2019 slot use.
- The 65/night limit is significantly below the number of historic night slots held by airlines today and, therefore, infringes this entitlement.
- This study has assessed the night flying regimes of comparable European airports and found no precedents for the imposition of night limits requiring the allocation of scarce movements that affect airlines' historic rights. Examples from Amsterdam, Brussels Paris and London all show that night flying regimes have been designed to respect airlines' historic rights and introduce reductions in night flights gradually if demand falls.
- Therefore, in Mott MacDonald's view, it is unclear how the proposed DUB operating restrictions could be implemented in a way that is compatible with the EU Slot Regulation, given the lack of precedents at other EU airports, and that there are risks that an attempted implementation would be subject to potential legal challenge.

Night Restrictions Benchmarking

- The table below summarises night restrictions at a number of comparable European airports.
- Night restrictions are applied in accordance with EU Regulations on a case-by-case basis, based on local conditions and many airports have no night restrictions. The purpose of this analysis is to benchmark the proposed DUB night restrictions with comparable European airports to understand how night movements are managed elsewhere.
- It should be noted that at other airports, night limits have been set to accommodate historic demand and only reduced in ways that do not infringe airlines' historic rights to night slots.
- It should also be noted that the proposed night restrictions period at DUB from 2300 to 0700 (8 hours) is unusually long. Only Amsterdam and Warsaw have equivalent night restrictions periods. The average night restrictions period is between 6h and 6.5h.
- In particular, the London airports (DUB's closest competitors) have a night restrictions period from 23:30 to 06:00. This night restrictions period does not constrain first-wave departures (post 06:00), which feature heavily in DUB's night restrictions period demand, and allows unrestricted arrivals up to 23:30.

Airport		Night Period (local time)	No of Night Hours	Slot or Runway Time	Comments
London	LHR LGW STN	23:30 - 06:00	6.5h	Runway	Seasonal limits on movements and noise (Quota Count) points. Limits reviewed 5-yearly. Number of night flights has remained constant since the 1990s, but noise points have been reduced in line with introduction of quieter aircraft
Amsterdam	AMS	Arrivals 22:40-06:59 Departures 23:00-07:19	8h (approx)	Slot	Annual night movements limit currently 32,640/year reducing to 29,000/year.
Paris CDG	CDG	Arrivals 00:30 - 05:29 Departures 00:00 - 04:59	5h	Slot	Annual night movements limit set at 22,500/year in 2003/04 reducing progressively based on lost historics.
Frankfurt	FRA	23:00 - 05:00	6h	Runway	Curfew. Delayed arrivals permitted 23:00-23:59. Curfew introduced with opening of the new runway in 2011.
Munich	MUC	22:00 - 06:00 (restrictions) 23:30 – 05:00 (curfew)	8h 5.5h	Runway	Curfew 2330-0500 except postal and calibration flights. During shoulder period 2200-2330 and 0500-0600, limit on scheduled movements to 28/night except for quiet aircraft types.
Lisbon	LIS	Arrivals 00:05 - 06:00 Departures 23:55 - 05:50	6h	Slot	Night movement cap
Brussels	BRU	23:00 - 05:59	7h	Runway	Annual night movements limit. *Silent Nights:* no new slots allocated between 01:00-06:00 Saturdays and 00:00-06:00 Sundays/Mondays.
Zurich	ZRH	Arrivals 00:00 - 05:00 Departures 00:00 - 06:00	Arrivals – 5h Departures – 6h	Runway	Curfew
Vienna	VIE	23:30 - 05:30	6h	Runway	Night movement cap
Warsaw	WAW	22:00 - 06:00	8h	Runway	Night noise point limit

EU Slot Regulation

Slot Coordination

- Where demand for air services at an airport exceeds capacity, a process of *schedule facilitation* or *slot coordination* may be applied to manage airline schedules and the operations of other aircraft operators within available capacity. These processes are governed by the EU Slot Regulation(1).
- At a *schedules facilitated* airport, schedule time adjustments are negotiated with airlines on a voluntary basis. Where there is a significant shortfall in capacity and such voluntary processes are ineffective, the airport may be designated as *coordinated*, and a process of slot coordination implemented. At a *coordinated* airport, airlines must have a *slot* allocated prior to operation, and must adhere to the allocated slot time. Financial penalties are in place for intentional slot misuse (e.g., operating without a slot or intentionally operating at the wrong time). Slots are allocated by an *airport coordinator*.
- The Member State is responsible for designating an airport as *coordinated* and ensuring that an independent coordinator is appointed. In Ireland, these responsibilities are performed by the Commission for Aviation Regulation (CAR). The CAR's roles are:
  - to designate Community airports located in Ireland as schedules facilitated or coordinated as appropriate,
  - to appoint a schedules facilitator or coordinator as necessary,
  - to approve any local guidelines proposed by the airport's Coordination Committee
  - the seasonal declaration of slot coordination parameters.
- The CAR designated Dublin Airport as a *coordinated* airport with effect from March 2007, and appointed Airport Coordination Limited as the airport's coordinator.
- The EU Slot Regulation also requires Member States to ensure that at a coordinated airport:
  - A *Coordination Committee* is set up to advise on matters relating to airport capacity and slot allocation *(Article 5);* and
  - That the airport's coordination parameters (capacities) are determined each season (*Article 6*).

(1) Council Regulation (EEC) No 95/93 on common rules for the allocation of slots at Community airports, as amended by Regulation (EC) No 793/2004

- Dublin Airport has a Coordination Committee, with membership consisting of daa as the airport operator, IAA as the ATC provider, and the airlines operating regularly at the airport.
- The CAR is responsible for the determination of coordination parameters under Article 6 of the EU Regulation following consultation at the airport's Coordination Committee.
- The Coordination Committee also has the ability, under the EU Regulation, to develop local guidelines relating to the allocation of slots. DUB currently has two local guidelines(2). The London airports have guidelines relating to the allocation of night movements and noise quota, for example. All local guidelines must be approved by the Member State (the CAR in Ireland) and must be in compliance with Community law (ie, they cannot override an explicit provision of the EU Regulation).
- daa, as the airport operator, has 4% of the voting rights on the Coordination Committee. Over 90% of the votes are controlled by airlines (in proportion to their movements at the airport)(3). This means that daa does not control the process for declaring coordination parameters or setting local guidelines on the administration of operating restrictions at the airport.
- The roles and responsibilities under the EU Regulation, as applied in Ireland, are summarised below:

Role	Responsible Body
Airport designation	CAR
Appointment of coordinator	CAR
Allocation of slots	Coordinator
Determination of coordination parameters	CAR
Development of local guidelines	Coordination Committee + CAR approval

(2) *Local Guideline 1: Urgent and Time Critical Operations; Local Rule A (to manage Covid-19 related capacity reductions)*
(3) Dublin Airport Coordination Committee Constitution

EU Slot Regulation

Historic Right to Slots

- Article 10(2) of the EU Slot Regulation grants airlines *'historic rights'* to series of slots, where a *series of slots* is at least 5 operations at the same time on the same day-or-week in a season (e.g., a series 06:30 departure slots on at least 5 consecutive Tuesdays in a summer season). This means that historic rights apply only to regularly scheduled services, and not to ad hoc operations such as a one-off positioning flight or GA operation.
- Historic rights are subject to a *use-it-or-lose-it* rule, whereby the airline must operate at least 80% of the slots in the series to retain the slots in future seasons (e.g., operate 4 of the 5 Tuesday 06:30 departures in the example above). Except for this *use-it-or-lose-it* rule, there is no mechanism under the EU Slot Regulation to withdraw airlines' historic slots.
- Dublin Airport's currently-established schedule (as at Summer 2019) has more slots to which *'historic rights'* apply within the 23:00-07:00 period than the 65/night permitted under the planning condition – there were 113 regularly scheduled commercial night flights in the Summer 2019 busy day analysed for this study.
- In response to the COVID-19 pandemic and disruption to air services from March 2020, the European Commission and Parliament adopted an amendment to the EU Slot Regulation to waive the *use-it-or-lose-it* rules for the Summer 2020 season. This waiver was subsequently extended to the end of the Winter 2020/21 season. As a consequence, airlines retain their historic rights to slots (including night slots) at levels equivalent to their 2019 slot use.
- Therefore, there is an issue of how the 65/night movement limit could be implemented under the EU Slot Regulation. This study has examined case studies and precedents applied at other European airports.

DUB Night Restrictions and the Slot Regulation

- The key characteristics of the Dublin night restrictions from a Slot Regulation point of view are:
  - That the limits are below historic levels of night flying and compliance would impact on airlines' historic rights;
  - The restrictions are not temporary; and
  - The restrictions are not a curfew, where the airport is effectively closed, but a limited number of movements which must be allocated to airlines according to some mechanism deemed to be fair and reasonable.
- The case studies for the European airports examined are discussed on the following pages.

EU Slot Regulation

Case Study – Frankfurt Airport

- Frankfurt Airport opened a new runway in late October 2011. On 11 October 2011, the Hessian Administration Court ruled that night flights between 23:00 and 05:00 were no longer allowed at Frankfurt Airport after the inauguration of the new runway, and therefore over-rode an approval from the Hessian government from 2007 which allowed 17 scheduled flights per night. On 4 April 2012 the German Administrative Court confirmed the decision of the Hessian Administration Court, banning night flights between 23:00 and 05:00.
- As the ruling imposed a curfew on the airport, it was deemed that airlines' historic rights to night slots were void. The curfew applied to all flights, so there were no issues of having to allocate a scarce resource, and applied to all types of flight.
- Before the curfew was introduced, night operations were primarily cargo services, with Lufthansa being the largest operator. The affected night flights were rescheduled out of the curfew period with priority given to these mandatory time changes in the slot coordination process.

Case Study – Brussels Airport

- In 2009, the Belgian authorities introduced a *Silent Nights* policy, applying to the 3 weekend nights (Friday through Monday). It is not a curfew, but restrictions prohibiting the allocation of new slots during the Silent Night periods. Historic night flights are permitted to continue to operate.

Case Study – Paris CDG

- In November 2003, effective from the Winter 2003/04 scheduling season, the French authorities implemented an annual limit on night flights at Paris CDG. The restrictions apply between 00:00 and 04:59 for departure slots and between 00:30 and 05:29 for arrival slots. The limit was set in 2003 at 22,500 night slots measured over a 52 week period for the Winter 2003/04 and Summer 2004 season. This level was set to accommodate current levels of demand at that time.
- For subsequent years, the limit of 22,500 is reduced if airlines fail to retain historic rights to night slots or return them voluntarily. Such slots are permanently lost and not reallocated to other airlines.
- The order implementing the Paris CDG night restrictions specifically refers to compatibility with the EU Slot Regulation. The mechanism to reduce available night slots only as and when slots are lost under the usage rule is designed to avoid conflicting with airlines' historic rights while progressively reducing night flying.

EU Slot Regulation

Case Study – London Airports

- The 3 main London airports (Heathrow, Gatwick and Stansted) are subject to night flying restrictions between the hours of 23:30-06:00, applied by the UK Department for Transport (DfT). The restrictions set seasonal limits on both the number of night movements and on the number of *Quota Count* (QC) noise points. Each aircraft is assigned a QC rating based on its noise certification and there is a limit on the total number of QC points operated each season.
- The London night restrictions are set for 5-year periods, and the DfT consults widely on changes in the limits in advance of each new quinquennium. The number of night movements available has remained the same at each airport since 1999, but there have been reductions in the QC limits.
- The reductions in QC limits were applied progressively and followed analysis and consultation to ensure that they remained adequate for continued airline operations while at the same time bearing down gradually on aircraft noise, so incentivising airlines to invest in quieter aircraft.
- This progressive approach in line with airline fleet modernisation has ensured that airline historic rights to night slots has not been affected.

Case Study – Amsterdam Schiphol

- In 2013 the number of historic night slots at Amsterdam Schiphol airport was 34,620 per annum. There is a policy objective to bring this down to 29,000 over a number of years. In order to do this, when airlines fail to retain historic rights to night slots or return them voluntarily, such slots are not re-allocated on a basis eligible for historic rights. Instead, spare night slots may be only used by airlines on a non-historic basis.
- This process is intended to gradually reduce the number of night slots eligible for historic rights so that the movement limit may be reduced in future. Airlines allocated non-historic night slots understand that such slots are only available temporarily.

Case Study – Warsaw Chopin Airport

- Warsaw Chopin airport had night restrictions of 40/night. Demand had grown above this level and, in 2012, slot coordination was introduced to reduce demand within the limit and control night flying going forward.
- Prior to this point, Warsaw Chopin had not been designated as *coordinated* and airlines did not have historic rights to slots (which only exist at a coordinated airport). Therefore, airlines did not have a legal basis to challenge the imposed reduction in night flights.
- In establishing slot coordination for the first time, airlines were required to adjust their schedules to fit within the night restriction. The process was administered by Airport Coordination Limited, who also act as the coordinator of Dublin Airport.
- The coordination process adjusted the timings of flights by the minimum amount necessary to reduce demand (i.e., moving flights from the edge of the night restrictions period), and in a proportionate way amongst airline operators.
- Subsequently, the night movement restriction at Warsaw Chopin was replaced by a Noise Point limit modelled on the London QC system. The effect of this change was to allow approximately 20% more night flights within the same noise contour profile, made possible by the introduction of quieter aircraft at the airport.

EU Slot Regulation

Case Study – Temporary Demand Reductions

- Dubai International (DXB) and Brussels airports underwent major runway resurfacing projects in 2014 and 2015 respectively. As a result of these works, there were significant reductions in runway capacity for a temporary period meaning that reductions in the flight schedules were required.
- In both cases, airlines were required to make pro rata reductions in their schedules, with exemptions for airlines which only operated 1 or 2 flights per day. The effect of these exemptions was that the larger airlines were required to make reductions above the airport average. This was deemed to be the fairest way to 'share the pain'.
- In both cases, there was a waiver of the *use-it-or-lose-it* rule during the works so that airlines' historic rights to slots were protected and flights could resume after the works were complete and capacity returned to normal.
- There is no process under the EU Slot Regulation or IATA Worldwide Slot Guidelines (which cover slot allocation rules worldwide, but do not have the force of law) to cater for such demand reductions. The demand reduction processes were developed specifically for these capacity reduction scenarios, but were none-the-less accepted by the industry on the basis that the works were necessary, the reductions were temporary, and the alternative to planned schedule reductions would have been unacceptable levels of flight delay and disruption.
- Although these cases do not relate to night movements, they provide a guide on possible ways to reduce demand in a fair way.

EU Slot Regulation

Conclusions on EU Slot Regulation Assessment

- The conclusions from these case studies, which relate to Dublin's night restrictions, are:
  - Except in the case of the Frankfurt Airport night curfew, reductions in night movements have only occurred as demand for night flying naturally fell or where airlines have lost historic slots through non-use. The principle of historic rights has been respected.
  - However, the Frankfurt curfew case is not comparable to the Dublin situation as it involved a complete night ban, not limits on night flying creating a scarce resource with the consequent allocation and distribution issues.
  - Where demand reductions have been implemented, the approach of requiring pro rata reductions with exemptions for small operators has been adopted. This has only been applied in the case of temporary reductions (eg, Brussels and Dubai airports), however.

- The 65/night limit proposed for Dublin presents a difficult issue of how current levels of night flying can be reduced. Such reductions are in conflict with the EU Slot Regulation, appear to be without precedent, and are likely to be open to legal challenge.
- daa is not in control of the capacity declaration process, responsibility for which resides with the CAR. Therefore, the ability of daa to declare night restriction limits, particularly without the support of the Coordination Committee and the CAR, is untested. Local rules relating to night slot allocation are subject to agreement by the Coordination Committee and approval by the CAR.
- The majority (over 90%) of votes on the DUB Coordination Committee are held by the airlines who would have their historic rights to night slots impacted by the restrictions.

Assumptions for this Study

- For the purposes of this study, a pro rata reduction in night flying has been assumed, described in the next section.
- These assumptions are made for the purposes of the subsequent analyses. Whether such rules could be introduced and applied in practice is open to challenge, for the reasons discussed above.

Appendix C: Independent Review of daa Forecasts

Forecast Review Contents

Summary

Introduction

- Mott MacDonald has been appointed by daa to provide an independent review of the unconstrained traffic forecasts through 2050 and forecast flight schedules. This report considers daa's normal forecasting methodology, as applied for pre Covid-19 pandemic projections, and the latest traffic recovery forecasts reflecting the Covid-19 crisis.
- This review is conducted in parallel with the development of constrained busy day schedules and analysis of the current Dublin Airport operational restrictions which limit use of the new North Runway at night and the number of night movements. This report focuses on the independent review of the unconstrained traffic forecast, for both pre and post Covid-19 crisis scenarios.
- We have reviewed the long term traffic forecasts produced by daa to determine the extent to which the forecast outputs represent a fair and reasonable expectation of the likely development of passenger traffic and aircraft movements over the forecast period (to 2050).
- The review examines the latest Post Covid-19 recovery scenarios (developed October 2020) and the normal long-term forecast methodology based on Pre Covid-19 forecasts (developed July 2019).
- Our review focused on the methodology, inputs, and assumptions adopted by daa in preparing the forecasts. We also reviewed the reasonableness of the traffic forecasts themselves (both pre and post Covid)
- The forecasts have drawn upon a wide variety of input sources such as data provided by daa, data collated by Beontra's internal databases and reputable industry-wide data.
- daa has prepared three traffic cases: Base, Low Case and High Growth Case. The forecasts are based on a number of key assumptions which we have reviewed and commented upon under Section C3.

Main Observations and Conclusions

- The daa long term traffic forecasts are based on a robust econometric forecasting methodology, using the Beontra strategic forecasting tool based on top-down macroeconomic-driven traffic forecast projections.
- The long-term forecast is mainly driven by top down macroeconomic growth projections (e.g. GDP, CPI) derived from reputable sources.
- daa develops its own bottom-up airline capacity traffic forecast upon which the long-term market growth projections from the top down Beontra model are placed.
- The bottom-up assumptions of the forecast are related to airline capacity development and introduction of new routes and airlines based upon the airport's market intelligence.
- daa's short term approach, informed by airline business intelligence and airport / airline market insight provides a sound starting point to the long term passenger and ATM growth projections.
- The market segmentation undertaken by daa is sensible, and the projected growth for all the market segments analysed appears to be reasonable in all cases.
- The Low and High case forecasts analyse the effects of slower or more rapid economic growth across the markets than the Centreline case, as well as lower or higher shares of hubbing transfer traffic. These cases follow commonly-recognised approaches to evaluating a range of traffic throughput outcomes that are reasonably likely to be realised.
- The Post Covid recovery scenarios model the short/medium term recovery profiles from the current crisis. The daa scenarios provide a reasonable Low-to-High recovery range given the inherent uncertainties. Daa's forecasts benchmark well with Eurocontrol and ACI international benchmarks.
- We have made in this report a number of recommendations and suggestions for further development of the forecasting methodology, which are largely technical in nature.
- Overall, the daa traffic forecasting methodology is robust and forms a valid basis for planning airport developments.

Contents

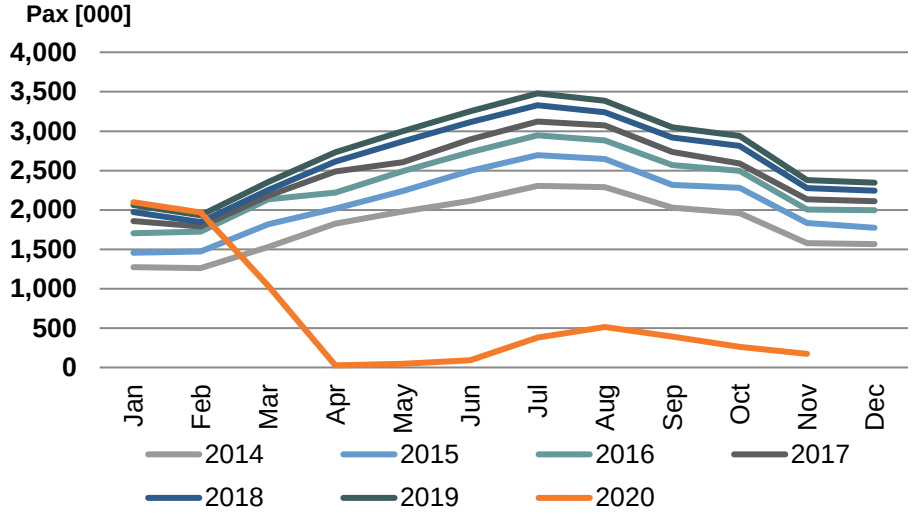
- In this section we present the impacts of the Covid-19 pandemic and air travel traffic crisis, as well as daa's latest (October 2020) recovery forecasts, including:
  - ➢Covid-19 cases and deaths
  - ➢2020 traffic profiles
  - ➢2020-2050 recovery and forecast scenarios for passengers and ATMs
  - ➢Impact on load factors and passengers-per-ATM
  - ➢Recovery profile benchmarking

Dublin airport Covid-19 pandemic impact

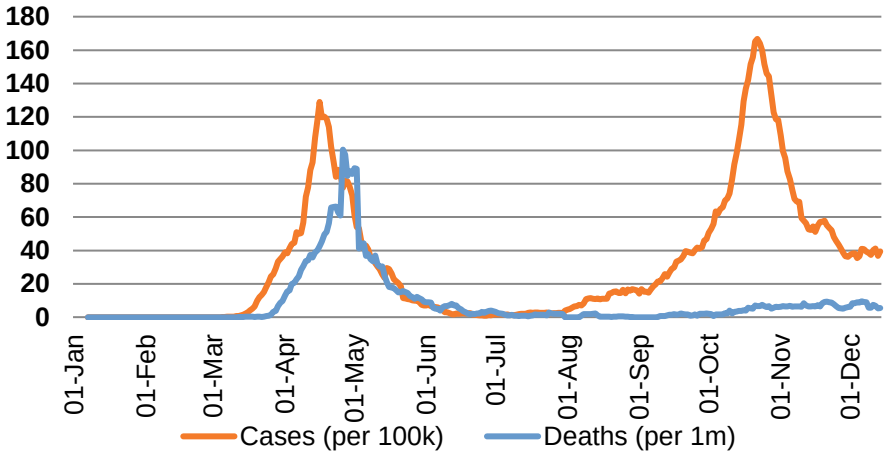
DUB Airport traffic came to a virtual standstill in April 2020 due to lockdown restrictions implemented to control the Covid-19 pandemic. After a tentative start to recovery in Q3 (July-Sept), traffic has slowed due to second-wave infections and the start of the winter season.

- DUB began 2020 with modest (~2%) traffic growth over 2019 levels in January and February, before the spread of Covid-19 globally brought air travel to a virtual standstill.
- Lockdown restrictions were imposed across Europe during March 2020, and DUB traffic during 2020 Q2 (April-June) was down 98% compared with 2019 levels.
- Ireland has experienced distinct waves of Covid-19 infections, the first occurring in April/May and a second in October/November. This two-wave pattern is typical of western European countries.
- DUB traffic started to recover slightly in Q3 (July-Sept) as infections subsided and lockdown restrictions were eased, but only reached 15% of normal levels in August before the second wave began. By November 2020, passenger traffic was again down 92% compared with 2019 levels.

Monthly distribution of passengers at DUB

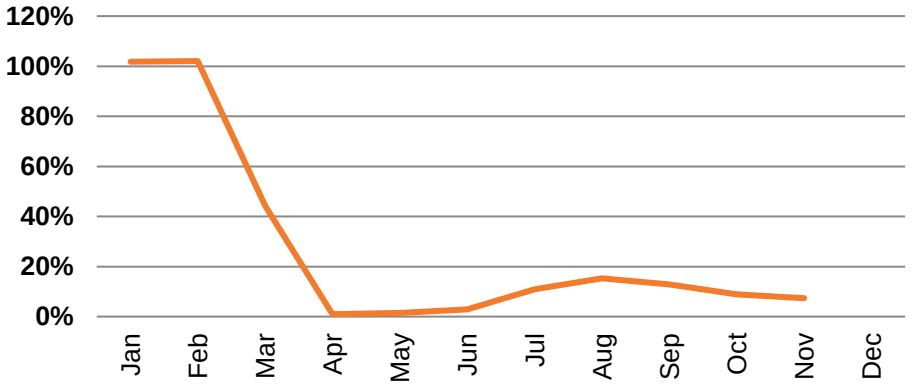


Ireland 7-day Covid-19 Cases and Deaths per Population



Source: European Centre for Disease Control

DUB 2020 Passengers as percentage of 2019



Source: daa

Dublin airport Covid-19 recovery

daa have produced post Covid-19 traffic recovery scenarios which expect recovery to 2019 traffic levels by around 2025. There is considerable uncertainty around traffic recovery from this crisis, which daa has addressed through appropriate Low and High case scenarios.

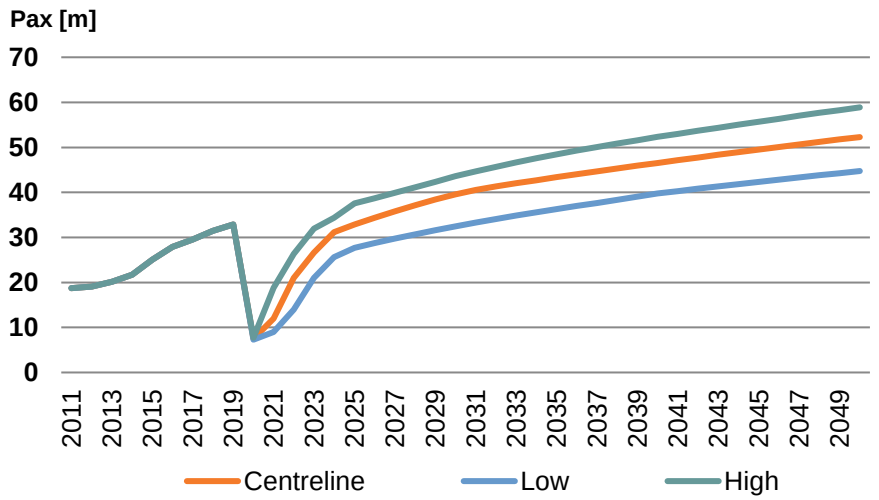
- The daa Covid-19 recovery scenario forecasts we are reviewing for this study were produced in October 2020. There remains considerable uncertainty regarding how the Covid-19 pandemic will progress, what infection control interventions will be required, and the consequent impact on air travel.
- Current projections are that 2020 full-year traffic will be around 7.5m passengers, equivalent to 23% of 2019 levels.
- The daa Centreline forecast scenario assumes that GDP recovers from the current recession to 2019 levels by 2021/22, but that the airport's passenger traffic will not recover to 2019 levels of around 32m annual passengers until 2025.
- Recovery exceeds 2019 levels by 2024 in the High case and 2030/31 in the Low case.

daa Revised Traffic Forecast (Oct 2020) – Pax(m)

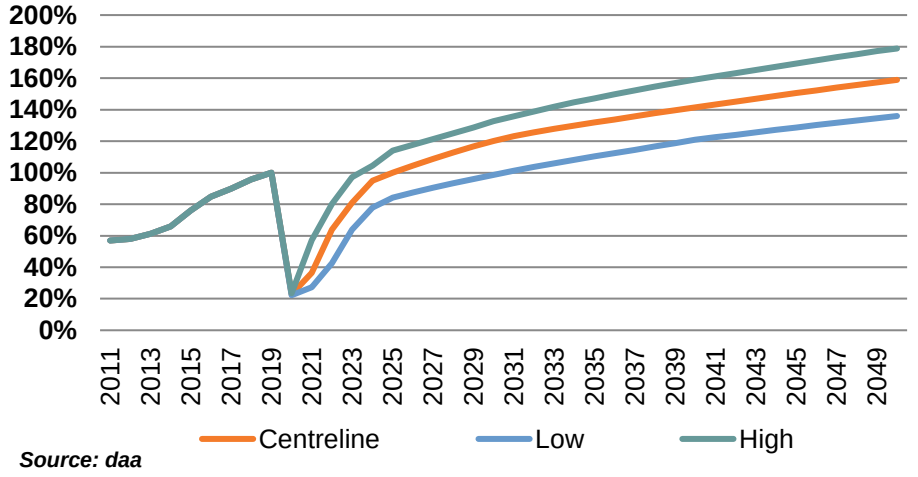
Year	Centreline	Low	High
2019	32.9	32.9	32.9
2020	7.5	7.3	7.7
2021	12.0	9.0	18.8
2022	21.0	14.0	26.3
2023	26.7	21.0	32.0
2024	31.2	25.7	34.4
2025	32.3	27.7	37.6
2026	34.0	28.8	38.7
2027	35.6	29.8	39.9
2028	37.0	30.7	41.1
2029	38.4	31.6	42.4
2030	39.6	32.5	43.7
2031	40.5	33.3	44.7
2032	41.3	34.1	45.7
2033	42.1	34.9	46.7
2034	42.7	35.6	47.6
2035	43.4	36.3	48.4

Source: daa

daa Revised Traffic Forecast (Oct 2020)



daa Revised Traffic Forecast (Indexed 2019 = 100%)



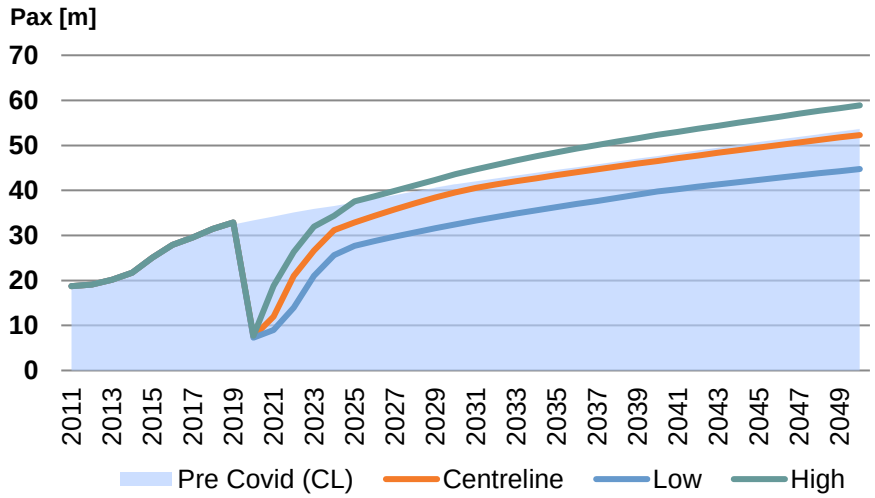
Source: daa

Dublin airport Covid-19 recovery assumptions

daa's post Covid-19 traffic recovery scenarios are reasonable and prudent given the current uncertainties regarding traffic recovery profiles.

- The 2020 full year estimate is 7.3 to 7.7 million passengers, based on year-to-date traffic performance (to September 2020) and projections for Q4 informed by airline published schedules and plans.
- 2021 scenarios are based on indications of airline recovery plans, the economic impact of the pandemic and GDP forecasts (sourced primarily from the IMF), and scenarios for control of the pandemic (infection rates, vaccine availability, etc) and the easing of travel restrictions. Given the uncertainties for 2021, the daa forecasts cover a wide range between 14 – 26m passengers (21m in the Centreline case).
- Post 2021, the forecasts follow Centreline/Low/High scenario trajectories towards recovery to 2019 traffic levels, occurring in 2025 in the Centreline case; 2024 in the High case; and not until 2030/31 in the Low case.
- After initial recovery to 2019 traffic levels, the daa forecasts assume above-trend growth rates for approximately 5 years of gradual recovery towards the long-term traffic trend.
- Traffic levels do not fully recovery to pre Covid-19 projections however. For the Centreline case, traffic levels in the long term lag daa's pre-Covid forecasts by about 2 years – for example, the latest Centreline forecasts reach 40m passengers in 2030/31 compared with 2028/29 in pre-Covid projections.
- Overall, our view is that the methodology and assumptions adopted by daa in developing the latest post pandemic traffic forecasts are reasonable and prudent given the uncertainties around traffic recovery from this crisis.

daa Revised Traffic Forecast Comparison



daa Traffic Forecast – Average Annual Growth Rates

	Pre Covid	Post Covid		
Average Growth Rates	Centreline	Centreline	Low	High
2019 – 2025	2.4%	0.0%	-2.8%	2.2%
2025 – 2030	2.1%	3.8%	3.2%	3.1%
2030 – 2035	1.5%	1.9%	2.3%	2.1%
2035 – 2050	1.2%	1.3%	1.4%	1.3%

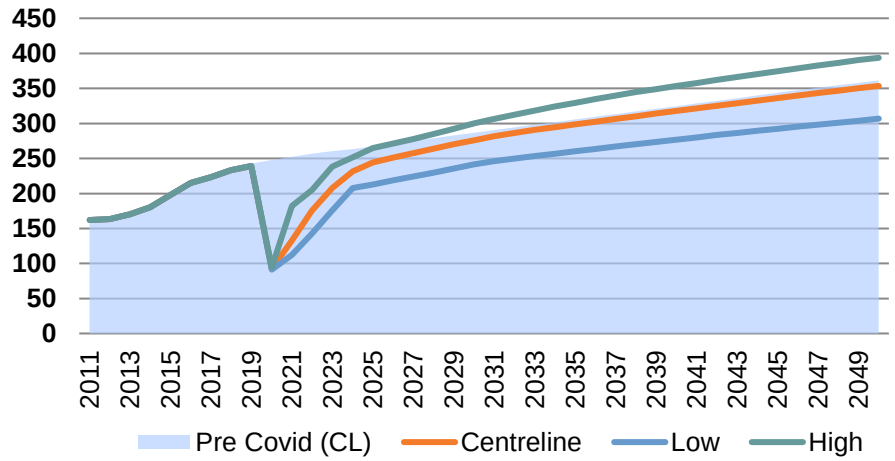
Source: daa

Dublin airport Covid-19 recovery – ATM forecasts

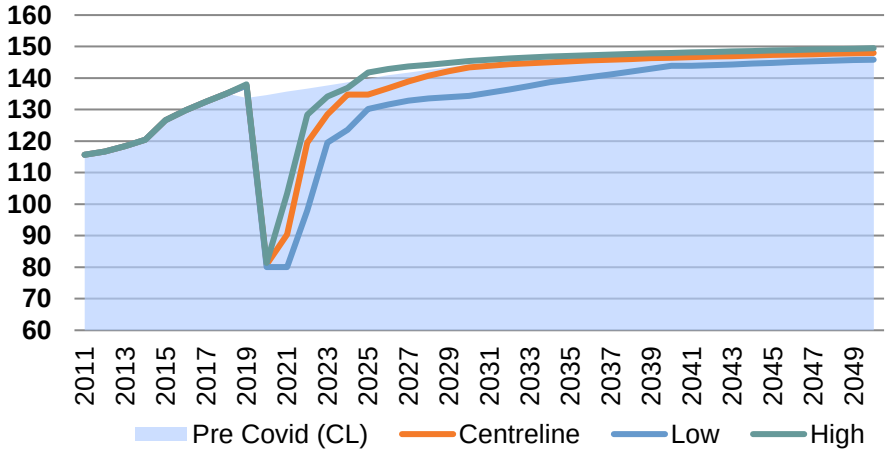
daa's post Covid-19 traffic recovery scenarios are reasonable and prudent given the current uncertainties regarding traffic recovery profiles.

- The charts opposite show the forecasts for air transport movements (ATMs) at DUB corresponding to the passenger traffic recovery scenarios discussed above.
- Overall, the number of ATMs has dropped less than the number of passengers. In 2020, ATMs are -62% down on 2019 levels, compared with -77% for passengers. This is due to a drop in the average passengers-per-ATM, resulting mainly from flights operating with low load factors but also due to airlines downsizing the aircraft type in operation.
- The daa forecasts expect load factors to remain low in 2021 before recovering towards pre pandemic levels, with a reasonable spread of recovery scenarios between the Centreline, Low and High cases.
- Normal slot use-it-or-lose-it rules were suspended for the Summer 2020 and Winter 2020/21 seasons due to the *force majeure* nature of the Covid-19 pandemic, allowing airlines to cancel flights without being at risk of losing historic rights to slots. For the Summer 2021 season, slot relief has been agreed in the EU, UK and other major regions, but there is an increasingly fragmented approach to relaxation of the slot usage rules, making airline planning and recovery more challenging.
- From 2022 onwards, it is reasonable to assume that airlines will be progressively required to use their slots in order to retain historic rights, although some relief from pandemic effects may still be required. As markets reopen, airlines will be under pressure to discount fares in order to achieve reasonable load factors and encourage passengers to fly again.
- Therefore, overall the daa scenarios for ATM and passengers/ATM recovery are reasonable and consistent with the passenger demand projections.

daa Air Transport Movement Forecasts



daa Average Passengers per ATM trends



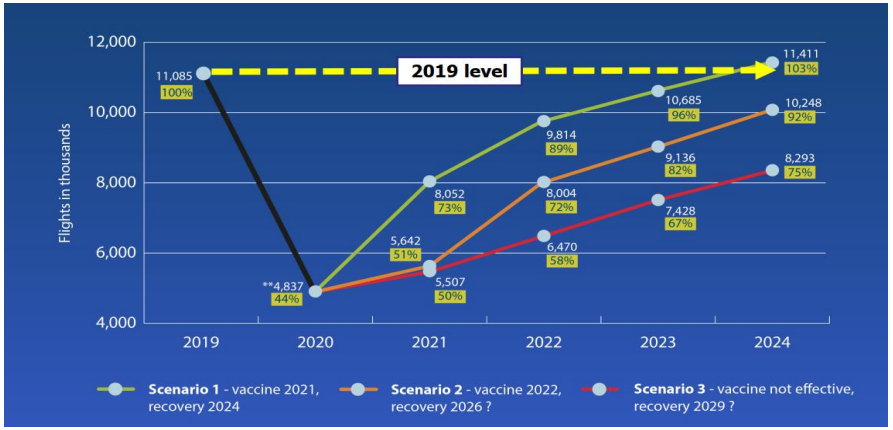
Source: daa

Dublin airport Covid-19 recovery – International Benchmarks

daa's post Covid-19 traffic recovery scenarios benchmark well with international comparators and appear reasonable.

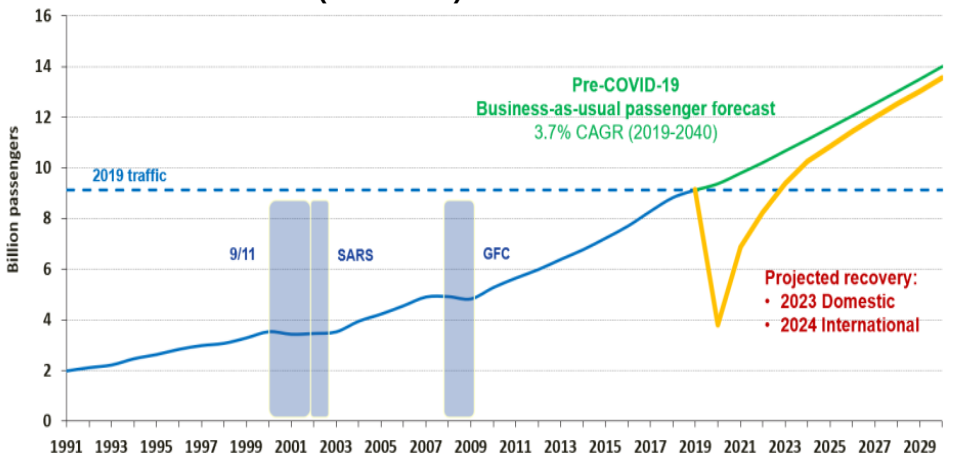
- Comparing daa's recovery forecasts with other international benchmarks, we see broad consistency.
- **Eurocontrol's** latest forecasts for recovery of ATMs has recovery profiles for three scenarios based on vaccine roll-out and success. These show recovery to 2019 levels between 2024 – 2029. The daa forecasts show recovery to 2019 levels between 2024 – 2030 (High, Centreline, Low cases), which are broadly consistent with these Eurocontrol projections.
- The **Airport Council International (ACI)** global forecasts predict recovery to 2019 levels in the 2023 – 2025 period. This is 1-2 years' earlier than the daa forecasts, but the ACI forecasts represent global traffic. Faster than average recovery is expected in emerging markets and for domestic traffic (which is minimal in DUB). DUB competes in a mature aviation market and is dependent on international flights, so slightly slower traffic recovery than the global average is to be expected.
- Overall, the daa Covid-19 recovery forecasts benchmark well with international comparators and appear reasonable.

Eurocontrol ATM 5-year Forecast Scenarios (2020-2024)

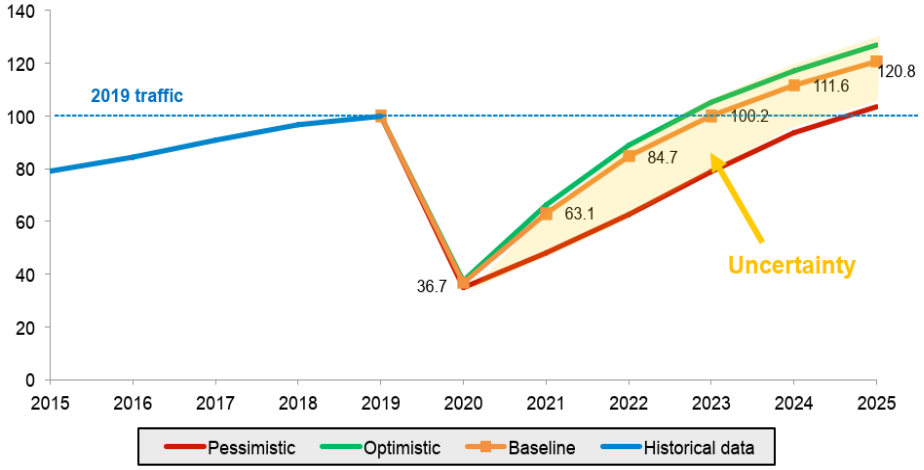


Source: Eurocontrol (November 2020)

ACI Global Forecasts (2020-2030)



ACI Global Passenger Recovery Scenarios (2020-2025)



Source: ACI (8 December 2020)

Contents

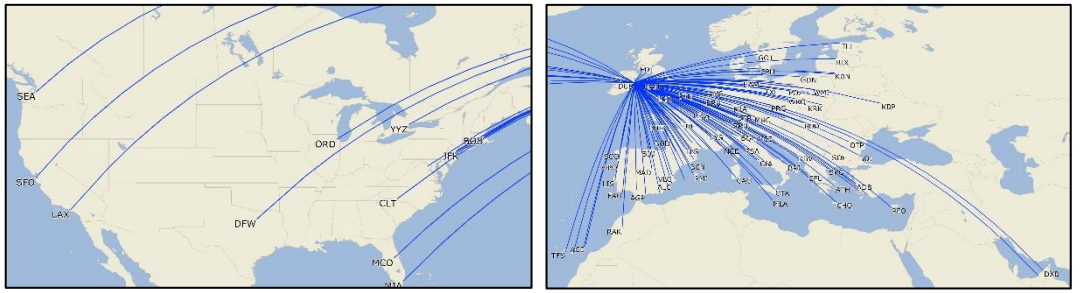
- A brief analysis of the Dublin market is presented in this section covering the following:
  - ➢Airline passenger performance
  - ➢Airline capacity overview
  - ➢Route network developments
  - ➢Traffic seasonality
  - ➢Historic fleet mix
  - ➢Recent market developments and trends

Airline route network review

Since the recovery from the 2009 Global Financial Crisis, DUB transfer volumes grew by 30% – x principally driven by Aer Lingus and partners connecting European and North American destinations

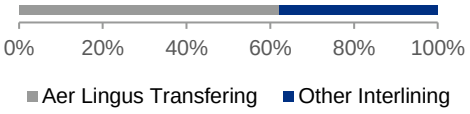
- DUB's geographical location makes it a natural gateway between North America and Europe and its U.S. border preclearance services make it an attractive connecting option.
- DUB handled around 2.2 million connecting passengers in 2019, and over 90% of these were transferring between North America and destinations in the UK and Europe.
- Aer Lingus represents over 60% of DUB connecting traffic, and if Aer Lingus Regional (operated by Stobart) is included, this share increases to around 70%.
- Ryanair and Aer Lingus provide over 70% of DUB's seat capacity. Both provide a comprehensive short haul network from DUB, while Aer Lingus also offers long-haul services to a number of North American destinations.
- Pre-Covid load factors at DUB range from 75% to 90% seasonally, with the highest levels coinciding with the busy summer months; overall, the average load factor is around 83%.

Scheduled route network from DUB for its top 5 operating carriers by ASMs for 2019



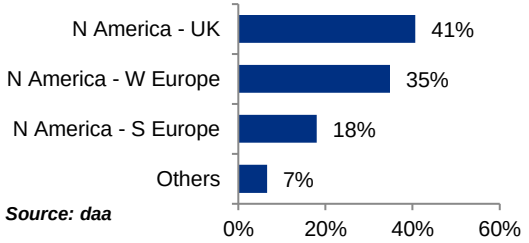
Source: SRS Analyser (full schedule for June 2019, top airlines in ASK for each region)

Aer Lingus share of connecting pax at Dublin Airport



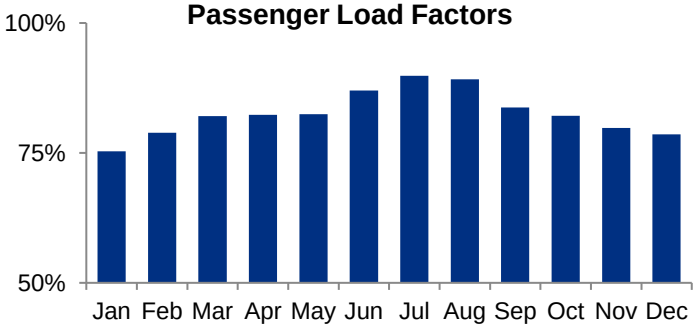
Source: MIDT

Dublin Airport transfer passenger flows



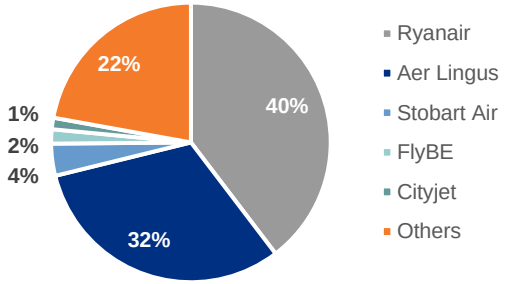
Source: daa

Passenger Load Factors



Source: daa

Dublin Airport top airlines scheduled capacity (seats) share for 2019



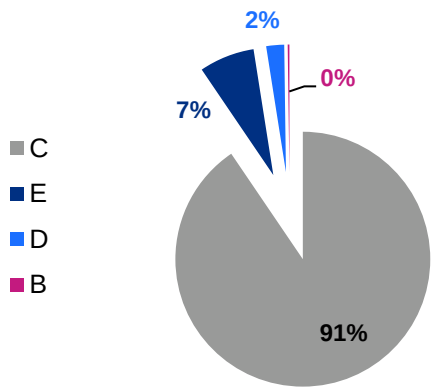
Source: SRS Analyser

Airline capacity review

Average seat capacity at DUB reflects a primarily ICAO Code C fleet operation from Ryanair and Aer Lingus; between them, these two carriers offer over 70% of the seats at DUB

- Aer Lingus and Ryanair, as DUB's main based carriers, is reflected in the overall airport average seat capacity, mirroring a primarily Code C operation from the two carriers for serving extensive short-haul networks.
- Pre-Covid, long-haul operations accounted for approximately 15% of total capacity offered out of DUB airport, covering the Transatlantic, African, Asian and Middle Eastern markets.
- It is likely that seat capacity will increase in future years. Ryanair, for example, will take delivery of Boeing 737 MAX 200s, configured with 197 seats (compared to 189 on the 737-800). There is also a potential increase in the DUB long-haul market share through further penetration in the transatlantic market from existing DUB carriers and the opening of new routes to Far East and South American destinations in the longer term.

Dublin Airport 2019 ICAO Code aircraft size distribution



Source: SRS Analyser

2019 market share & capacity summary table by main DUB operating carrier

Main DUB Carriers	ATMs	Seats	Seats/ATM
Ryanair	37.1%	40.5%	189
Aer Lingus Limited	27.0%	30.2%	194
Stobart Air	9.3%	3.9%	73
British Airways	2.4%	2.3%	166
Cityjet	2.2%	1.2%	94
DUB Overall	**229,546**	**39,682,525**	**171**

Source: SRS Analyser

2019 market share & capacity summary table by main DUB market segment

Main DUB Markets	ATMs	Seats	Seats/ATM
Western Europe	25.0%	24.2%	168
UK Provincial	20.7%	16.1%	134
Southern Europe	20.2%	21.7%	185
UK London	17.1%	16.1%	163
North America	8.0%	11.8%	256
Eastern Europe	5.2%	5.6%	184
Other Regions	2.5%	4.0%	280
Domestic	1.3%	0.4%	60

Source: SRS Analyser

Contents

- In this section we provide a summary overview of:
  - ➢The daa long-term forecast approach
  - ➢The daa annual traffic forecast results
  - ➢The daa forecast schedules

Summary of daa long term forecasting approach

For the annual forecasts, daa uses a top-down macroeconomic approach driven Beontra forecasting tool to derive annual growth rate forecasts, applied to a 1-year bottom-up airline capacity modelling approach driven by airport / airline market intelligence.

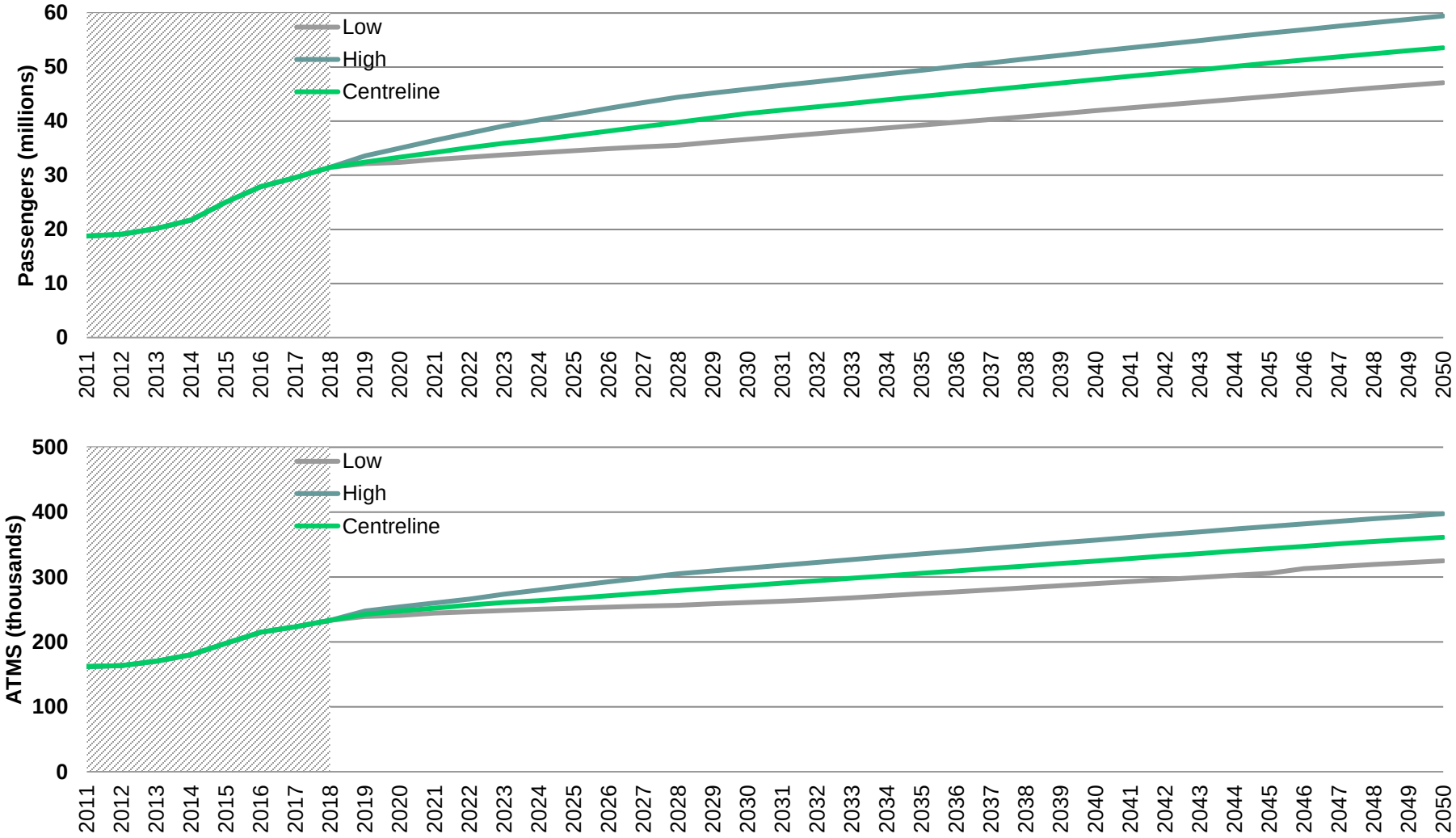
Airline/airport capacity – Supply and demand side

Traffic Cases	Short Term (1-2 year)		Medium Term (~5 year)	Long Term (5 year +)	
Centreline case	• Full year actuals by market and passenger segments and schedules by carrier, route, a/c and month (Seats and ATMs) • 1-year bottom up forecast informed by airport & airline market intelligence on airline growth, services & capacity plans • Low case reflects lower load factors and fewer new services • High case reflects higher load factors and further new services	• Short term economic outlook for the country	• Macroeconomic forecasts: ❖ GDP/CPI [Sources: IMF WEO, OECD Economic Outlook] ❖ Population [Source: Eurostat] ❖ Beyond 5 years, daa apply a tail-off factor to replicate declining economic forecast trends	• Regression models for market growth based on: ❖ O&D economic forecasts ❖ Macroeconomic growth drivers ❖ Route maturities / historic performance ❖ Aggregated market regression outputs validated against: 1. Airbus, Boeing, ACI forecast estimates 2. Oxford Economics study 'Review of Future Capacity Needs at Ireland's State Airports', produced on behalf of the Department of Tourism, Transport and Sport (DTTaS)	• Continuation of the GDP growth rates at a decreasing rate
Low Growth case			• Macroeconomic downside: 1% decrease in Irish GDP for 10 years (to 2030) • Thereafter, GDP growth rates are equal to the Centreline case		• Continuation of the GDP growth rates at a decreasing rate
High Growth case			• Macroeconomic upside; 1% increase in Irish GDP growth rate for 10 years (to 2030) • Thereafter, GDP growth rates are equal to the Centreline case		• Continuation of the GDP growth rates at a decreasing rate

- The above graphic presents our understanding of the unconstrained long-term traffic forecast approach undertaken by daa.
- The Beontra tool is the main mechanism used for the development of long-term annual forecasts, for the Centreline case. This tool is part of the Beontra Scenario Planning suite and allows the development of long-term forecasts using a set of econometric and statistical parameters.
- A bottom up, airline capacities and market intelligence informed forecast is developed for Year 1 upon which the Beontra model growth rates by market are then overlaid to develop the long term centreline view.
- Publicly available macro-econometric forecasts as deployed as inputs to the Beontra model.

Summary of the daa annual traffic forecast outputs

The one-year bottom-up capacity driven forecast is combined with the Beontra econometric model output to derive annuals to 2050. These are the latest pre Covid long term forecasts developed in July 2019.



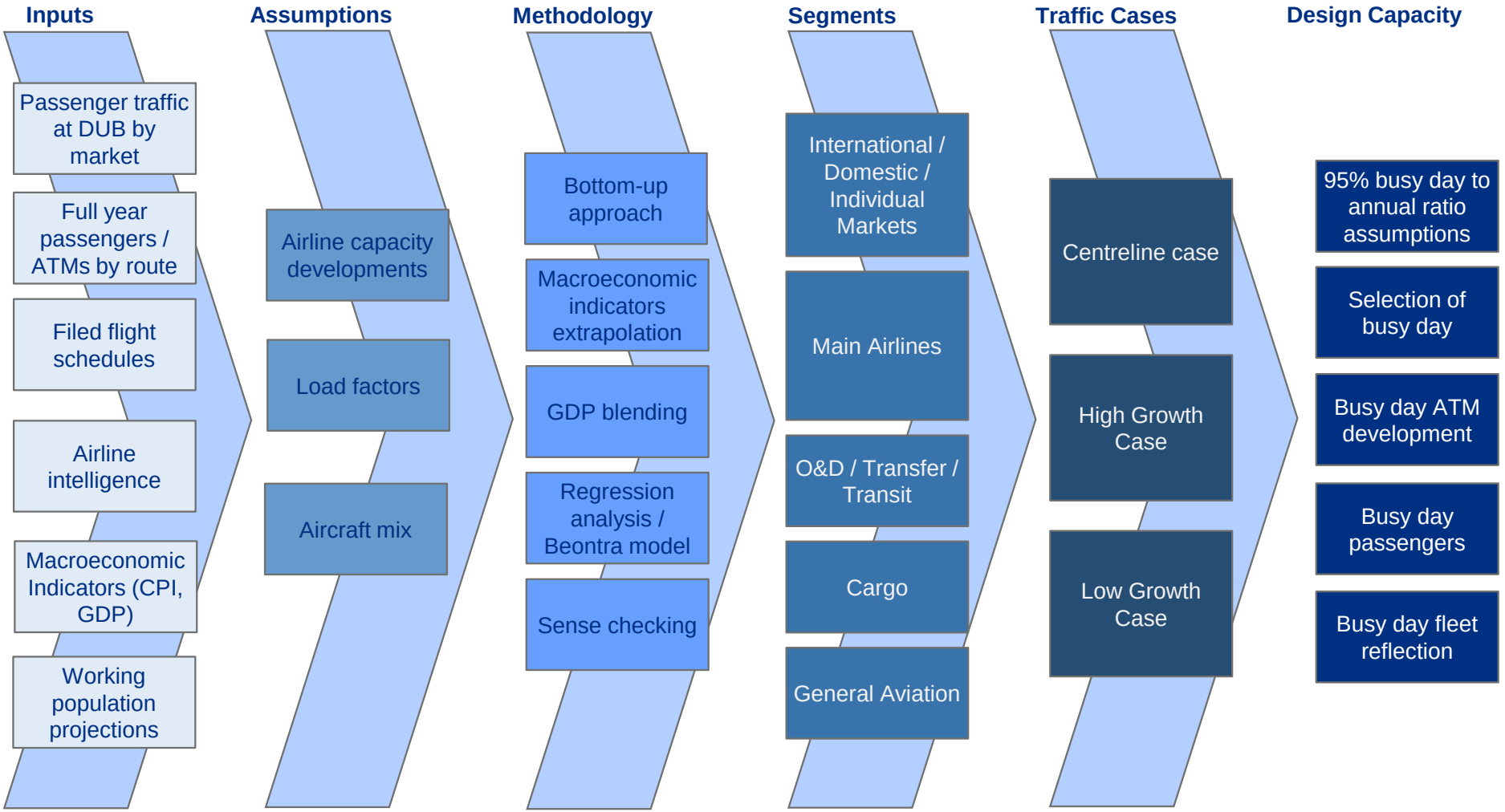
Source: Mott MacDonald analysis of daa data

Contents

- Our main review section covers:
  - ➢Summary points of our traffic forecast review
  - ➢The main forecasting inputs
  - ➢The key assumptions and forecast drivers
  - ➢The main methodology
  - ➢The main traffic segments
  - ➢The traffic forecast cases (Base, Low and High Growth)
  - ➢The forecast schedule development methodology and outcome

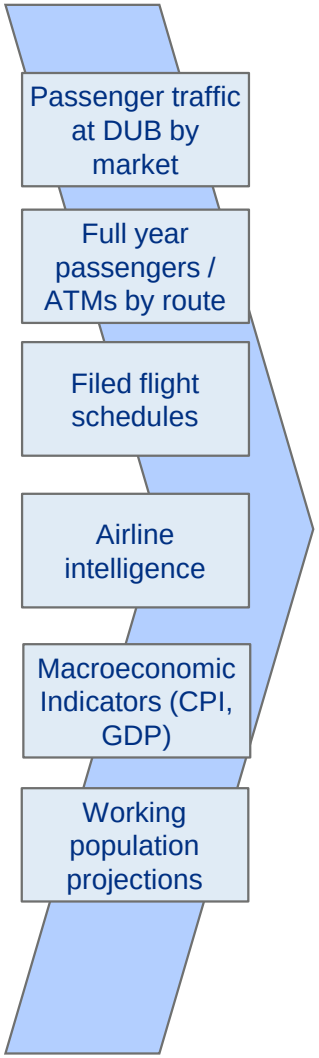
Our review – Summary

The headlines of our review on the daa traffic forecast are summarised on the figure below. The next pages include detail on the forecasting approach used by daa for each of the headline items, as well as our own review commentary highlighted in the blue boxes.



Our review – Inputs

We have reviewed the Pre Covid macroeconomic forecasts used by daa and we believe that they are a reasonable reflection of forecasts available.



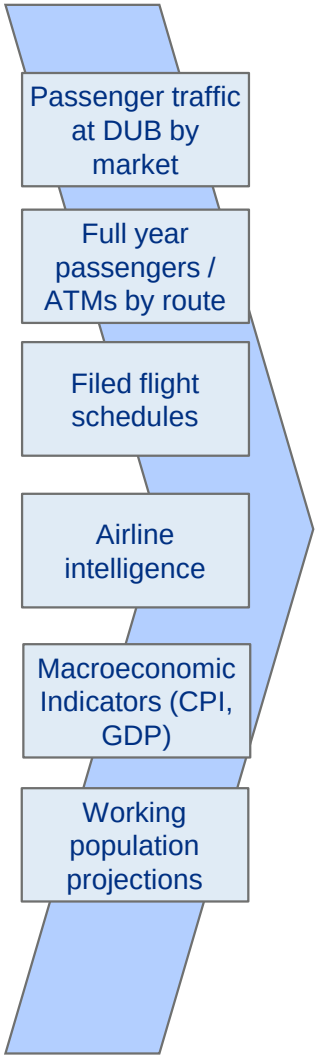
Commentary

- daa has used International Monetary Fund (IMF) World Economic Outlook Gross Domestic Product (GDP) projections to 2023 for the international markets and for the Irish domestic market.
- Post 2023, the daa has applied a decreasing trend to the GDP growth rates. This is similar to historic economic indicator trends that follow a gradual tailing-off profile in the later forecast years and also previous OECD GDP forecasts which also showed a tailing off in later years.
- For international markets, the Beontra model blends together the GDP forecasts for Ireland and the country in question to capture the different drivers of residents and non-residents. Inflation (Consumer Price Index, CPI, from IMF WEO) and working population (from Eurostat) are also used in some instances, depending on what combination of variables delivers the best correlation when predicting historic passenger performance.

- The macro-economic sources used in the daa model are commonly used in traffic forecasting.
- daa has used a reputable source for its GDP and inflation projections (the IMF) as well as a reputable source for its population projections (Eurostat) in order obtain a set of economic indicator projections for the entire forecast period.
- Undertaking multiple regression analysis and applying a blended GDP rate for the international markets is a prudent approach as it reflects both the inbound and outbound traffic, as well as close business and VFR ties between some of the countries.
- Beyond 2023, we would suggest using or benchmarking the growth projections against the OECD long term GDP forecasts until the end of the forecast period, for those markets that are available.
- We recommend that Irish overall population projections are used for the Domestic projections.
- The current economic situation in the UK is highly uncertain with ‘Brexit’ negotiations on-going.
- These forecasts represent the pre Covid situation. Post Covid forecasts should be updated as the pandemic and recovery profile develops.

Our review – Inputs

Latest available traffic and schedule data, as well as airline intelligence have provided a robust base for the one-year bottom up forecast.



Commentary

- In the short-term (Year 1), daa normally uses a 'bottom-up' forecasting approach which considers the published flight schedule as its starting point, which is then overlaid with airline intelligence obtained mainly from its Aviation Business Development team.
- At the time the bottom-up forecast is produced (early in the year), daa has a good view as to the likely out-turn during Q1.
- Any adjustments made for the summer season can then be applied to the subsequent winter season.
- The bottom-up approach is used for one year only; a macro-economic approach is used thereafter.
- Due to the current Covid-19 crisis, the usual bottom-up approach was not used for the Post Covid traffic recovery scenarios, as there is too much uncertainty for this detailed approach to be appropriate.

- Traffic and flight schedule data are an industry wide common starting point for bottom up traffic forecasting, thus the daa approach is in line with industry standard practices.
- The market segmentation of the traffic forecasts reflects the key markets in which DUB is active.
- For an airport where charter flight operations comprise a small proportion of total (as is the case at DUB), using the most recent schedules to drive the bottom up process can lead to very accurate results.

Our review – Assumptions

There are no specific assumptions made for the long term forecasts, which are mainly driven by top down macroeconomic growth projections.

Airline capacity developments

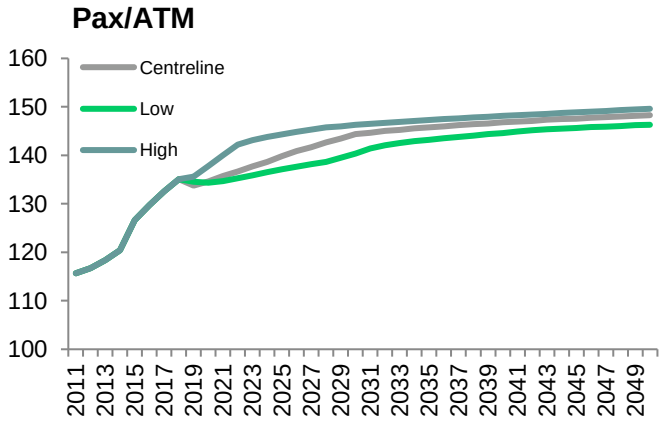
Load factors

Aircraft mix

Commentary

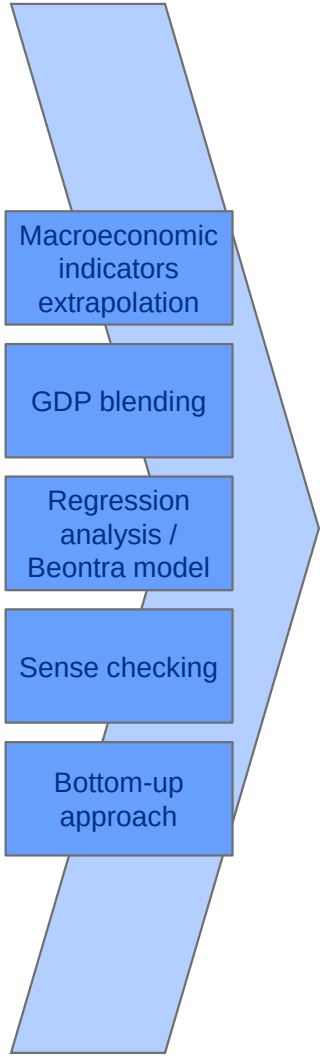
- The bottom-up traffic estimates are driven by market intelligence assumptions such as short term monthly capacity development and new routes introduction by airlines for the short term, informed by the top-down growth primarily driven by GDP projections per country to provide the long-term traffic outlook.
- The high case passengers per ATM imply a continued trend towards larger aircraft along with load factor growth, whereas the low case passengers per ATM implies more moderate growth in both aircraft size and load factor. For the centreline case, daa has mixed the two. Initially, airlines increase aircraft size and load factor which reflects historic trends and known fleet orders (e.g. Ryanair replacing older B737s with B737-MAX types). In the medium-term the centreline case trends only marginally below the high case, however the high case implies a more rapid increase in aircraft size in the shorter-term.

- daa has access to market intelligence that give an up to date and highly informative set of inputs to the bottom-up forecast, making the assumptions robust.
- We expect the assumptions to be within reason and acceptable and based upon a satisfactory level of analysis and detail.
- In the high case scenario, daa assumes that passengers per ATM will increase due to a trend towards larger aircraft and higher load factors and that this will ultimately happen in the low case too. The centreline is a mix of the high and low cases, with aircraft size reaching levels just below those of the high case in the medium-term, albeit at a slower rate. In the long-term, gains in both metrics slow in all three forecasts. We agree that the overall passengers per ATM is likely to grow due to the reasons outlined above.



Our review – Methodology

daa uses a sound methodology for generating long-term traffic forecast estimates and has a good sense-check process against other industry estimates. Regression coefficient checking and validation of the GDP process are two areas in which the daa methodology can improve.

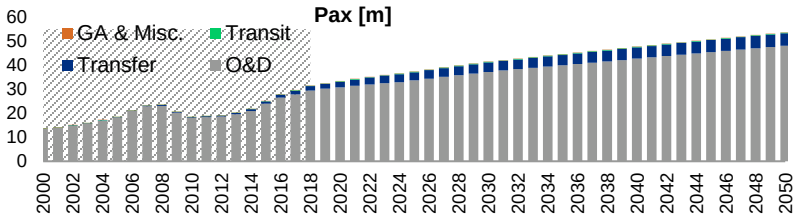


Commentary

- From 2023 onwards, daa has assumed a gradual tail off of GDP for the remainder of the period. This is based on historical indicators and also previous OECD forecasts which showed tail off to reflect market maturity.
- The macroeconomic variables used for each major market were blended between Irish GDP / country GDP to account for the different economic drivers between residents and non- residents. Other variables such as CPI and working population were considered for some markets where these improved historical regressions.
- A multiple regression in the Beontra tool was used for the Nordic and Benelux country cases.
- The model provides the regression R^2 output however it does not automatically generate the regression coefficient.
- The Year 1 bottom up estimate was compared against the Latest Expected Official number for Dublin Airport.
- For the long-term forecasts, daa compared aggregated market segment forecasts with estimates produced by Oxford Economics on behalf of the Department of Tourism, Transport and Sport (DTTaS) ('Review of Future Capacity Needs At Ireland's State Airports') as well as estimates produced by Airbus, Boeing and ACI.

- The extrapolation of GDP and CPI growth rates is a common procedure for long-term traffic forecasting, when published macroeconomic indicator projections by reliable sources are not available for the forecast horizon. We also agree with the built-in assumption of tailing-off of the growth rates, because markets typically show signs of maturity over time.
- We suggest that daa considers sources such as OECD or the USDA for GDP estimates beyond 2023 to cover the forecast period of interest.
- In principle, we agree with the use of a multiple regression and the blending process used are acceptable methods of prediction. Specifically for the blending, daa could validate the blending relationship using an airline by proxy country approach or with MIDT passenger shares for the countries of interest.
- daa refer to the regression R^2 outputs as indicating a good fit, however it is also important to consider the regression coefficient result for each regression to assess the significance of the result.
- daa are applying sense checks to the regression outputs which is standard practice. The Oxford Economics DUB base case forecasts reach 54m in 2050, very similar to daa's 53.6m in the centreline case. daa's North American market growth rate is similar to Boeing's (~3%) and although daa's European growth rate is lower than Airbus's (~2% v ~3%), this likely reflects the fact that DUB is a relatively mature market compared with some other European regions (for example Eastern Europe).

CAGR	2000-18	2018-22	2022-30	2030-40	2040-50	2018-50
O&D	4.4%	2.1%	1.9%	1.4%	1.2%	1.5%
Transfer	-	11.8%	3.9%	1.9%	1.1%	3.3%
Transit	-	0.0%	0.0%	0.0%	0.0%	0.0%
GA & Misc.	1.9%	(0.8%)	0.3%	(0.1%)	0.4%	0.1%



Our review – Market Segments

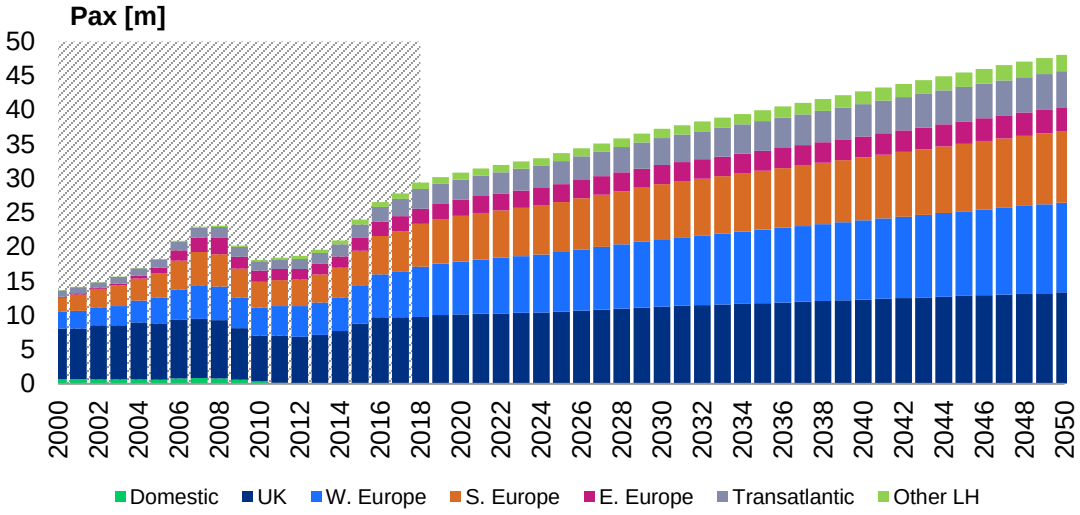
The projected growth for all the market segments analysed appears to be within reason. This analysis reflects the Pre Covid market conditions.

- International / Domestic / Individual Markets
- Full Service / Low Cost / Charter / Individual Airlines
- O&D / Transfer / Transit
- Cargo
- General Aviation

Commentary

- The daa projections for overall traffic growth at DUB show the 2018-2022 CAGR at 2.7%, not dissimilar to the projected annual GDP growth rate for Ireland, at 3.3% by the IMF (Oct 2018). Traffic grows more strongly in the early years of this period, driven by known capacity increases by DUB's airlines during 2019 as well as stronger projected economic growth in the Irish economy. The Eastern European and other long-haul markets are forecast to grow the strongest in the near term.
- In the short to medium term, the main drivers of traffic growth are likely to be Ryanair and Aer Lingus. Both carriers have new aircraft entering their fleet over the next few years and while some of these will likely replace older models, some are expected to be used to grow capacity at DUB and, in the case of Aer Lingus, to further strengthen its hub position.
- The UK market is expected to grow on average at 1.3% per annum between 2018 and 2022. This is lower than recent growth (the UK market grew by an average of 3.6% per annum between 2015 and 2018), however this reflects the IMF's October 2018 forecast GDP growth rates for the UK (~1.5% between 2018 and 2022) and uncertainty surrounding Brexit in the UK.

- The projected growth for the market segments appear to be reasonable.



CAGR	2000-2018	2018-2022	2022-2030	2030-2040	2040-2050	2018-2050
Domestic	(10.6%)	(0.4)	0.2%	0.0%	0.0%	0.0%
UK	1.5%	1.3%	1.2%	0.9%	0.8%	1.0%
W. Europe	6.2%	2.5%	2.4%	1.6%	1.3%	1.8%
S. Europe	6.5%	2.6%	1.9%	1.4%	1.3%	1.6%
E. Europe	18.1%	3.1%	1.5%	0.9%	1.2%	1.4%
Transatlantic	6.3%	1.5%	3.0%	1.9%	1.1%	1.9%
Other LH	-	3.3%	3.2%	3.2%	2.5%	3.0%

Our review – Market Segments

The projected growth for all the market segments analysed appears to be within reason. This analysis reflects the Pre Covid market conditions.

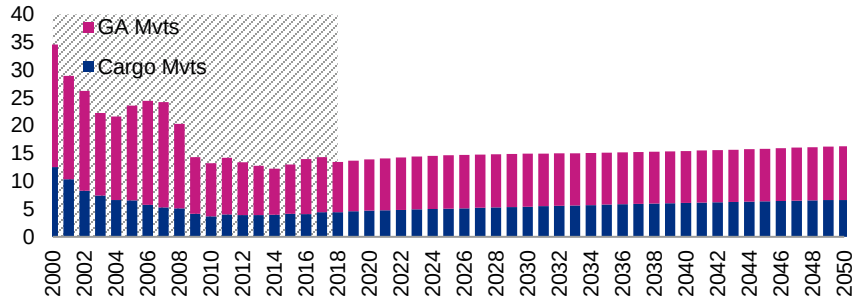
- International / Domestic / Individual Markets
- Full Service / Low Cost / Charter / Individual Airlines
- O&D / Transfer / Transit
- Cargo
- General Aviation

Commentary

- The transfer market is expected to grow the most rapidly in the short term, from 1.9 million in 2018 to 3.2 million by 2023. This is driven by assumptions around Aer Lingus' long-haul fleet, which is projected to grow from 17 aircraft in 2018 to 30 by 2023[1]. Beyond this, the transfer traffic is aligned to growth in the transatlantic market (which has a CAGR of 1.9% from 2018 through 2050). The volume of transfer passengers is expected to reach nearly 5.3 million by the end of the forecast period, or ~10% of the DUB's total, as the airport strengthens its hub potential with feeds between the transatlantic and short-haul markets.
- Transit passengers are expected to decline in percentage terms over the forecast period (from ~0.8% to ~0.4% of the total), but in absolute terms the number remains fairly static across the forecast period at approximately 238,000.
- Cargo volumes have been forecast using a combination of Irish Gross National Product (GNP) and the U.S. exchange rate, which led to a good fit against historic volumes. We are not aware of any changes being applied to average aircraft size.
- General Aviation (GA) represents the smallest part of DUB's traffic (approximately 0.1% in 2018) and it peaked in 2008 with approximately 48,000 passengers. daa's forecast suggests that GA passengers will remain fairly static, with ~37,000 in 2018 comparing to ~38,000 by 2050.

- The assumptions behind the growth in transfer, transit and GA passengers appear reasonable.
- Cargo ATMs increase from ~4,400 in 2018 to ~6,600 by 2050, however we are unable to comment further as we are not aware of any assumptions being made to the average aircraft size.

Non-Passenger ATMs



CAGR	2000-18	2018-22	2022-30	2030-40	2040-50	2018-50
Cargo ATMs	(5.7%)	2.5%	1.4%	1.2%	0.8%	1.3%
GA (non-ATMs)	(4.8%)	1.0%	0.1%	(0.2%)	0.3%	0.2%

1: Sources = daa supplied data, Irish Times November 2018

Our review – High & Low Growth Case Traffic Scenario

Overall, we consider the High and Low Growth traffic cases to be reasonable. This analysis reflects the Pre Covid market conditions.

Centreline case

High Growth Case

Low Growth Case

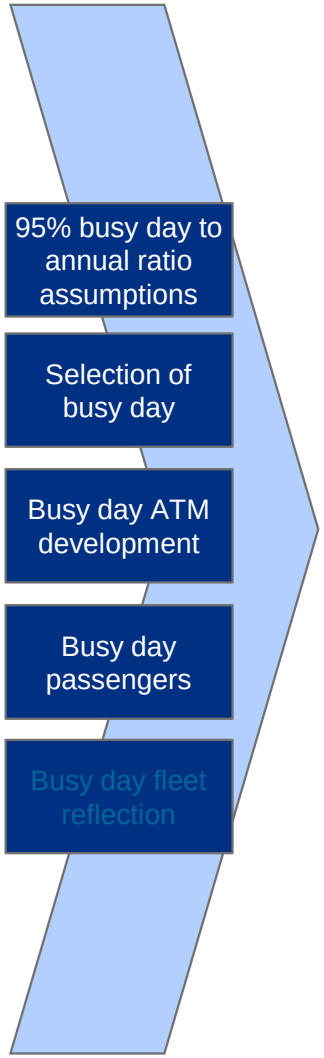
Commentary

- daa developed the High Growth and Low Growth case forecasts by undertaking variations to the GDP growth rate between the years 2019 and 2029. Beyond 2029, the Centreline scenario GNP growth rates were used.
- Based on the Centreline scenario, the Irish GDP growth rate was increased by 1% point per year to 3.8% for the 10 year period to generate the High Growth passengers. This led to a 3.0% increase in passengers.
- The reverse was applied for the Low growth scenario, leading to a 1.2% increase in passengers.

- Overall, we consider the High and Low Growth scenario approach to be a reasonable, albeit simplified approach.
- daa might consider modelling a more 'informed' set of High and Low Growth scenarios, for example by looking at the upside from an expanded DUB route network and hub growth potential or the impact of a macroeconomic downturn in one of DUB's key markets (i.e. Europe or North America).
- We would also expect the High and Low cases to evaluate the sensitives of each market segment developed for the forecast, rather than applying the GDP growth variation in aggregate.

Our review – Design Capacity

The busy day for passengers and ATMs has been identified for the expected market categories for a design capacity assessment study and according to industry standards.



Commentary

- The base schedule is based on an approximate 95% busy day for 2019. Although a precise 95% busy day for 2019 cannot be calculated until year end, there is good visibility on the 2019 schedule enabling an approximate 95% busy day to be calculated. This day is determined to be 22 July 2019 (Monday) with 793 movements and 119,127 forecast passengers.
- The future busy day schedules for 2022, 2027 and 2040 represent hypothetical busy days applying a 95th busy hour passenger LF and peak movement activity and were calibrated based on the annual forecast figures for the main markets.
- The forecast schedules were produced based on the High Growth scenario annuals and they reflect an unconstrained scenario; slot / runway availability or any other infrastructure elements are not a constraining factor.
- The schedule for future years was adjusted through an:
  - Increase in additional flights for the future determined by the composition of annual forecast (region and airline type). The build-up of planning day flights by route type/airline type were guided by the annual trend.
  - The LF's on the forecasted busy day have been based upon the LF in a historic typical busy day (namely 2018), by airline and main market.
  - The market composition in the schedule is similar to, but not identical to, the annuals because market seasonality and market representation across the busy day have also been taken into account.
  - Flight distribution follows the existing unconstrained profile throughout the day, albeit with gradual fill of shoulder peaks for future new flights and frequencies.
  - The overall busy hour forecast produced from the planning day schedules was sense- checked using a top-down ratio analysis.

- The methodology used by daa for the development of the forecast schedules is acceptable and according to industry standards.
- We have validated the 2018 95% passenger and ATM peaks.
- A prudent approach is taken to derive busy day passenger and ATM estimates, based on BDRs at an airport total level.
- We would recommend that daa also undertakes an busy day to annual ratio approach for each of the key passenger segments.
- However, validating the markets based on current market seasonality is an acceptable sense check.
- The gradual de-peaking of the flight profile of the busy day at the airport is a reasonable assumption as the airport traffic grows in size.
- We would also recommend that daa validate the busy day to annual ratio through benchmarking busy hour projections against European comparator airports.
- We have verified that the market breakdown of the busy days mirrors the annual market breakdown – with exceptions due to seasonality on some markets. We are comfortable with this assumption being carried forward in the future busy day schedules.

Our review – Design Capacity

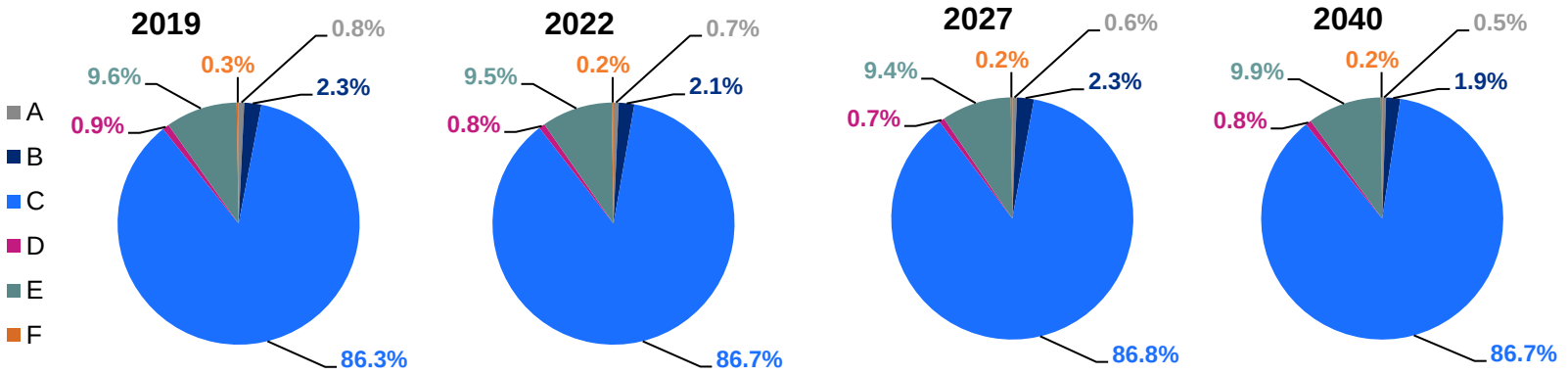
The methodology that daa has followed for the busy day schedules and all the relevant airline and market assumptions are satisfactory.

- Busy to annual ratio assumptions
- Selection of busy day
- Busy day ATM development
- Busy day passengers
- Busy day fleet reflection

Commentary

- daa assumes that DUB's fleet will continue to be largely composed of ICAO Code C aircraft, although aircraft that are no longer in production (such as the RJ-85 and first generation Boeing 737 variants) are anticipated to be replaced with newer versions.
- Other current generation aircraft are anticipated to be replaced over the next 20 years.
- daa has assumed that Aer Lingus will mainly operate mainly A321NEOs, A330-200s and A330-300s on its long haul routes, while the CityJet operations flying on behalf of Aer Lingus which currently use RJ-85s will be upgraded to Embraer 190s.

- Fleet evolution assumptions reflected in the forecast schedules reflect a predominantly ICAO Code C operation at DUB, although we note an increase in A321LR operations which contributes to an overall rise in seats per movement from 167 in 2019 to 174 by 2040. These are largely anticipated to be operated by Aer Lingus and reflects Aer Lingus' current fleet order for eight of the type.
- We also checked the busy day schedules and their composition in terms of airline mix, passenger load factors and destinations. The airline mix is forecast to remain relatively constant, with Ryanair and Aer Lingus continuing to account for ~60% of the operations and the destination market mix is similar to the annual market mixes, with the UK and Europe forecast to remain the largest markets. We note the passenger load factors for certain airlines are close to the maximum, an assumption that can be justified considering the schedules represent a busy days.
- The methodology that daa has followed for the busy day schedules and all the relevant airline and market assumptions are satisfactory.



Source: daa

MOTT MACDONALD

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