

Operational Efficiency module clarification questions - Heathrow Airport
Limited Submission - 18 June 2014

Question number		Date sent	Answer provided
<u>Terminal planning</u>			
TTS:			
1	If possible we would like to understand better the design of TTS platforms and connections to the Piers, given the need for separate routes for clean and dirty passengers.	18/06/2014	See Slide 2 for T2B TTS platform layout highlighting how the TTS platforms are designed to segregate passengers. In the final new long loop circuit across the airport, there will be one Departure, one Arrival and one Transfer platform per station - see Slide 3
2	How has HAL demonstrated that the capacity of the TTS train with the proposed 5 carts is sufficient to serve the entire airport (except T4) and cope with the clean/dirty separation of passengers?	18/06/2014	See Slides 3-6 showing the proposed high level TTS operating concept including the segregation of passengers, assumptions and capacities.
3	How will a passenger get to their gate if they have missed the right stop of the TTS?	18/06/2014	Recovery routes will be constructed in each pier to enable passengers to switch from the eastbound line to the westbound line (and vice versa) in the event that they mis-route. There will be screening facilities in each pier and departing passengers that miss their stop and have to travel back to the correct concourse on an arrivals train (transfer car) can be re-screened before re-entry to the departures area.
4	Is it possible for HAL to elaborate on how the decentralised security lanes will be built into the existing infrastructure of T5B, C and T2B (providing sufficient capacity) and be planned into the piers? Has any provision for this been made in HAL's cost plan?	18/06/2014	Slide 7 shows the decentralised screening level in T2B. Other new build piers will be constructed in a similar way. In T5B and T5C the new cross campus TTS line will be constructed to the south (as the current T5 TTS is capacity constrained due to the short pinched loop design as well as the T5 baggage hall to the west of the T5A station). Allowance has been made in the cost plan to construct new TTS platforms, pier extensions and security screening to the south of T5B, T5C as well as T5A for transfer passengers.
5	Similar to the above question: grateful if HAL could explain how the decentralised retail offering will be built within both the existing and planned infrastructure, especially given the current footprint and floor area.	18/06/2014	Slide 8 shows the existing T5B departures level with decentralised/secondary retail facilities. The pier width is 45m and it is proposed that new concourses will be built to this width. In addition to providing additional floorplate for retail, there are considerable benefits for baggage handling as it will allow decentralised make-up facilities to be accommodated at apron level as opposed to subsurface.
6	Have the effects of decentralised security and retail (increased operational expenditure, decreased non-aeronautical revenue) been taken into account in HAL's business case?	18/06/2014	Yes
MCT times:			
7	Disembarking a wide body aircraft in 3min (as assumed) seems very fast – grateful if HAL could comment and provide justification for the assumption made.	18/06/2014	There are a number of factors to consider in the disembarkation process including aircraft size and number of airbridges, with wide bodied aircraft such as the A380 having 3 airbridges. There is also a degree of probability to take account of in the MCT calculations, so that one is not adding the longest possible duration for each of the processes together, as that is unlikely to occur. Agreed that some passengers may take longer than 3 minutes to disembark, however It is sensible to assume that those passengers on a short connect will understand the urgency of their situation and ready themselves to exit their arriving aircraft as quickly as is practical. On this basis an assumed overall disembarkation time (including doors open) of 6 minutes does not seem unreasonable to carry forward into the overall MCT calculations.
8	What are HAL's reasons for not including gate acceptance at the end of the transfer passenger's journey?	18/06/2014	There is a 5 minute buffer time from the passengers reaching the gate to chocks off. In that time there would be a short gate acceptance process prior to aircraft boarding and doors closed. It is assumed that there would be no queue at the boarding gate acceptance at 5mins before departure as this would inevitably cause a delay in the departure of the aircraft and hence give the transfer passenger longer to complete their connection.
9	HAL has indicated that it is unclear whether the arrivals baggage handling process will be a pier-served DCV system or the conventional tug and dolly. Is it possible to provide the MCT's in the case of the latter?	18/06/2014	Whilst there are options being considered for arriving bags to be transported between aircraft and reclaim using either DCV or tug and dolly, transfer bags will be transported from aircraft to injection point on the satellite using tug and dolly and then between the concourses using an automated system.
10	Grateful if HAL could confirm MCT times for passengers with domestic legs.	18/06/2014	See Appendix 12 Minimum Connection Times Rev 2. New domestic journeys highlighted in green. If Domestic is located in T6 it is assumed to be located centrally in the satellite, in order for a 45 mintue MCT to be met.
T6:			
11	Grateful if HAL could provide floor plans of T6 and T6 Satellite (Pier J and K) that show the designated areas (halls, passenger processes, circulation, departure lounges, gate seating, queuing, etc.) on departures and arrivals, etc.	18/06/2014	The proposed T6 and T6 satellite have not yet been planned in detail. The main processor (Concourse J) has been sized and planned on the T2 terminal concept and the satellite on a 45m wide concept as constructed for the existing T5B (noting that there will be some changes necessary in the design as the TTS station is turned through 90 degrees and it is proposed for decentralised baggage handling makeup to be undertaken at apron level). Slides 9-13 show the existing floorplates of T2 and T5B which are an indication of the future plans for T6 and T6 satellite.
12	We would value some further information on T4. It appears that the current plans are to close T4 and provide a 2nd satellite to T6 (namely Pier L) to serve these passengers. Are these passengers for Pier L supposed to be served by the main T6 building which is built for a capacity of handling the 36 million passengers per annum (including T6 satellite or Pier K)? It appears as if T6 would not be able to cope with an additional minimum of 10mppa.	18/06/2014	T4 will be retained in the proposed plan. Section 3.11.1 speculates on growth beyond the remit of the current plan and indicates that T6 would grow beyond the current suggestion of 35mppa capacity
T5:			
13	Grateful if HAL could specify and detail how T5 will be able to cope with an additional 16% of passengers (30mppa to 35mppa by 2026) given its current infrastructure limits.	18/06/2014	T5 currently has a number of periods during the day (e.g. evening) when it is not operating at capacity. Through more strategic allocation of demand brought about through a larger pool of traffic it is assumed that these troughs in capacity can be filled in to increase the overall throughput, without increasing the existing peak demand through the terminal, upon which the building is designed.
T2:			
14	We would welcome further information on the extension of T2 and demolition of T1. If possible we would like detail on phasing, and also to see future floor plans that show the future T2 building with the baggage handling system that is currently located in T1.	18/06/2014	Slides 14-15 show indicative phasing plans for extending T2, given the starting point of T2 being served by the existing T1 baggage handling system. The phasing strategy allows for new baggage handling facilities to be constructed whilst the existing T2 check-in to T1 baggage system is maintained (Part 1). The recently opened T2 is designed to allow for the baggage to switch from the T1 link to the new T2 facilities once constructed, after which the T1 link can be closed and the remainder of T2 (Part 2) to be constructed.

15	It seems to us that T2A (main building) has a similar capacity in 2014 as in 2036 when it is fully extended and 2-3 times as large. Grateful if HAL could explain this.	18/06/2014	That is not the case. Please refer to Section 6.3
	<u>Airfield planning:</u>		
16	Given the displaced thresholds, it appears to us that the parking and holding of wide bodied aircraft close to the end of the runway (and on some of the new remote stands) may be compromised due to the approach surfaces under mixed mode operations. Grateful if HAL could provide further details as to how these issues are to be mitigated and managed.	18/06/2014	The following principles have been applied in the planning of the airfield. Parked aircraft and buildings are considered as fixed obstacles which sit underneath the approach or transitional obstacle limitation surfaces. Taxiing or holding aircraft have been considered as mobile obstacles which need to be near to the runway as they have to access the runway but which do not protrude the obstacle free zone for CAT I, II, III landing conditions. Aircraft parked on the remote stands on Apron 6 to the south of the new satellite are assumed to park with tail to the north and nose to the south. Whilst A380-800 tailfins are close to both the transitional and approach surface, it is assumed that the pavement levels can be designed to accommodate them without penetration of the surface. See drawing R3500-XX-GA-904-000113
17	We are not clear if sufficient allowance has been made for inter-stand clearways. Grateful if HAL could provide further details to demonstrate the layout of stands and clearways on the new Concourse K, and stands to the west of Concourse J.	18/06/2014	At this early stage, rather than drawing up individual stands, apron capacity has been assessed and drawn up using a stand frontage metric which takes into account interstand clearways. The required frontage for each apron has been assessed by converting the peak stand demand by aircraft size into a total frontage, which has assumed a gross up of 7m per stand for interstand clearways as well as adding 5% frontage for equipment areas and a 10% factor of safety for stand outages/off-slot performance. All stands are off Code F depth, thereby providing flexibility for more detailed stand planning nearer to the design year, when there is greater certainty on the exact mix of aircraft types and airline allocation.
18	How is the car park at the end of 27C to be used? For example, grateful for further details on how this car park is to be accessed and whether is it a surface level car park.	18/06/2014	In order to make best use of land within the airport boundary, it has been identified to use the space between the runway (beyond the RESA/ILS) and end-around-taxiways for a surface car park. The car park will have relative low turnover of traffic so as to comply with PSZ requirements. The surface car park will be used for T5/T6 business parking as a landside island site and will be accessed via tunnel from the central terminal area road system between T5 and T6.
19	It would be helpful if HAL could provide further details demonstrating how the existing northern runway hold points, along with queuing aircraft, will be operated, especially in easterly operations. We would particularly welcome details on the impact this may have on the wider taxiway network and T5 stands. Equally, does HAL envisage any 'bottle necks' forming on the taxiway network as a result of aircraft queuing for departure? And what impact will de-icing at runway hold points have, if any, on departing aircraft queue lengths?	18/06/2014	As there are 5 'full length' holding points for 09C - 2 to the north and 3 to the south - this would mean that the departure 'queue' as a whole would be more spread out across the holding points than on other runways with fewer holding points. In addition this would result in ATC being more able to depart aircraft in the most expeditious order. The Easterly MDL TAAM modelling results (with and without T5 North stands) indicate that the airfield generally flows smoothly and that congestion is not significant - especially as in the model only 09C departures transit in the area to the north of T5 whereas ATC would use these taxiways on a tactical basis to reduce taxi time for individual aircraft (particularly (R3) 09L departures/arrivals to and from T5) where appropriate. There will be scope to finesse / refine the flows as well as the schedule when and the allocation of traffic to the runway hold can be managed according to the demand. Taxiway routes are indicated in the TAAM output. De-icing was not modelled in the simulation but the process will be fully integrated with A-CDM principles, and the timings and order of de-icing will be controlled according to appropriate logic. The logic behind positioning pads at departure runway ends is that once an aircraft is de-iced, it will be able to taxi straight out and depart, meaning no issues with the 'holdover time'. Once de-iced, each aircraft has a time before which it has to be airborne otherwise the de-icing fluid loses its effectiveness and the aircraft has to be de-iced again. This is typically around 20 minutes - but can vary between 10-30 minutes depending on actual weather conditions and type of fluid. Holdover times can affect the current operation at Heathrow where most aircraft are de-iced on stand and taxi time is around 20 minutes. CDG airport already has several de-icing pads for each departure runway end and has proven the success of this approach.
20	Does HAL envisage there being any operational constraints on the taxiway network as a result of aircraft pushbacks to the North of Concourse K? We would welcome further details showing how the inner and outer parallel taxiway network will operate under the various 3rd Runway operating scenarios.	18/06/2014	If concourse K is the T6 building between the Central and Northern runways then the MDL modelling highlights one area (to the north of the centre runway on easterly operations) that might need to be managed e.g. use as low priority stands. Currently only an MDL option has been modelled - if necessary details can be provided of the taxiway flows for other options.
21	Arrivals on Easterlies, with the northern runway used solely for departures (Period 4 in submission document), appear to result in longer taxi times for all aircraft on the T6 concourse. Is HAL able to share with us the approximate taxiing time for aircraft arriving on easterly operations and parking on Concourse K when the new 3rd runway is operating as departures only and the existing southern runway is operated as mixed mode?	18/06/2014	TAAM modelling has been undertaken for MDL on westerlies and easterlies but not DLM. In MDL mode taxi times from the southern runway to the centre of Apron 6 are in the order of 16-17 minutes. However, it is anticipated that in practice a terminal arrivals operation (i.e. landing on the runway nearest to the apron) would prioritise Apron 6 to land on the centre runway, where the taxi time from the runway to the centre of the apron would be in the order of 13-14 minutes (when approximated using the MDL times given the reduced distance). This would need to be confirmed through full TAAM modelling of DLM at a later date.
22	Our analysis suggests that westerly departures on the central runway could result in significant congestion when holding for departure. We would be interested to see any analysis you have undertaken on taxiway congestion, especially around the eastern end of the airfield when operating on Period 4 as shown on pg 177 Vol 1. We would be grateful if HAL could provide details showing how the runway hold locations and associated queues will be managed in this scenario.	18/06/2014	Period 4 is a DLM which has not yet been modelled. MDL has been modelled for Easterly and Westerly operations and indicates no serious problems in this early iteration of analysis. A-CDM principles will continue to be used and enhanced to derive the optimal departure sequence and associated times to leave the stand and taxi to the runway. As A-CDM develops it is expected that there will be a significant reduction in the number of aircraft waiting at the holding point for departure. TAAM modelling is based on a set of rules that apply throughout the run time of the model. However, human ATC is more flexible and is able to change behaviours (in terms of taxiway routings and the use of holding points) as appropriate and as the situation (including length of departure queue, imbalance of distribution of SIDs across holding aircraft) changes. TAAM does not yet fully model the effect of A-CDM on the departure system.
23	Is HAL able to confirm the width of the new runway and the width of shoulders? Please could you also provide reasoning as to why this particular distance was selected?	18/06/2014	The width of new runway shown on the masterplan is 60m at full depth runway pavement construction. There will also be 7.5m paved runway shoulders either side, in accordance with CAA CAP168, as the runway will be regularly used for Code F movements.
24	We would be grateful if HAL could provide a set of Obstacle Limitations Surfaces including the Obstacle Free Zone and confirm the extent of penetrations.	18/06/2014	See Obstacle Limitation Surface drawing and OFZ drawings R3500-XX-GA-904-000111, 114, 115. A full survey of all new obstacles has not yet taken place so it is not possible to confirm the full extent of all penetrations. However, a number of key topographical features have been checked, including St Mary's Church Harmondsworth, The Queen Mother Reservoir, M4/M25 junction as well as Terminal 5. There does not appear to be any significant or unresolvable obstructions. The main point to note (see Q27 below) is the spire on top of the tower at St Mary's Church Harmondsworth.
25	For the new runway, the TOCS involves overflying a retaining wall for the reservoir to the West. Is HAL able to confirm the TOCS clearance over the retaining wall.	18/06/2014	The eastern edge of the Queen Mother Reservoir is approximately 1700m to the west of the R3 runway strip. From OS data, the top of the reservoir embankment is around 35m AOD (bottom of embankment approximately 20m AOD i.e. the embankment is c15m tall). With the level of the runway at the 09L end at approximately 22m AOD, the level of the TOCS over the eastern end of the reservoir would approximately 54m AOD, therefore the top of embankment would sit approximately 19-20m underneath it.

26	To the east, TOCS covers taxiing/holding positions of the parallel taxiways of the existing runway. Is HAL able to confirm the TOCS clearance and any implications for operations.	18/06/2014	The TORA for the centre runway has been reduced to 3500m from 3885m today. Given the change from old quad Code E aircraft to new generation twin Code E or new generation quad Code F, 3500m will be a suitable runway length in the future without payload restrictions. On this basis, the distance from the end of the runway strip to the first of the end-around-taxiways is 1120m. The end-around-taxiway will be constructed 2-3m below the centre runway (see TBF Appendix 16) to allow 25m tall Code F aircraft to taxi unrestricted under the 1:50 TOCS of 27C.
27	Transitional Surface: the proposed runway strip runs to the south of Harmondsworth. We were unsure whether this transitional surface conflicts with any of the remaining local buildings.	18/06/2014	A check has been made on the transitional surface and the interaction with the spire of St Marys Church. Harmondsworth. The main structure of the church and tower sit underneath the transitional surface, the top spire and cupola protrude by c 4 metres, based upon current earthworks assumptions. Given the amount of penetration and frangibility, there is a case for the spire/cupola to be retained when the risk assessment is carried out (assuming the decision is made to retain the church in-situ) or a slight modification made. There may also be scope to refine the earthworks model further to reduce the amount of penetration. Tithe Barn is lower in height than St Mary's church and is located further away from the runway. See drawing R3500-XX-GA-904-000059
28	The PSZ impacts some residential properties to the east at Sipson and Harlington and Colnbrook to the west. What allowances have been made for compulsory purchase for those properties contained within the PSZ? Please identify all properties impacted.	18/06/2014	There are approximately 40 properties within the 10 ⁻⁵ zone. Currently these are not shown as subject to CPO. Other residential properties exist within the current 10-5 PSZs from the current runways. However, these 40 properties will fall within the 69-72 dB L eq contour and are therefore highly likely to be subject to an offer to buy once any consultation process on compensation measures is complete. HAL would then have the discretion on whether or not it was appropriate to resell, lease or demolish these properties.
29	Can HAL advise if an isolated parking position is provided and its proposed location (for parking of aircraft subject to unlawful interference)?	18/06/2014	We believe that putting this information into the public domain is not appropriate but we have management strategies in place for the existing airport and the future expanded airport
30	Is HAL able to provide details of all Declared Distances and the dimensions of stopways and RESA's?	18/06/2014	See drawing R3500-XX-GA-904-000112
31	We would request clarification that HAL's cost breakdown is aligned with RIBA Stage ⅔. Are there any supporting spreadsheets, including supporting quantities and pricing basis, that we may be privy too?	18/06/2014	See separate query answer
32	Please confirm HAL's view of future aircraft development (size and weight) over the next 40 years and how these can be accommodated within the development proposals.	18/06/2014	Paragraphs 1.3.1.5 and 3.2.1.4 of Taking Britain Further Volume 1 outline our assumptions in forecast changes to fleet mix up to 2040. Beyond this there is increasing uncertainty but we foresee that NEOs will continue to replace current A320 variants. We also foresee B777 next generation, B787 or A350 will replace B772/3 variants. The new as well as the existing reconfigured airfield is set out for Code F or, if adhering to CAA clearances, Code F+ in some areas (e.g. parallel taxiways adjacent to the runways). New aprons have been set out to full Code F depth (i.e. 80m A380-900 length) so there is a degree of future flexibility to deal with aircraft longer than those operating today.
33	It appears from the CAD drawings that the set of taxiways to the west of the new car park 2.5m shorter than what would be permissible for Code F aircraft under the new EASA regulations. Grateful if HAL could confirm if this distance should be increased by 2.5m to comply with the regulations, or if not, if there is a reason for this.	18/06/2014	Whilst EASA regulations are based upon 97.5m taxiway to taxiway and 57.5m taxiway to object clearance, the February 2014 10th edition of CAA CAP168 (Table 3.4), which has been updated in response to the new EASA regulations, states that the clearances can be 95m and 55m respectively. This original reduction in standards from ICAO arose as a result of an extensive taxiway deviation risk analysis study undertaken by a group of European airports (including HAL) around 10 years ago. Given the difference between the two standards, it is anticipated that the CAA will file for a difference in standards with EASA. However, should the CAA revert to 97.5m/57.5m at a later date the design has the ability to be modified to provide this increased clearance.
<u>Airspace</u>			
34	We have identified what appear to be contradictions regarding Compass Departures and a subsequent explanation of the direction of departures from runways. Grateful if HAL could provide more detail, referencing their document as appropriate, particularly p.177 s.3.5.1.3.	18/06/2014	It is recognised that there is and will likely remain an imbalance in demand for northbound versus southbound departures at Heathrow. With a third runway this would be especially relevant when the northernmost runway is being used for departures. To ensure that capacity would not be constrained by this in this scenario, SIDs have been designed that eventually head south but which initially turn to the north to ensure separation between these aircraft and avoid those departing from the more southern runway. For environmental considerations and the purposes of air traffic management in the vicinity of the airport they can be considered to be northbound SIDs. NATS ATC are happy to discuss this variant of Compass Departures during the meeting if required.
35	We note that HAL has provided no evidence on the potential impacts on other airports (i.e. Northolt). Has HAL conducted any analysis it is able to share with us on this topic?	18/06/2014	Please refer to previous query answers
36	There appear to be some uncertainties about the ability to meet all assumptions for arrivals and departures at the level of traffic asserted (740k)? Can HAL expand on this?	18/06/2014	Please clarify the question
37	We have some comments in relation to specific airspace options. Option 1 appears feasible but it is not clear to us if this option can deliver the stated level of capacity - i.e. if following principles in Option 1 of minimising the total number of people overflowed by restricting the number of SIDs flown, this may also restrict capacity. Can HAL share more in relation to this?	18/06/2014	Option 1 = Minimum total people affected. The divergence of the SIDs have been designed in such a way that capacity throughput can be maintained. As long as the separations detailed in the separation matrix (in the TAAM report) can be applied to each of the airspace options (minimum new people, total people, maximum respite) the TAAM results remain valid for all options which indicates that the throughout required to achieve 740k ATMs is achievable. If any revisions need to be made to the separations the impacts would need to be assessed.
38	Option 2 looks the most challenging of the three scenarios, does this accord with HAL's view?	18/06/2014	Option 2 = Minimise new people affected. This option is not considered more challenging than the others. As long as the separations detailed in the separation matrix (in the TAAM report) can be applied to each of the airspace options (minimum new people, total people, maximum respite) the TAAM results remain valid for all options. If any revisions need to be made to the separations the impacts would need to be assessed.

39	Option 3 – it appears to us that some human factor issues will need to be considered due to the potential for increased human error (ATC or pilot). For instance, introducing too many options to be employed at different times could be confusing for pilots/controllers, but we are aware that mitigation measures are viable.	18/06/2014	Option 3 = Maximum respite for people affected. In terms of variants of the same SID, this option is not considered to be more challenging than the others. This is reinforced by recent experience from conducting this type of operation with the RNAV SID trials (DOKEN/MID). To reduce complexity the change from variant to variant would likely occur overnight, perhaps on a weekly basis as has been the case with the SID trials. Having three, or more, variants of each SID is not inherently risky. They are all so similar that there should be no flight safety risk in the event that an aircraft, for whatever reason, flew the wrong variant. During the 6 months of the RNAV SID trial there have been no safety issues. In terms of runway alternation, a 3R alternation e.g. MDL to MLD, is more complex than a 2R alternation. It is envisaged that this type of change would occur overnight, rather than in the middle of the day, to avoid delay.
<u>Datasite</u>			
40	In various files in the 'Airspace Design Routes' folder, there are bold and shaded lines on the map. Please could you explain what these are intended to represent?	18/06/2014	The bold and shaded lines represent the routes that will be alternated between to provide respite e.g. period 1 = bold; period 2 = shaded.
41	Have you assumed that the 'end point' of the departures and 'start point' of the descents are at any particular height (e.g. 4,000ft)?	18/06/2014	For both the Noise and TAAM modelling, Arrivals enter and Departures leave the model 20 - 25nm from the airport. In th TAAM modelling Arrivals enter according to appropriate separations (wake turbulence pairs). Departures are assigned a separation using the SID separation matrix (as detailed in the TAAM results) over-ridden by wake turbulence separation if appropriate. The separation matrix was devised by considering the proposed routes available. In the TAAM model the SID routings are not flown exactly - aircraft fly towards the SID waypoint before leaving the model. Over time the model can be finessed to include this level of detail.