Analytics

Edinburgh Airport ACP Support

SID Options Analysis

June 2017

Version 1.0

NATS

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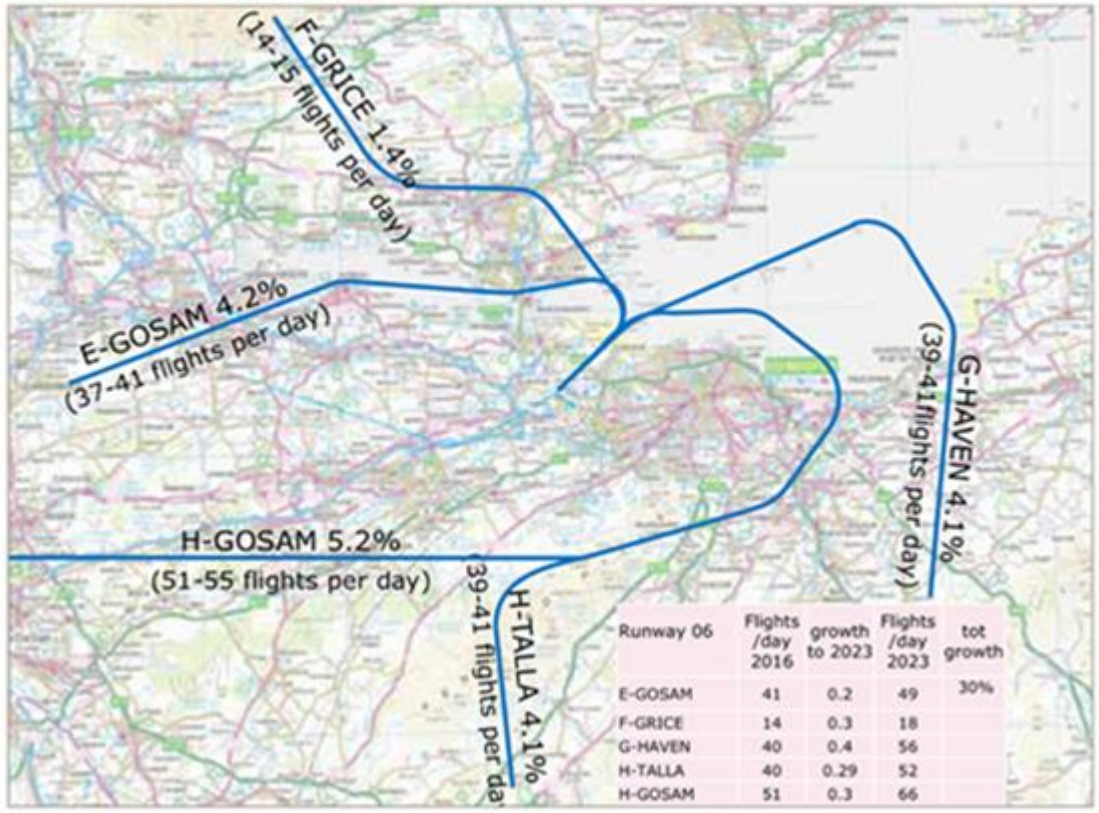
Caveats

- Simulation tools offer a ‘first cut’ assessment of operational scenarios. Changes to operations must not be implemented without first completing all appropriate actions, which may include further analytical assessment, real-time simulation, operational trials, safety assessment and obtaining regulatory approval.
- When interpreting results from simulation models, please note that models generally present an optimistic view of operations because events such as aircraft technical problems, pilot-ATC communication errors, variation in ATC/pilot performance, weather and slot compliance are not modelled.
- It should be noted that whilst every effort has been made to ensure that the modelled scenarios are as representative of real life as is possible, fast-time computer simulations can never predict future ATM operations with 100% certainty. Any business decisions made based on the outputs of such modelling need to take these uncertainties into account as well as all assumptions made during the modelling process.

Objectives

- This analysis is in support of the Edinburgh ACP.
- It assesses the difference in departure capacity of two different SID options for Runway 06 departures. The two options are as follows:
  a) The H-GOSAM SID being available for Jet traffic, with increased separation required when following non-Jet traffic using the H-TALLA SID;
  b) Moving all flights which would use the H-GOSAM SID to the E-GOSAM SID, reducing the requirement for increased separations between Jets and non-Jets on the H SIDs but increasing the load on the E-GOSAM SID.

Runway 06 departures (2016: 19% - 69 days per year)



Runway 06	Flights /day 2016	growth to 2023	Flights /day 2023	tot growth
E-GOSAM	41	0.2	49	30%
F-GRICE	14	0.3	18	
G-HAVEN	40	0.4	56	
H-TALLA	40	0.29	52	
H-GOSAM	51	0.3	66	

Departure Runway Holding Area (RHA) Delay: The time spent waiting to use the Runway by departing flights.

Analytics

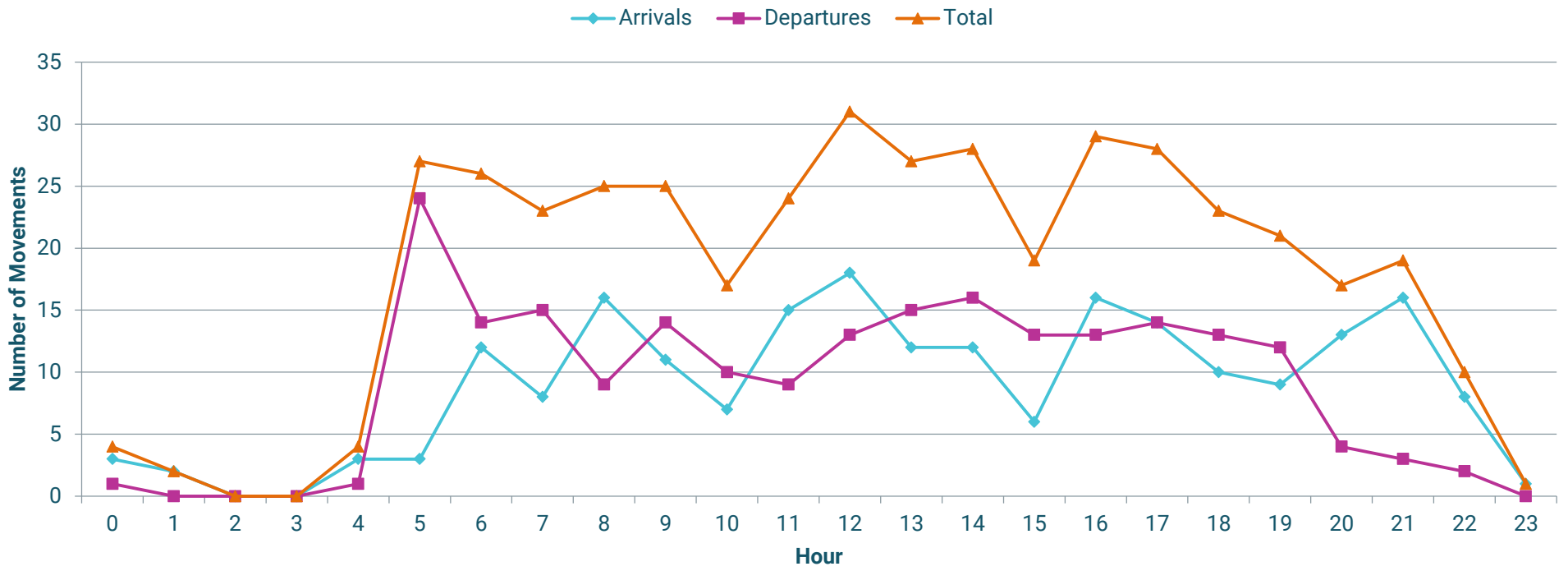
Methodology, Modelling Assumptions & Traffic

Methodology & Modelling Assumptions

- The Runway simulation tool will be used to assess the difference between the two SID options.
- In order to determine the best SID option the focus of this study is Departure Runway Hold Area (RHA) delay. Arrivals will be included within the model, but results for arrivals will not be presented.
- A single traffic profile will be used to model both the SID options, RHA delay results will be compared to see which causes the least delay.
- ACL schedule data provided by Edinburgh Airport has been used to create a baseline traffic sample for use within the modelling. The busiest day from August 2017, 11th August 2017, has been used. Details of the traffic profile can be found on the next slide.
- Departures are allocated a SID based upon a SID lookup table provided by ATC at Edinburgh Airport.

Baseline Traffic Profile – 11th August 2017

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	Total
Arrivals	3	2	0	0	3	3	12	8	16	11	7	15	18	12	12	6	16	14	10	9	13	16	8	1	215
Departures	1	0	0	0	1	24	14	15	9	14	10	9	13	15	16	13	13	14	13	12	4	3	2	0	215
Total	4	2	0	0	4	27	26	23	25	25	17	24	31	27	28	19	29	28	23	21	17	19	10	1	430

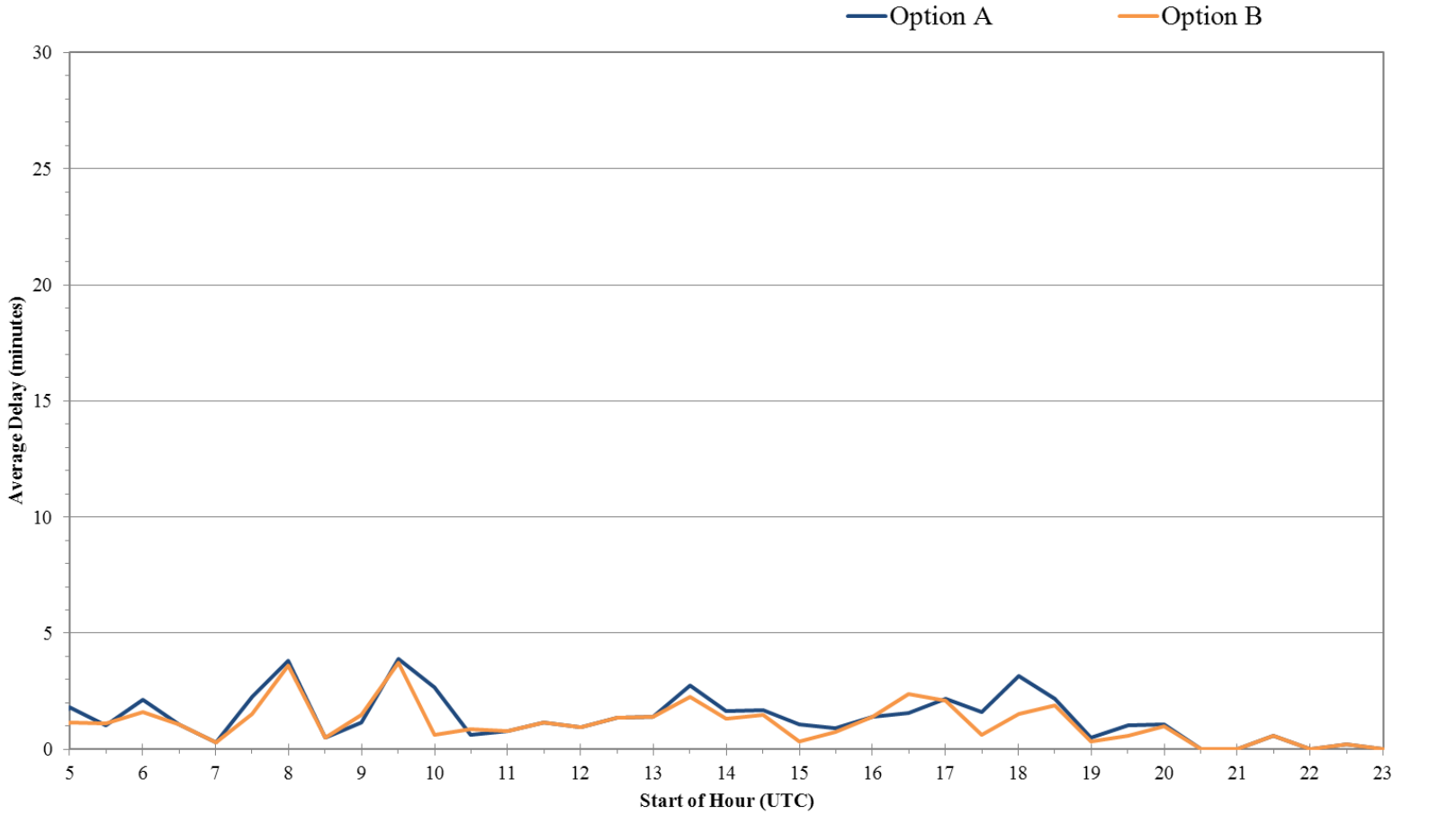


Separations

- The following separations will be used within the model:
  - AA Separation (between two consecutive arrivals, with no departure in between) – 4NM
  - ADA Separation (between two consecutive arrivals, where there is a single departure in-between) – 6NM
  - DD Separation (between two consecutive departures) : The model considers the required SID, speed group and wake turbulence separations required between any pair of aircraft, taking the largest of the three.
    - SID Separations: 1 minute between two aircraft on different SIDs (except H-TALLA and H-GOSAM), 2 minutes between aircraft on the same SID.
    - Speed Separations: Additional separation is required whenever a Jet aircraft follows a non-Jet aircraft on the same SID (for the purposes of speed separation, H-GOSAM and H-TALLA are considered to be the same SID).
      - DH4/D38 followed by a Jet – 3 minutes, extended to 4 minutes for H-TALLA/H-GOSAM
      - AT7/SF3 followed by a Jet – 4 minutes, extended to 5 minutes for H-TALLA/H-GOSAM
      - AT7/SF3 followed by DH4/D38 – 3 minutes, extended to 4 minutes for H-TALLA/H-GOSAM
    - Wake Turbulence Separations: Standard UK wake turbulence separations have been applied. A 2 minute separation is required for a Medium, Small or Light aircraft following a Heavy aircraft and for a Light aircraft following a Medium or Small aircraft.

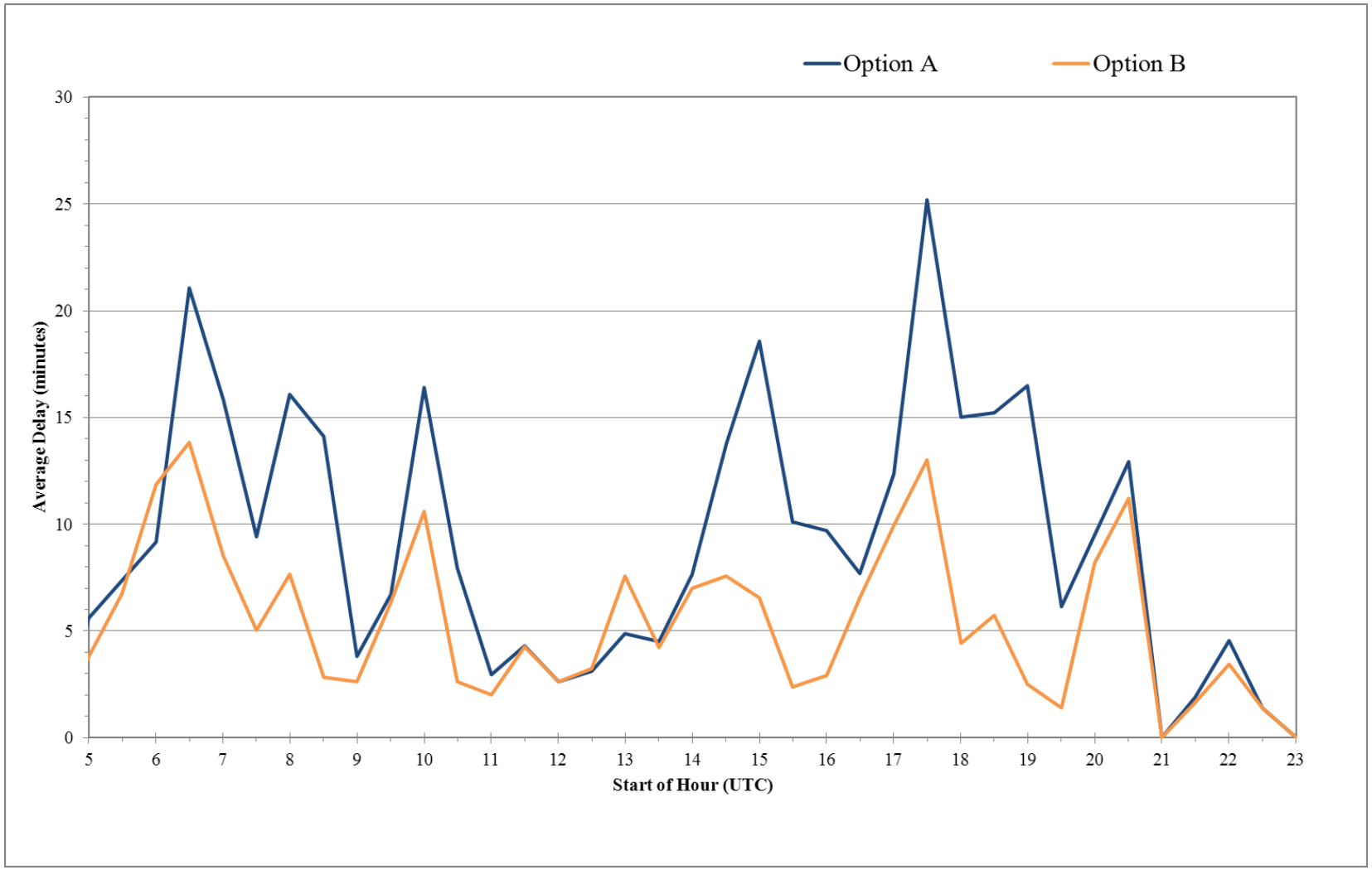
Results

RHA Delay Results



- RHA Delay is low across the day in both Option A and Option B, using the new ACP SID design and the schedule for 11th August 2017.
- This shows that with 2017 traffic levels and traffic mix, both Option A and Option B provide sufficient departure capacity, with comparable levels of delay.

RHA Delay Results – Grown Traffic



- As the 2017 schedule resulted in similar delays for both Option A and Option B, a grown traffic sample has been used to assess the difference in the two options with higher traffic levels.
- In this case, each flight has been duplicated to produce a schedule with twice as much traffic as the original.
- The resulting RHA Delay is higher for Option A than for Option B.
- Whilst the RHA delay is higher than Edinburgh Airport would likely find acceptable for both options, this shows that for higher traffic levels and the same traffic mix as currently seen, Option B provides greater departure capacity than Option A.

Summary Of Modelling For Two SID Options

- The NATS Runway simulation tool has been used to assess the difference in RHA delay between two different SID options in the Edinburgh Airport ACP design:
  - Option A – Jet traffic uses the H-GOSAM SID, which will require some larger departure separations for Jets following Turboprops;
  - Option B – Jet traffic that would ordinarily use the H-GOSAM SID uses the E-GOSAM SID. This reduces the need for additional speed separations, but places extra demand on the E-GOSAM SID.
- Using a Summer 2017 schedule, levels of RHA Delay are low in both options. This shows that both options provide sufficient departure capacity with the current traffic levels.
- A grown traffic sample with double the level of traffic was subsequently modelled. This showed that with higher traffic demand, Option B provides greater departure capacity than Option A, assuming that the current mix of aircraft types and destinations is unchanged.
- In reality, a combination of the two where most traffic uses E-GOSAM, but some traffic tactically uses H-GOSAM when speed separations are not required, may provide the best overall departure capacity.