Commission
for
Aviation
Regulation

Dublin Airport Coordination Committee
Dublin Airport
Co Dublin

19 October 2016

RE: Declaration of Parameters for Summer Season 2017

Dear Committee Member,

In this letter I set out my decision relating to the determination of coordination parameters for Dublin Airport for Summer 2017.

Legislative Background

The Commission, by virtue of Section 8(1) of the Aviation Regulation Act, 2001, is the competent authority in Ireland for the purposes of Council Regulation (EEC) No.95/93 (as amended) on common rules for the allocation of slots at Community Airports ("the Slot Regulations") other than the function of the coordinator.

Article 6 of the Slot Regulations states that, at a coordinated airport, the Member State responsible shall ensure the determination of the parameters for slot allocation twice yearly, while taking account of all relevant technical, operational and environmental constraints as well as any changes thereto. Pursuant to Article, 6(1) the final decision on the parameters is a matter for the State. The competent authority in the State for the purposes of Article 6 is the Commission for Aviation Regulation. Thus at Dublin Airport, it is for the Commission for Aviation Regulation to ensure the determination of parameters for slot allocation.

Article 5 of the Slot Regulations sets out the role of the coordination committee. In relation to determining the coordination parameters, the Coordination Committee's role is to advise the Commission.

Committee Meetings for Summer 2017 Parameters

At the Coordination Committee Summer 2017 pre-meeting on 13 September 2016, daa proposed a number of changes to declared capacity. It was proposed to increase departures from 35 to 37 in the 05.00 hour, changing the totals in that hour from 40 to 41 but capping the arrivals in that hour to maintain departure/departure separations. It proposed to change the departure/arrival ratio of the 06.00 hour, going from 30 to 32 departures, and to rebalance the 08.00 hour, going from 22 to 23 arrivals and reducing departures from 29 to 25. Increases in total movements were proposed in the 11.00 hour and the 16.00 hour, from 46 to 47 and from 48 to 49 respectively.

Committee members agreed to consider the proposals ahead of the 27 September AGM where they would vote on these proposals.

At the AGM on 27 September, Dublin Airport reiterated the proposals set out above. Dublin Airport and IAA voted in favour of the proposed runway parameters. The airlines all voted against them, and therefore the proposals were rejected by the Committee. The results of the vote is set out in the table below:

Organisation	Voting Rights	In favour	Against
Totals	794	60	734
Percent	100%	8%	92%

Airlines argued against the increase in capacity on the basis that it would result in increased delays due to congestion on the airfield.

The Commission views the above vote as the Committee advising it not to implement the changes, as envisaged under Section 5 of the Slot Regulations. This recommendation has been reiterated to the Commission by various members of the Committee.

The Commission's Involvement – Summer 2017

Before now, adjustments to coordination parameters have been made following discussion at the Coordination Committee and these have been implemented by the Coordinator appointed by the Commission. The evolution of coordination parameters has followed on from the most recent capacity analysis performed on behalf of the Commission which was the evidential basis upon which Dublin Airport was designated as coordinated in 2007.

The Commission, as observer at the September meeting, noted that a potential increase in capacity was rejected by the Airlines. Given that the thrust of the Slot Regulations is to identify opportunities to increase capacity, and that parties also raised this issue with us, to fulfil our duty under Section 6 of the Slot Regulations we decided to review the evidence and make a determination of the coordination parameters for Dublin Airport for Summer 2017.

To assist us with this task we engaged Alan Stratford and Associates (ASA), Peter Forbes from ASA was lead on the project.

ASA were asked by the Commission to assess the evidence presented for and against the increase in declared capacity. The report is annexed to this letter and should be read with it. The report notes that given the time available it should be regarded as a brief overview of the evidence; in ideal circumstances a full capacity assessment would be undertaken. That said, it concluded:

- The new parameters should theoretically allow for an increase in movements.
- While the NATS model concludes that the delay criteria will not be breached on Runway 28, it excludes taxi time from stand.
- Modelling would suggest the increase is feasible from an air traffic control perspective.
- Increases in taxi times at Dublin Airport have been observed in recent years.
- Dublin's on time performance is level with or above that of many other European airports – a small increase in delays may be acceptable.
- The report recognises the concerns of the airlines in relation to delays and the impact on customer satisfaction and costs.
- The proposed operational improvements may take some time to bed in and for the full benefits to be achieved.

It is important to note that ASA saw merit in both sides of the argument.

Decision – Parameters for Summer 2017

The Commission has decided that the coordination parameters for the summer season 2017 will remain the same as Summer 2016.

In reaching this decision, we examined (a) the technical information provided at the two Committee meetings and in subsequent stakeholder meetings and (b) the process for making decisions.

Technical Considerations

We noted the advice of the Coordination Committee which voted 92% against the introduction of the new capacity and the stated reasons for this vote both at the Committee meeting and those expressed to us in stakeholder meetings.

We also considered the conclusions of the expert we engaged. As discussed above, no clear conclusion can be drawn from the evidence available. The additional capacity may be theoretically possible but the effect on airfield congestion and delay is unclear. This has not been explored in enough detail to draw a definitive conclusion.

In order to approve the increase in capacity, considering the level of uncertainty, we would need to conduct a full capacity assessment of Dublin Airport. Sufficient time is not available to conduct this exercise in advance of the coordination process for Summer 2017. ACL, the Coordinator at Dublin Airport, requires the coordination parameters by 20 October in order to complete the coordination. This does not preclude us from conducting the exercise to inform subsequent declarations of capacity.

The Commission is of the view that the introduction of additional capacity at this time would come with an unquantified degree of risk given that some of the new operational measures to support the additional capacity are not yet in place, therefore the operational benefit is difficult to establish.

A holistic approach should be taken when looking at the coordination parameters and the examination of congestions and delays are a key part of this exercise. There needs to be a review of the effect of the suggested operational changes to see if, as suggested, they can facilitate the additional slots without unreasonable impacts in other areas of operation. If not, are there any additional measures that need to be considered.

Decision Making Process

Article 6 of the EU Slot Regulations places a number of obligations on the Commission when determining the parameters. We must:

1. Take account of all relevant technical, operational and environmental constraints as well as any changes.
2. Base our decision on an objective analysis of the possibilities of accommodating the air traffic, taking into account the different types of traffic at the airport, the airspace congestion likely to occur during the coordination period and the capacity situation.
3. Communicate our determination to the airport coordinator in good time before the initial slot allocation takes place for the purpose of scheduling conferences.
4. Discuss the determination of the parameters and the methodology used as well as any change in detail with the Coordination Committee with a view to increasing the capacity and number of slots available for allocation before a final decision on the parameters for slot allocation is taken.
5. Make available all relevant documents, on request, to interest parties.

As noted above, the daa brought its proposal to the Coordination Committee, for consideration, at a pre-meeting on 13 September and at a full meeting on 27 September. The Commissioner started considering the advice of the Committee after this meeting. It is worth noting that the airlines provided their initial submissions to the slot coordinator on 6 October and the Commission is required to provide the Coordinator with a decision on parameters no later than 20 October. The process concludes with the Coordinator allocating slots on 27 October.

In the time available, the Commission reviewed evidence provided by Committee members, met with members separately and again with the Committee as a whole.

On the basis of our review, we have decided that our analysis represents an overview of the issues and points to areas of additional work that needs to be undertaken. If we carry out a full assessment and examine the full impact of daa's proposals, we cannot meet the 20 October deadline. On balance, we are of the view that our depth of analysis and the time available to the Commission to discuss results with Committee members do not fully meet the requirements of Article 6.

In arriving at this decision the Commission fully appreciates the significant amount of work carried out by Dublin Airport and IAA on operational efficiencies. Reduction of departure-departure separation by IAA and the increased use of Runway 28 should improve resilience and congestion on the airfield in time. We also welcome the introduction of ACDM. While the timeline for achieving the benefits is uncertain, in time we believe this enhanced level of data collection and information sharing will assist in operational resilience.

The Commission will communicate this decision to ACL and the coordination for Summer 2017 will occur in the normal way.

Future Work

It is timely to conduct a full capacity assessment of Dublin Airport in order to assist in the determination of coordination parameters beyond Summer 2017. The Commission will start this assessment in the near future.

In addition, the Commission would like to work with the Coordination Committee and other stakeholders to review the process for determining coordination parameters. This is particularly important when increases in capacity are proposed.

Finally, I would like to thank all stakeholders for engaging fully in this process under tight timelines.

Yours sincerely

Cathy Mannion
Commissioner

Commission for Aviation Regulation

Assessment of proposed capacity parameters at Dublin Airport

Final Report

November 2016

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1. Introduction

This report has been prepared by Alan Stratford and Associates Ltd on behalf of the Commission for Aviation Regulation (CAR) in Ireland. It provides a brief assessment of potential changes to the slot coordination parameters at Dublin Airport. Under Irish legislation, the Commission for Aviation Regulation has a statutory duty as defined under EU Regulation No 95/93 (as amended) to determine its capacity. The slot coordination parameters form the basis of this capacity declaration.

The assessment has been made prior to the declaration of capacity for the Summer 2017 (S17) season. The Commission must make this declaration by 20th October 2016 in order that the Coordinator (Airport Coordination Limited – ACL) can prepare for the next stage of the coordination process. As such, the assessment should be regarded as a brief overview of the evidence for and against the proposed capacity changes. In ideal circumstances, a full capacity study would be undertaken.

The assessment has involved a review of all available documentation relating to the proposed changes, including historic and current on-time flight performance (OTP) data. Interviews were also held with key stakeholders including Dublin Airport, the Irish Aviation Authority, the airport coordinator (Airport Coordination Limited - ACL) and four of the principal airlines, Ryanair, Aer Lingus, Cityjet and British Airways using Dublin Airport, who represent about 85% of total movements.

The various sections of this report include a review of traffic growth at Dublin Airport, an assessment of runway, taxiway and aircraft stand infrastructure particularly in relation to arrival and departure movements, a summary of the current (Summer 2016) and proposed (Summer 2017) slot coordination parameters and a review of the results of the simulation model developed by NATS (National Air Traffic Services) on behalf of the Dublin Airport Authority (daa). Further sections of the report include a review of the flight on-time performance (OTP) statistics for Summer 2015 and 2016, an appraisal of the potential short-term operational measures that could be introduced to improve capacity, a benchmarking analysis against UK and other European airport and an overview of the views of stakeholders including the daa, the air traffic services provider (the Irish Aviation Authority) and the principal airlines currently operating at the airport. At the end of the report, we show our preliminary conclusions from the assessment, which are given as an independent external consultant, rather than from the viewpoint of the regulator.

At Dublin the regulator (ie the CAR) determines the airport's capacity, rather than the airport itself – and there is a special committee, the Airport Coordination Committee, comprising representatives of the daa, the IAA and the airlines who advise CAR on capacity issues, the misuse of slots etc. The proposed changes to the slot coordination parameters for S17 have been suggested by Dublin Airport based on an aggregated wishlist of slot demand prepared by ACL. The wishlist

was derived from base carrier expected demand and time changes and new slot requests based on information provided by the daa.

These changes were considered by the Committee on 27th September 2016. The proposals were, however, rejected by most of the airlines at the meeting and under its voting procedures, they were rejected by the Committee as a whole.

2. Dublin Airport – Traffic growth

Following a dip in traffic levels between 2010-2012, Dublin airport has grown strongly, handling some 25.0m passengers and 197,870 aircraft movements in 2015, representing increases of 15.4% and 9.7% over the previous year. Total passengers handled between January-September 2016 increased by 11.8% and total aircraft movements by 9.6% over the comparable period in 2015.

The airport operates primarily as a single runway airport, although the cross-runway can be used at certain times. Whilst the airport is not at full capacity throughout the day, it is constrained at peak periods, particularly in the early morning peak between 0500-0900 hours UTC. Dublin's capacity is declared based on its operation as a single runway airport, although in practice the cross-runway can also be used to improve resilience during the early morning peak.

As a result of the capacity constraints at the airport and the predicted future traffic growth, the daa is planning a second full length runway to the north of R10/28. This is expected to be operational by 2020 so the expected benefits fall outside the scope of this assessment.

3. Runway and other infrastructure constraints

Dublin airport has a single main runway, 10/28, which is 2,637m in length and a 2,072m cross-runway, 16/34, which is used in certain weather conditions either as the sole or an additional runway. . Over the period January 2014 to date, some 65% of all movements used R28, 30% R10,-4% R16 and 1% R34.

In general terms, the use of R28 for both arrivals and departure traffic is preferred as this requires the least taxiing time and provides the best performance in terms of minimising average delays. The cross-runway (R16/34) can be used by most aircraft at Dublin Airport, although there may be payload restrictions on certain flights eg to the US and Canada.

As at all airports, the use of the preferred runway direction, R28, is constrained by the tailwind. Historically, if this exceeded 5 knots, the runway direction would be switched to R10. The IAA has, however, recently introduced procedures whereby the Duty Chief ATC Controller can maintain operations on R28 until the tailwind exceeds 10 knots. This increased usage of R28 (potentially for up to 75% of all movements) should result in improved on-time performance (OTP) although there is limited data to date to show the overall impact. In addition, the IAA has introduced the possibility of dual operations on R28 and R34, subject to the

appropriate wind conditions, between 0630-0800 hours. During this period, R34 can accommodate up to 13 hourly departure movements by short haul aircraft, thus improving OTP during this peak period. Dublin's capacity however is declared based on the use of the single main runway. Any movements made on the cross-runway therefore add to resilience rather than increase this capacity.

The layout of the passenger terminals, the runways, taxiways and stands at Dublin airport is shown in the Aerodrome Chart in Appendix A and the Aircraft Parking Chart in Appendix B. The airport has two passenger terminals, the older Terminal 1 (T1) and Terminal 2 (T2) which opened in 2010. T1 is served by Piers 1, 2 and 3 and other remote stands, whilst T2 is served by Pier 4 with some access to gates in Pier 3. Pier 2 is unsegregated between arrival and departure passengers – so its gates can only be used for domestic flights or those to the UK[1].

Dublin's largest carrier, Ryanair, uses Piers 1 and 2, served by T1. Cityjet and Stobart Air use Pier 2 and its associated remote stands. The long-haul carriers operate from both T1 and T2. Air Canada, West Jet and Etihad use T1, although Etihad will move to T2 by S17. American, United, Emirates and Aer Lingus, who offer both long-haul and short-haul flights, operate out of T2 and use Piers 3 and 4.

As indicated in the chart in Appendix B, most of the taxiways to the pier-served stands are cul-de-sacs in that a departing aircraft from one of the pier stands can potentially block another aircraft taxiing towards a stand beyond it (or vice versa). This can create congestion and additional taxiing times particularly at peak periods eg the first wave of departures. This has been partially alleviated in the taxiway to the north of Pier 1 where three potential routings within the taxiway have been introduced enabling two short-haul aircraft to pass each other, if required.

The R28 runway end is accessed via the Foxtrot taxiway or via R16, which can be used as a taxiway, if not in operation. There are two main line-up positions for departing aircraft – although manoeuvring within this area is complex and it is considered as a runway hotspot. Aircraft departing on R10 will access the line-up position via Bravo taxiway – although taxiing from Piers 1 or 2 will take some 8-10 minutes, even if there is no congestion.

A key concern is the taxiway congestion experienced by arrivals flights in the early morning peak (0600-0800 hours UTC) as these are impeded by aircraft queuing at the line up points. This applies both to operations on R28 and R10. Further congestion can be introduced by early arrivals, which often have to wait on a taxiway or other hold position before a stand becomes vacant. This applies to both early US and Canadian flights, where the flight times can be variable dependent on the wind conditions and track used and to early UK and European flights. ACL have recently arranged to reschedule two transatlantic flights (operated by Delta and United) to partially alleviate this situation. In addition, a small number of carriers can regularly arrive outside of their allocated slot time. Carriers can be

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[1] An exception to this is the Air France flights operated by Cityjet on an ACMI basis – although special staffing is required to separate the arrival and departure passenger streams. A capital project to provide a physical separation is expected to be completed by S17.

fined for doing this although at Dublin the sanction regime has been in place for less time than at UK and other European airports.

The impact of these various taxiway constraints is difficult to assess, although this can be measured in terms of the trends in the average taxi times, particularly during peak hour periods (see Section 7).

4.   Slot coordination parameters

In principle, Dublin's runway capacity should be similar to any single runway airport operated in mixed mode, subject to similar infrastructure eg entry and exit points, departure routings (SIDS) etc. London Gatwick currently handles the highest number of movements for a single runway airport in the world (267,760 in 2015 in comparison to 194,709 at Dublin) although this reflects greater capacity utilisation throughout the day and an increased hourly movement rate (up to 55 per hour) due to a larger range of fully separated departure routings (SIDS).

The current declared capacity at Dublin is set on an hourly basis for each Winter and Summer Season. Under the current parameters for S16 (see Appendix C), there is a maximum hourly rate of 48 aircraft movements between 1600-1700 hours UTC (or 1700-1800 hours local). The maximum permitted departure rate is 35 per hour (subject to maximum of 40 total movements) between 0500-0600 UTC, whilst the maximum permitted arrivals rate is 30 per hour (subject to a maximum of 36 total movements) between 2100-2200 hours UTC.

In addition to these runway movement limits, there are also hourly and two hourly constraints on the maximum number of departure passengers[2] and an hourly constraint on the maximum number of arrivals passengers[2] for each terminal. There are also constraints to ensure that there are sufficient stands available to operate the coordinated schedule.

Based on the initial slot wishlist made by airlines for S17, ACL provided Dublin Airport with an hourly breakdown of the expected utilisation of the current slots available (based on historic usage and retention), the forecasted usage of excess available capacity and the additional capacity required to fulfil these requests. This breakdown, which is shown in Appendix E, can therefore be regarded as the 'wish list' for additional capacity based on airline requirements.

Using this initial wish list, Dublin airport prepared a proposed breakdown of the hourly capacity increases that they believed would be feasible without significantly impacting average or peak hour average delay times (Appendix F). These capacity changes were primarily designed to enable increase in departure movement rates in the first wave including 2 additional departures in the 0500-0600 hour UTC to give a throughput of 37 departures per hour. Further increase to the maximum movement rates in the 0800-0900, 1100-1200 and the 1600-1700 hour UTC were also proposed.

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[2] Based on an average load factor of 85% for scheduled services and 95% for charter services

Dubiin airport's proposed capacity increases for S17 were presented to the Airport Coordination Meeting on 27th September 2016 and were supported by the infrastructure and operational changes which they believe will prevent any significant increases in average departure or arrival delay at the airport.

5. NATS modelling results

To test the operational feasibility of these capacity increases, Dublin Airport commissioned NATS to undertake a simulation modelling exercise using their RUNWAY fast-time stochastic model. The proposed hourly capacity increases given to NATS both for their 'Wish List 1' and 'Wish List 2' were slightly more demanding that those finally proposed by Dublin Airport, as shown in the table below:

Table 5.1:   Dublin Airport – S17 – Total movement capacity[3]

Wish List 1	NATS modelled	daa proposed
0500-0600	+2	+1
0800-0900	+2	0
1000-1100	+1	0
1100-1200	+2	+1
1500-1600	0	0
1600-1700	+2	+1
1700-1800	+1	0
Wish List 2	NATS modelled	daa proposed
0500-0600	+2	+1
0800-0900	+2	0
1000-1100	+1	0
1100-1200	+1	+1
1500-1600	+1	0
1600-1700	+1	+1
1700-1800	+1	0

NATS carried out two simulations[4] to calculate the average hourly arrival and departure delay for operations on R28 and R10. These were based (a) on a Departure-Departure (DD) movement separation of 1.0 nm and (b) on a DD movement separation of 0.7 nm and an increased usage of R28 rather than R10 due to a relaxation in the tailwind constraints for the use of R28 from 5 knots to 10 knots.

The simulation results under Scenario (b) are shown in Appendix F. It should be noted that the overall average peak hourly arrival or departure delay does not exceed the 10 minute delay criteria at any time of day for either Wish List 1 or 2, based on a weighted average usage of R28 and R10. Given that daa's proposed Wish List is less onerous than either Wish List 1 or 2, this suggests that it should be regarded as technically feasible.

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[3] This table shows total proposed hourly movement capacities. The hourly capacities as modelled by NATS split by arrival and departure movements are given in Appendix F.
[4] Dublin Airport – Summer 2017 Capacity Modelling Results – Sept 2016, Version 1.1

The NATS model, however, does have certain limitations. It is designed to determine runway capacity only with an assessment of average hourly arrivals delay (based on the holding time prior to landing) and the average hourly departure delay as measured by the aircraft queuing time at the runway line up positions. Taxiing times from the stand to the line-up positions and any delays from taxiway congestion are ignored in the model. Similarly, delays caused by other factors eg late passengers at the gate, ground handling, late inbound aircraft etc are also ignored.

6.   On-time performance statistics – S16 v S15

Dublin airport and its user airlines recognise that there is a balance to be drawn between continued increases in declared capacity and movement levels and the overall delays experienced by both arrival and departure flights. In S16, Dublin is handling about 9% more movements than in S15 with only minor adjustments in declared capacity.

In terms of on-time performance (OTP), a departure delay arises if the off-blocks time exceeds the scheduled departure time by more than 15 minutes. It may arise from a variety of reasons eg late inbound aircraft, technical issues with the aircraft, late reporting passengers etc. It is possible that some delay will occur prior to push-back due to taxiway congestion, although these would not normally be in excess of 15 minutes. As defined, the departure delay does not arise as a consequence of operating the runway close to its capacity. This is better assessed by the taxiing and queuing times analysed in Section 7 below. It does, however, provide a starting point to which any further delays from abnormal taxiing or queuing times must be added.

An arrival delay occurs if the on-blocks rime exceeds the scheduled arrival time by more than 15 minutes. As such, it includes the impact of any ATC holding time and any abnormal taxiing time caused by operating the runway close to its capacity.

We have compared the arrival and departure delay at Dublin Airport in July/August 2016 against July/August 2015, based on data provided by the daa[5]. The results are shown in Table 6.1 below.

Table 6.1:   Dublin Airport – Arrival & Departure delays (>15 mins)
             Jul/Aug 2016 v Jul/Aug 2015

	Arrivals		Departures	
	2015	2016	2015	2016
Total Flights	18936	20772	18942	20774
Delayed Flights	7961	8984	8240	8914
Proportion Delayed	42.0%	43.3%	43.5%	42.9%
Average Delay - Delayed flights	20.4	20	22.6	23.4
Average Delay - All flights	10.1	10.5	12.6	13.6
Average Delay - Non-delayed flights	2.8	3.3	5	6.3

The results show that there has been a 0.4 minute increase in the overall delay experienced by arrivals flights and a 1.0 minute delay by departure flights in the peak two months of 2016 in comparison to 2015.

We have also analysed the average length of delay by airline in July/August 2016 against July/August 2015. This show the degree of variability between airlines – with some airlines improving their OTP punctuality and with other recording a poorer performance in 2016.

Dublin Airport: Average arrival delay by airline (all flights)
Jul/Aug 2016 v July/Aug 2015
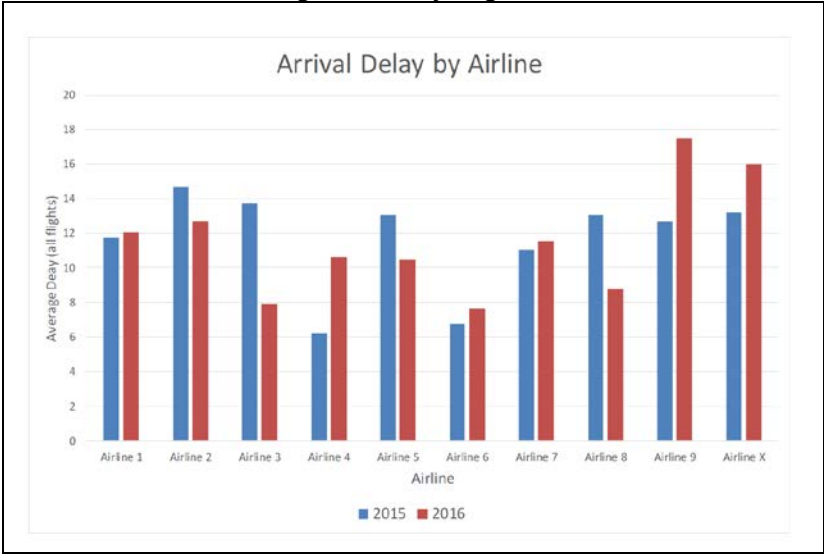
Dublin Airport: Average departure delay by airline (all flights)
Jul/Aug 2016 v July/Aug 2015

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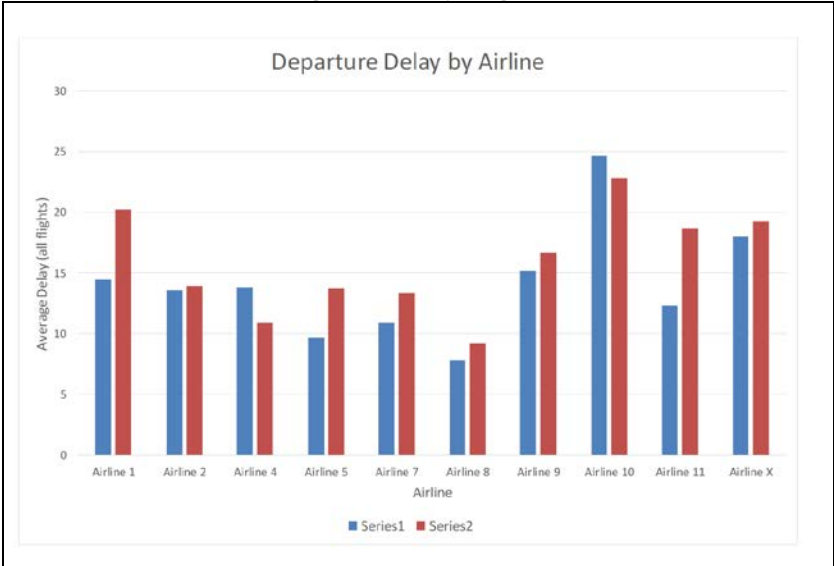
[5] It should be noted that this analysis is subject to the quality of the data and the sample size.

7. Taxiing out / departure queuing times

The best measure of assessing the impact of operating an airport at or close to full capacity is to assess the average aircraft taxiing time for departure flights, which includes the queuing time at the line-up position and, for arrival flights, the ATC holding time and taxiing times.

The average taxiing times for arrivals and departure aircraft at Dublin Airport for July/August 2016 and July/August 2015 are shown below in Tables 7.1 and 7.2 below.

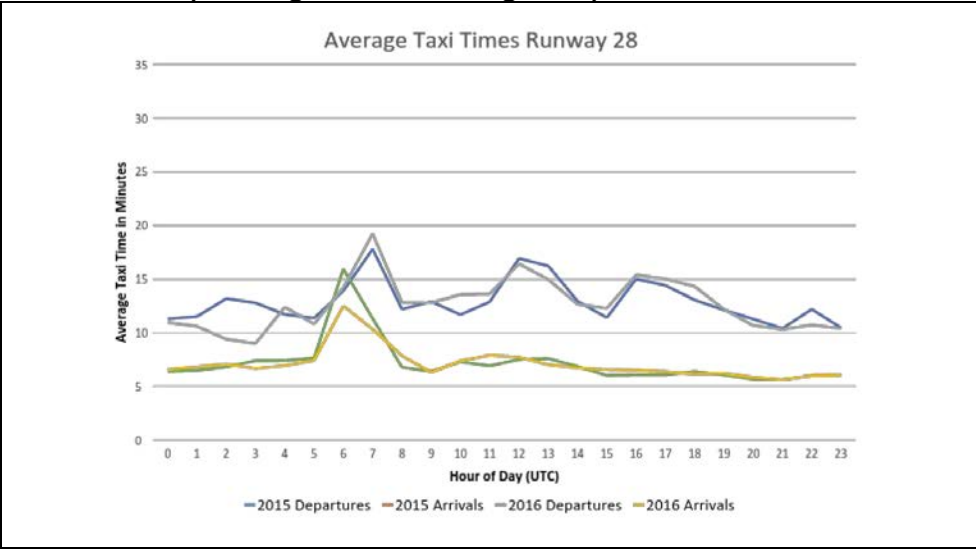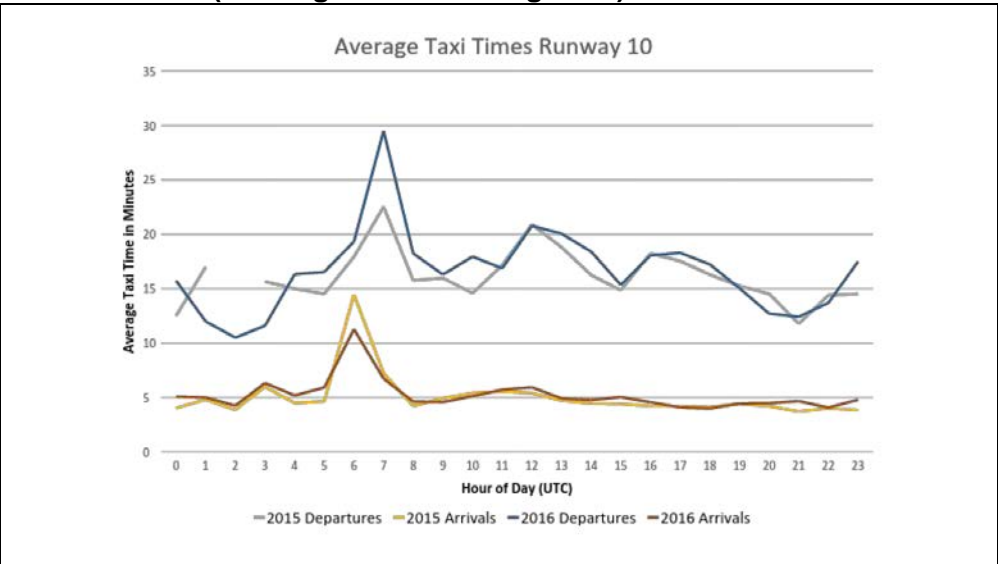**Table 7.1   Dublin Airport - Average taxiing times – R28 (Jul-Aug 2016 v Jul/Aug 2015)**

Table 7.2   Dublin Airport - Average taxiing times – R10 (Jul-Aug 2016 v Jul/Aug 2015)

The results show the substantial variation through the day, with significant peaks for both departure and arrivals flights between 0600-0800 hours for operations on both R28 and R10[6]. There are increases in both departure and arrivals taxiing times in S16 in comparison to S15 in the 0600-0800 peak period – but not at other times of the day.

It should be noted that the increased taxiing times for arrivals flights in this period are largely caused by taxiway congestion from the line up queue for departures. This would, to some extent, be alleviated by the proposed additional three runway line-up positions planned – although these would not be in place by S17.
The average taxiing times are inevitably dependent to some extent on the location of the aircraft stand in relation to the runway and the taxiing route required. This varies by Pier, as demonstrated in the chart shown in Appendix F.

A further measure of average taxiing and queuing times for departure flights is given in data collected under the Single European Sky (SES) Performance Scheme which is available at http://ansperformance.eu/data/performancearea/. This data shows the 'unimpeded' average taxiing and queuing time – representing the best achieved time during each month and the 'additional' time (due to taxiing and runway capacity delays). For comparative purposes, this is shown for Dublin, Gatwick, Stansted, Dusseldorf, Berlin Tegel and Brussels airports.

This SES performance data indicates that, whilst 'additional' departure delay at Dublin has increased in S16 in comparison to S15, this is not as dramatic as that at Gatwick. We understand that some airlines have complained that Gatwick may now be over-declared and that this is one of several factors being examined by the UK CAA as part of a review of the airport's performance. It should also be noted that Stansted has also recorded rising additional taxiing times in S16 although this is not the case at other European airports.

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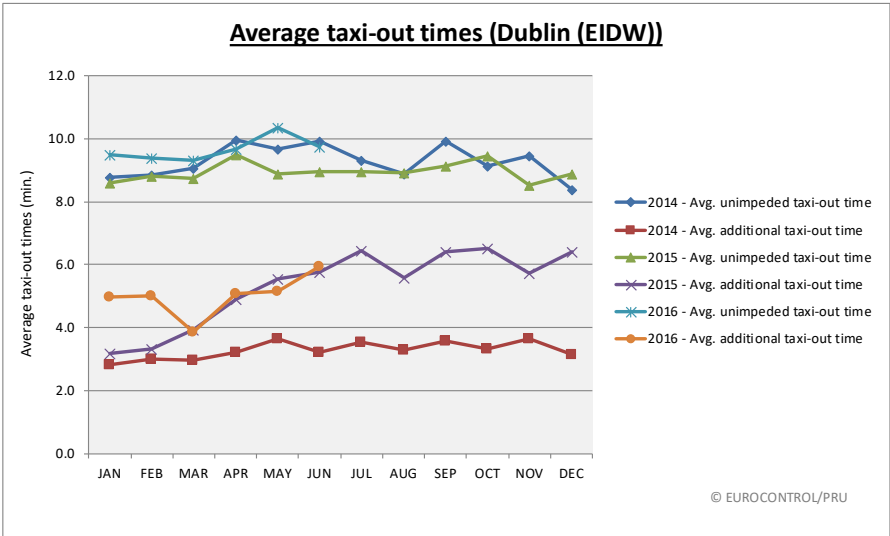
[6] The results for R10 are based on a small sample size and may not be fully representative

Average taxi-out times (London/ Gatwick (EGKK))
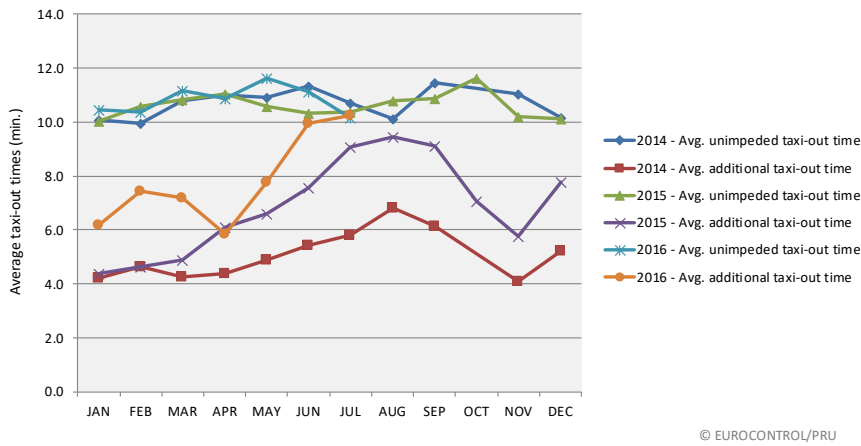
Average taxi-out times (London/ Stansted (EGSS))
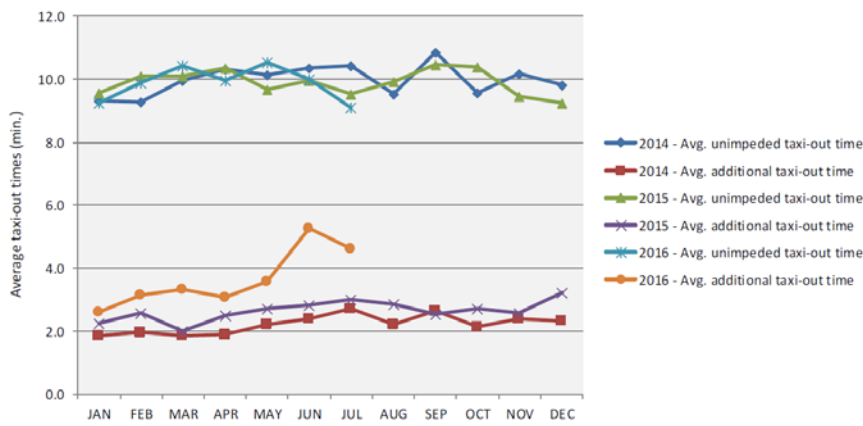
Average taxi-out times (Dusseldorf (EDDL))

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Average taxi-out times (Berlin/ Tegel (EDDT))

Average taxi-out times (Brussels (EBBR))
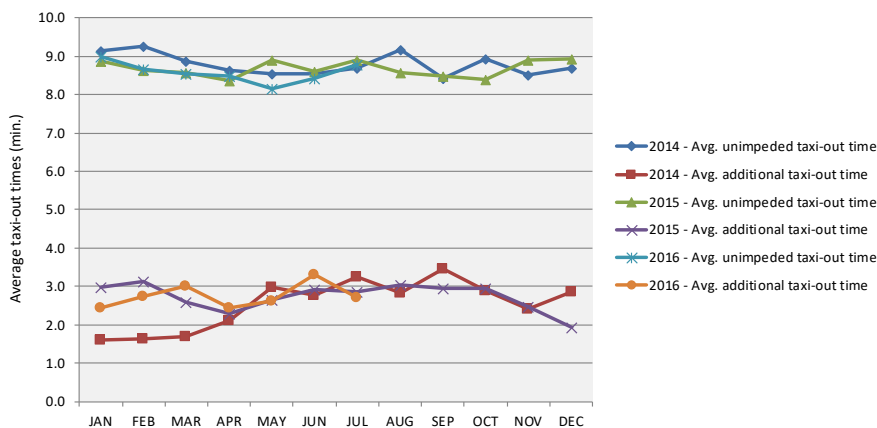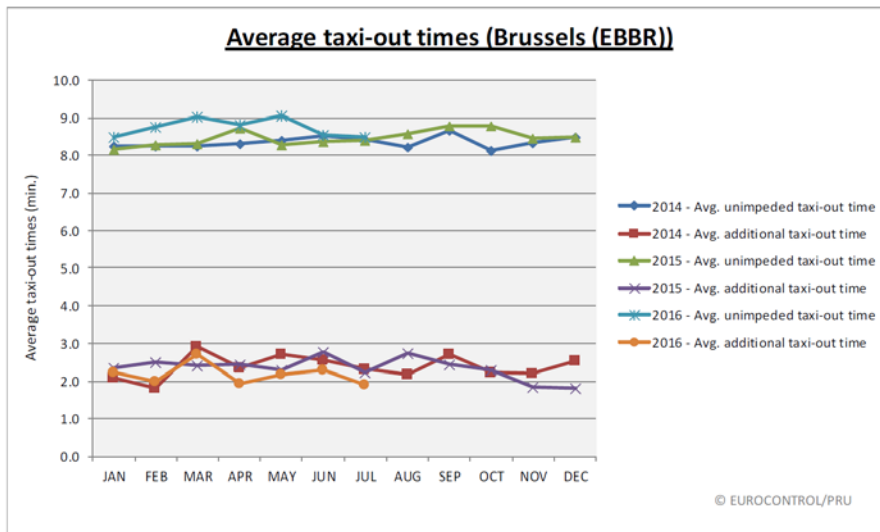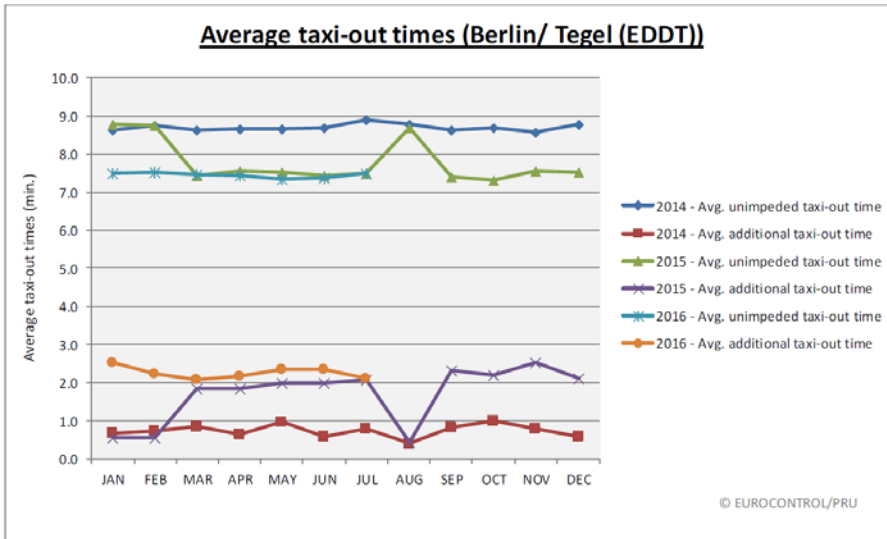
8.   Potential short-term measures to improve capacity and resilience

There are a number of short-term measures that are expected to be operational in S17 which should improve resilience at Dublin airport, particularly during peak periods. If the expected benefits can be achieved, it may be feasible to increase declared capacity at the airport during certain hours of the day.

The IAA will introduce a new separation of 0.7 nm rather than 1.0 nm between successive departure flights. As a result, they indicate that they will be capable of handling 37 rather than 35 peak hour departures. The technical feasibility of this, in terms of the impact on arrival and departure delay, would appear to be endorsed by the NATS simulation model and by further modelling by Arup. The Arup

modelling, however, was based on a 75 rather than the proposed 77 second DD separation..

We are slightly concerned that the NATS model shows that the highest peak average departure delay occurs in the 1700-1800 UTC hour rather than in the morning peak. This is particularly exacerbated when R10 is in use. This hour will have a mix of arrivals and departures traffic so the new DD separation standard is unlikely to be of great benefit.

Dublin airport will be introducing a new operational tool known as A-CDM (Airport Collaborative Decision Making) by S17, which should in principle significantly improve on-time performance at the airport. This is a new European-wide software system to ensure that each stage of a turnround or flight is completed at an optimal time in relation to the airport's operations as a whole. The system at Dublin includes the use of electronic flight strips for Approach and Aerodrome Control. The expected benefits will vary by airport, but potentially include a reduction in the average taxi-out times of between 0.25 – 3 minutes per departure and scheduled adherence improvements of between 0.25 – 2 minutes per flight. The system also enables reduced push-back delays after start-up approval, increased AFTM (air traffic flow management) slot adherence and other benefits.

Use of the new A-CDM tool will require training and will need to be bedded in before these benefits can accrue.

Pier 2 at Dublin airport currently operates in an unsegregated mode between arrival and departure passengers. As a result, it is under-utilised as it can only be normally only be used for domestic flights and those to and from the UK. By S17, this will be upgraded to a fully segregated pier, which will mean that it can be used for all flights. This will provide more flexibility in stand allocation, which may help to prevent the bottlenecks that arise in the taxiway cul-de-sacs and from aircraft waiting for a vacant stand.

9. Airline views

As discussed, we have sought the views of the main airlines operating at Dublin airport as to whether the proposed changes to the declared capacity are desirable. All the main home-based carriers (Ryanair, Aer Lingus, Cityjet and Stobart Air) all expressed the view that the changes would increase average delay times which impact on their customers and on their costs. The importance of minimising delays in the first wave of departures was stressed in order to achieve their scheduled rotations and not incur any financial penalties for beaching curfews at the airports they serve. Aer Lingus also expressly mentioned the importance of the overall departure delay including taxiing and queuing time to meet onward connections at the destination airport – although this have more relevance to some carriers than others.

Several of these airlines have plans to expand their fleets by S17, although no firm decisions have been made as to where to base the additional aircraft. Whilst initial applications had been made for additional slots, it was unclear as to whether the

proposed new capacity could be used. Ryanair, for example, suggested that the maximum Terminal 1 passenger constraint might be breached if they were to be allocated an additional slot in the 0500-0600 UTC hour. The airlines felt that, whilst growth in capacity was in principle desirable, the expected operational improvements by S17 needed to be bedded in before these capacity changes could be made.

10. Benchmarking against UK and other European airports

We have benchmarked Dublin in terms of the overall delays experienced by flights either originating or arriving at the airport in 2015. This data is extracted from http://www.flightstats.com/company/monthly-performance-reports/airports/. The comparators have been selected due to either having a similar traffic level or predominant use of a single runway.

Table 10.1   Single runway airports – Flight delays - 2015

Airport	Number of runways	Flights	Delayed (15min+)	Average Delay per delayed flight
Gatwick (GAW)	1	13788	43.48%	43.3 min
Istanbul SAW	1	10,157	37.93%	39.3 min
Dublin (DUB)	1	9566	25.49%	37.4 min
Dusseldorf (DUS)	2	9561	23.67%	41.0 min
Stockholm (ARL)	2	9185	16.89%	38.9 min
Brussels (BRU)	2	9053	24.18%	37.8 min
Berlin Tegel (TXL)	2	7808	18.14%	35.3 min
Stansted (STN)	1	7271	33.97%	34.0 min

Plotting average delay per delayed flight against number movements demonstrates that Dublin's delays are lower than the average for this group, suggesting that extra movements could be accommodated.

11. Conclusions

The data available ideally needs further analysis to determine whether the proposed changes in the declared capacity at Dublin airport is operational feasible or desirable. Based on the data we have available, our preliminary conclusions are as follows:

1)   The proposed new declared capacity parameters should theoretically enable a significant increase in aircraft movements to be handled in S17 – although further work by Dublin Airport and ACL is advised to ensure that the terminal capacity constraints are not breached (particularly in Terminal 1) and that there is adequate overall stand capacity.

2)   The modelling undertaken by NATS only analyses departure queuing delay and ATC holding time (in IAA's 'Point Merge' system) and excludes taxiing time to the stand. The modelling suggests that the average 10 minute delay criteria for departure queuing time or arrival ATC holding time would not be breached even during the morning peak from 0500-0900 hours UTC, except if R10 is used.

3)   The NATS simulation model would seem to indicate that the daa's proposed Wish List is technically feasible given the proposed reduction in DD separation from 1.0 nm to 0.7 nm.   If R10 is used, the average 10 minute peak hour arrival or departure delay criteria is breached marginally on certain occasions when there is a mix of arrival and departure traffic. In practice, however, the usage of R10 will reduce in S17, due to changes in the tailwind constraint for operations on R28.

4)   The overall level of arrivals and departure delay (excluding taxiing and queuing time) at Dublin has declined slightly between July/August 2016 in comparison to July/August 2015 – but not dramatically so.

5)   We note that taxi-out and taxi-in times have increased in S16 in comparison to S15 – particularly in the morning peak, although the data we have does not easily enable us to assess whether this is due to increased taxiing or holding time at the line-up positions prior to take-off.

6)   We note that Dublin's OTP performance as a whole is level with or above that of many European airports in view of the number of movements handled – suggesting that a small rise in average departure or arrival time might be considered as 'acceptable' if it enables a significantly higher volume of traffic to be handled.

7)   We recognise that concerns of the main airlines at Dublin who feel that the current and possible increase in delay time due to an increased movement rate would impact both on customer satisfaction and on their costs, particularly where delays for other reasons are also rising. We also recognise that the proposed operational improvements by S17, including reduced DD separation, the use of A-CDM and certain infrastructure changes such arrival and departure passenger segregation within Pier 2 may need some time to bed in and for the full benefits to be achieved.

8)   Whilst the NATS modelling results suggest that daa's proposed changes in the capacity parameters may not breach the average 10 minute peak hour departure or arrival delay criteria set for runway capacity constraints, their impact needs to be assessed in the context of increasing arrival and departure delay at Dublin Airport from all causes – including delays attributable both to the airlines and to the airport, including taxiway congestion.

Appendix A

Aerodrome Chart

AERODROME CHART - ICAO

	53 25 17 N	ELEV 242 FT
	006 16 12 W	

	TWR 118.600
	GND 121.800
	ATIS 124.525

RWY	DIRECTION	THR		BEARING STRENGTH
10	99°	53 25 20.75 N	006 17 24.27 W	PCN 70/R/B/W/T
28	279°	53 25 12.94 N	006 15 02.08 W	
16	160°	53 26 13.16 N	006 15 43.12 W	PCN 75/R/D/W/T
34	340°	53 25 11.66 N	006 14 58.54 W	

LEGEND

RVR	◁
DISUSED PAVEMENT	
STOPBAR	
RUNWAY HOLDING POSITION MARKINGS	
HOT SPOT	⭕
CLEARWAY	
STOPWAY	
ENGINE TEST SITE	✳

PRECISION APPROACH CAT I LIGHTING SYSTEM

RADAR MSSR 2 272 (30)

RADAR MSSR 1 281 (39)

CWY 61m x 150m

WDI

THR. RWY 16 ELEV 217 GUND 184

ILS GP/DME 280 (38)

PAPI 3° MEHT 62.3 FT

AIRCRAFT PARK C WDI

ENGINE TEST SITE 1

LIGHT AIRCRAFT PARK B

ENGINE TEST SITE 4

North Apron

VAR 4° W 2016

ANNUAL RATE OF CHANGE - 11' W

HOTSPOT HS1
Dual RWY Threshold. Ensure Correct line up. Multiple runway entry points and converging taxiways. Potential for TWY confusion, disorientation, wing tip collision and RWY incursion. Pay attention to signage and ATC instruction. Pilots must ensure correct clearance.

Central Apron

HANGAR 254 (12)

HANGARS

LINK 6

LINK 5

PIER 1

HANGARS

HANGAR

SMR 367 (125)

TWR 314 (72)

2072m x 61m ASPHALT

PIER 2

PASSENGER TERMINAL 1

PASSENGER TERMINAL 2

FIRE STATION 249 (7)

West Apron

PIER 3

PIER 4

CARGO TERMINAL

HOT SPOT

B3

LINK 1

A

F1

LINK 1

B2

E2

E1

28 34

NOTE 1: RWY 10/28 IS PROVIDED WITH 7.5M WIDE ASPHALT SHOULDERS.
NOTE 2: ALL TAXIWAYS 23M WIDE EXCEPT TWY R: 15M, LINK 1: 33M, LINK 2: 65M, LINK 3: 42M, LINK 4: 73M, B1 AND B2: 24M, E6: 30M, F1: 25M

PRECISION APPROACH CAT II LIGHTING SYSTEM

ILS LOC 260 (18)

099°

THR. RWY 10 ELEV 242 GUND 184

ILS GP/DME 294 (52)

B7

E7

E6 (RET)

B6

E5

ARP

B5

E4

B4

E3

PAPI 3° MEHT 65.6 FT

B3

E2

WDI LGTD

South Apron

LINK 1

Z B1

PERIMETER ROAD

2637m x 45m ASPHALT

PAPI 3° MEHT 65.6 FT

CWY 213m X 150m

279°

THR. RWY 28 ELEV 202 GUND 184

PRECISION APPROACH CAT III LIGHTING SYSTEM

CWY 213m x 150m

SWY 56m x 45m

PAPI 3° MEHT 65.6 FT

WDI LGTD

ILS GP/DME 258 (17)

ILS LOC 204

SWY 91m x 45m

ILS LOC 207

CWY 183m x 150m

THR. RWY 34 ELEV 202 GUND 184

SIMPLE APPROACH LIGHTING SYSTEM

340°

AIRFIELD MAINTENANCE BASE

HANGAR

METRES
0 500 1000

SCALE

FEET
0 1000 2000 3000

NOTE 3 : TAXIWAY E6 IS THE ONLY RAPID EXIT TAXIWAY (RET) AT DUBLIN AIRPORT.
NOTE 4 : BEARINGS ARE MAGNETIC.
NOTE 5 : LINEAR DIMENSIONS IN METRES.
NOTE 6 : ELEVATIONS IN FEET AMSL.
NOTE 7 : HEIGHTS IN FEET ABOVE AERODROME ELEVATION SHOWN IN BRACKETS.
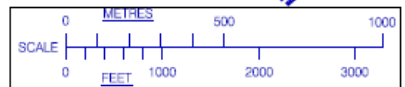
CHANGES: NEW LINK 6, APRON EXTENSION NORTH OF PIER 1, MAGNETIC VARIATION, ENGINE TEST SITE 3 REMOVED

IRISH AVIATION AUTHORITY

AERONAUTICAL INFORMATION 18 AUG 2016

Appendix B

Aircraft Parking Chart

Appendix C

Dublin Airport – Slot Parameters – S16

Date: September 2015

Dublin Airport Scheduling Limits for the summer 16' Season

The Dublin Airport Coordination Committee has agreed the following scheduling limits for the summer 2016 season:

Runway Limits:

Runway Hourly Limits			
Time UTC	Arrivals Limit	Departures Limit	Total Limit
0000	23	25	32
0100	23	25	32
0200	23	25	32
0300	23	25	32
0400	23	25	32
0500	23	35	40
0600	20	30	42
0700	25	25	42
0800	22	29	42
0900	23	24	41
1000	27	27	45
1100	27	28	46
1200	23	26	46
1300	27	24	46
1400	23	26	44
1500	26	24	45
1600	25	28	48
1700	23	27	42
1800	23	24	37
1900	23	22	38
2000	25	22	38
2100	30	25	36
2200	26	25	32
2300	23	25	32
Totals	579	621	942

Maximum number of movements per 10 minute period	
Maximum Total	9
Maximum Arrivals	6
Maximum Departures	6*

*Exception - Maximum Departure Limit is 7 mvts at 0500, 0510, 0520, 0530, 0540, 0550 UTC.

Change from summer 15':

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Arrivals																									
Departures						+2																			
Totals						+1										+1									

In Hour Profile:
A revised departure limit of no more than 7 departures per 10 min period in the 0500hr was extended to include 0540 and 0550.

Passenger Terminals:

Departures	Hourly Limit	Two hour limit
Terminal 1	3,375	5,400
Terminal 2	3,450	5,040

Arrivals	Hourly Limit
Terminal 1	3,390
Terminal 2	3,050

Notes:

1) The hourly limit for passengers is a rolling limit, rolled every ten minutes.

2) Load factors of 85% and 95% are applied to Scheduled and Charter services respectively.

Advisory Flags:

Area	Flag
T2 Check in Desks 1–28 (T2 Operators excluding EI)	Demand exceeds 28 desks
US Preclearance	New flights and schedule changes departing between 09:30 – 12:30

Stands:

Area	Flag
Stands	Where demand for stands exceeds supply based on ACL allocation, flights to be referred to Dublin Airport for detailed assessment.

Widebody Configuration

	Code F (MARS)	Code E (MARS) 777-300	Code E Max 777-200	Code E (MARS) Max 777-200	Code D (MARS)	Code D (MARS) max 763	Code D Max 763	Code D Max 757	Code D (MARS) max 757	Code C (A321)	Code C (MARS) A321	Code C (MARS) Max 738	Code C Max 738	Code C Max A320	Code B + ATR/AR 8	Total Stands
Pier 1		4		2						8				2		16
Pier 2						1				2				2	2	9
Pier 3		1	3	1			1	1						1		8
Pier 4	1	6		1				1		2						11
Remote	1	1		1	5			2		2				3	7	22
West Apron Remote		7								5					4	16
																82

Total Stands 82

Narrowbody Configuration

	Code F (MARS)	Code E (MARS) 777-300	Code E Max 777-200	Code E (MARS) Max 777-200	Code D (MARS)	Code D (MARS) max 763	Code D Max 763	Code D Max 757	Code D (MARS) max 757	Code C (A321)	Code C (MARS) A321	Code C (MARS) Max 738	Code C Max 738	Code C Max A320	Code B + ATR/AR 8	Total Stands
Pier 1										8	10	2	2			22
Pier 2										2		2	2	2	2	10
Pier 3			3				1	1	1		3			1		10
Pier 4								1	2	2	14					19
Remote								2		2	13			4	9	30
West Apron Remote										5	14				4	23
																114

Total Stands 114

Appendix D

Unconstrained slot demand – S17
(as advised by ACL)

Proposed Summer 17 Position

Hour	Expected changes to baseline utilisation			Pot 1 (within existing Capacity)			Pot 2 (new capacity required)			Proposed S17 Capacity		
	A	D	T	A	D	T	A	D	T	A	D	T
00	0	0	0	0	0	0	0	0	0	23	25	32
01	0	0	0	0	0	0	0	0	0	23	25	32
02	0	0	0	0	0	0	0	0	0	23	25	32
03	0	0	0	0	0	0	0	0	0	23	25	32
04	2	1	3	2	1	3	0	0	0	23	25	32
05	2	4	5	2	0	1	0	4	4	23	39	44
06	0	4	4	0	0	3	0	4	1	20	34	43
07	6	2	8	6	2	6	0	0	2	25	25	44
08	1	2	3	0	2	0	1	0	3	23	29	45
09	3	4	7	3	4	3	0	0	4	23	24	45
10	3	0	3	3	0	2	0	0	1	27	27	46
11	5	3	8	3	1	0	2	2	8	29	30	54
12	1	4	5	1	4	5	0	0	0	23	26	46
13	3	4	7	3	4	7	0	0	0	27	24	46
14	-1	2	0	-1	2	0	0	0	0	23	26	44
15	2	2	4	2	0	1	0	2	3	26	26	48
16	5	2	5	4	1	1	1	1	4	26	29	52
17	2	5	6	2	5	1	0	0	5	23	27	47
18	1	2	3	1	2	1	0	0	2	23	24	39
19	0	0	0	0	0	0	0	0	0	23	22	38
20	5	0	5	5	0	5	0	0	0	25	22	38
21	0	0	0	0	0	0	0	0	0	30	25	36
22	3	0	3	0	0	3	3	0	0	29	25	32
23	1	0	1	1	0	1	0	0	0	23	25	32

Based on operators wishlists changes

Are additional slots fitting within existing runway capacity?

Is additional runway capacity required?

Proposed changes based on Wishlist

Appendix E

Proposed capacity changes
(by Dublin Airport)

Runway Capacity - Changes

0500 hour:
- **Increase from 35 to 37 departures and**
- **40 to 41 total movements**
- **No more arrivals**
- based on reduction in DD seps from 1nm to 0.67nm
- Dependent on agreement from safety regulator
- Introduction of conditional clearances using stop bars and benefits from A-CDM

0600 hour:
- **30 to 32 departures**

0800 hour:
- Change the bias between arrivals and departures
- 22 to 23 arrivals
- 29 to 25 departures

1100 hour:
- Increase from 46 to 47 totals

1600 hour
- Increase from 48 to 49 totals

In hour profile:
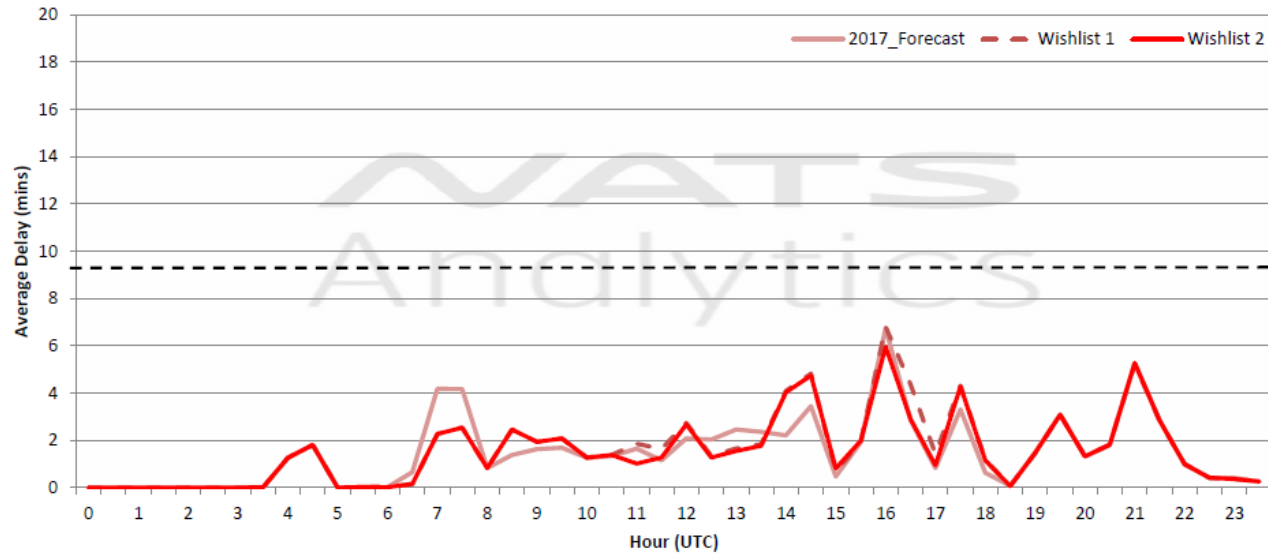- No Change

Coordinator Initiated Flex
- 0900, 1000, 1500, 1700 only

	Runway Hourly Limits		
Time UTC	Arrivals Limit	Departures Limit	Total Limit
0000	23	25	32
0100	23	25	32
0200	23	25	32
0300	23	25	32
0400	23	25	32
0500	23	37	41
0600	20	32	42
0700	25	25	42
0800	23	25	42
0900	23	24	41
1000	27	27	45
1100	27	28	47
1200	23	26	46
1300	27	24	46
1400	23	26	44
1500	26	24	45
1600	25	28	49
1700	23	27	42
1800	23	24	37
1900	23	22	38
2000	25	22	38
2100	30	25	36
2200	26	25	32
2300	23	25	32
Totals	580	621	945

DublinAirport

Appendix F

NATS - Summer 2017 Capacity Modelling Results
September 2016, Version 1.1

Runway 28 Arrival Delay

Hour		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Wishlist 1	Arrivals							-2		+1			+1					+1	+1						
	Departures						+2	+2		+1		+1	+1					+1							
	Totals						+2			+2		+1	+2					+2	+1						
Wishlist 2	Arrivals							-2		+1			+1				+1		+1						
	Departures						+2	+2		+1		+1	+1					+1							
	Totals						+2			+2		+1	+1				+1	+1	+1						

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Analytics

Final report

Weighted Average Arrival Delay

Hour	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Wishlist 1 Arrivals							-2		+1			+1					+1	+1						
Wishlist 1 Departures						+2	+2		+1		+1	+1					+1							
Wishlist 1 Totals						+2			+2		+1	+2					+2	+1						
Wishlist 2 Arrivals							-2		+1							+1		+1						
Wishlist 2 Departures						+2	+2		+1		+1	+1					+1							
Wishlist 2 Totals						+2			+2		+1	+1				+1	+1	+1						

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Analytics

Final report

Runway 28 Departure Delay

Average Delay (mins) vs **Hour (UTC)**

Legend: 2017_Forecast — Wishlist 1 — Wishlist 2

	Hour	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Wishlist 1	Arrivals							-2		+1			+1					+1	+1						
	Departures						+2	+2		+1		+1	+1					+1							
	Totals						+2			+2		+1	+2					+2	+1						
Wishlist 2	Arrivals							-2		+1							+1		+1						
	Departures						+2	+2		+1		+1	+1					+1							
	Totals						+2			+2		+1	+1				+1	+1	+1						

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Analytics

Runway 10 Departure Delay

Hour	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Wishlist 1 Arrivals							-2		+1			+1					+1	+1						
Wishlist 1 Departures						+2	+2		+1		+1	+1					+1							
Wishlist 1 Totals						+2			+2		+1	+2					+2	+1						
Wishlist 2 Arrivals							-2		+1							+1		+1						
Wishlist 2 Departures						+2	+2		+1		+1	+1					+1							
Wishlist 2 Totals						+2			+2		+1	+1				+1	+1	+1						

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Analytics

Appendix G

Average taxi-out times by Pier
S16 v S15

RWY 28 Operations - Taxi out times (0600 – 0800 Local Time)

Apron 5G
- S15 – 14 mins
- S16 – 19 mins

Pier 1 North
- S15 – 16 mins
- S16 – 17 mins

Pier 1 South
- S15 – 15 mins
- S16 – 16 mins

Pier 2 North
- S15 – 16 mins
- S16 – 16 mins

Pier 2 South
- S15 – 18 mins
- S16 – 16 mins

Central Apron
- S15 – 14 mins
- S16 – 16 mins

Pier 3 North
- S15 – 16 mins
- S16 – 18 mins

Pier 3 South
- S15 – 17 mins
- S16 – 15 mins

Pier 4 North
- S15 – 16 mins
- S16 – 16 mins

Pier 4 South
- S15 – 16 mins
- S16 – 16 mins

South Apron
- S15 – 17 mins
- S16 – 17 mins

DublinAirport

RWY 10 Operations - Taxi out times (0600 – 0800 Local Time)

Apron 5G
- S15 – 22 mins
- S16 – 21 mins

Pier 1 North
- S15 – 19 mins
- S16 – 22 mins

Pier 1 South
- S15 – 18 mins
- S16 – 19 mins

Pier 2 North
- S15 – 20 mins
- S16 – 20 mins

Pier 2 South
- S15 – 18 mins
- S16 – 21 mins

Central Apron
- S15 – 17 mins
- S16 – 19 mins

Pier 3 North
- S15 – 20 mins
- S16 – 22 mins

Pier 3 South
- S15 – 21 mins
- S16 – 22 mins

Pier 4 North
- S15 – 21 mins
- S16 – 23 mins

Pier 4 South
- S15 – 22 mins
- S16 – 24 mins

South Apron
- S15 – 24 mins
- S16 – 26 mins

Dublin Airport

Hyde Park House
5 Manfred Road
London SW15 2RS

Tel: 020 8785 5551
Fax: 020 8874 2150

Email: info@alanstratford.co.uk
Web: www.alanstratford.co.uk