Appendix C: Component Identification

This appendix presents the evaluation tables for component identification (see Section 2.3 in 'Our approach to redesigning our airspace network' for context). These tables are provided to demonstrate the range of components considered and the nature of the evaluation. As it is the direct output of the assessment workshops it is highly technical in nature.

Component Identification and Evaluation

Table's C1 & C2 summarise the outputs of the component identification and evaluation process for arrival and departures respectively. These tables provide a summary description of each component, key issues raised in the identification workshops, and the results of evolution in terms of whether the component was retained or dismissed.

Table C2: Summary of Output for Departure Components

Key	Type	Description	Component History	Comments	Pro	Con	Conclusion
D-1	Route	1 SID off each departure runway	Identified at initial brainstorm workshops	Unknown how far along a SID could split into other routes. Known to work at Paris, 1 min intervals (might work at EGLL if this could be guaranteed). Independent SIDs, full separation between the 2 runways.	Minimal routes, low complexity	Inefficient in initial direction, wrap-arounds likely further downstream, very hands off, unlikely to deliver required throughput	**Retained**
D-2	Route	2 SIDs off the main departure runway; and 1 off the mixed-mode runway	Identified at initial brainstorm workshops	Independent SIDs, full separation between the 2 runways.	Minimal routes, low complexity	Inefficient in initial direction, wrap-arounds likely	**Retained**
D-3	Route	2 SIDs off each departure runway	Identified at initial brainstorm workshops	Independent SIDs, full separation between the 2 runways.	Likely to support the required throughput, continuous climbs likely, not too complex, systemised, could rotate letterboxes		**Retained**
D-4	Route	2+ SIDs off each departure runway	Identified at initial brainstorm workshops	Independent SIDs, full separation between the 2 runways.	Likely to support the required throughput, continuous climbs likely, systemised, could rotate letterboxes, could allow short track length		**Retained**
D-5	Misc	After departure, each SID to 1 letterbox (no splits)	Identified at initial brainstorm workshops	This component is not restricted to 1 SID per runway (generic component).	Onward routing, low complexity	Inefficiencies, constrained by terminals	**Retained**
D-6	Misc	After departure, each SID to 2+ letterboxes (splits)	Identified at initial brainstorm workshops	This component is not restricted to 1 SID per runway (generic component).	Systemised, could support respite, 1 min intervals achievable, could rotate letterboxes		**Retained**
D-7	Misc	2 or more SIDs (from the same runway) feeding into the same letterbox	Identified at initial brainstorm workshops	Simultaneous use of multiple SIDs from a single runway which terminate at the same point in space. Could be used for different speeds e.g. faster aircraft on a shorter route to the letterbox. Different to D-9 as SIDs could all be used at once.	Reduces number of en-route routes, could support respite	Longitudinal catch-ups, throughput constraints, constraints put on other airfields, different climb gradients could create speed over the ground issues, suitable tool support and separation standards would be required for coincidental use.	**Retained**
D-8	Misc	2 or more SIDs off different runways ending at the same letterbox	Created in the MDL-MLD west workshop	SIDs could initially diverge before converging to the same letterbox. There would need to be some thought into how this would work for the mixed-mode SIDs. Ordering of traffic on the mixed-mode runway is dependent on arrivals. Departures might need to take priority against other traffic.	Small amount of respite, off-loading for ground balancing, supports compass departures	Potential catch-ups, enhanced tools required, increased controller workload, runway dependencies, reliant on tool support or manual coordination.	**Retained**
D-9	Misc	Alternate SIDs to the same letterbox	Created in the MDL-MLD west workshop	Assumes that this is not the only SID in use/ isolation. Workload is very dependent on the actual use of this component i.e. how frequently the route changes.	Supports respite	Conformance monitoring required e.g. aircraft use the wrong route	**Retained**
D-10	Misc	Letterboxes activated/ deactivated	Identified at initial brainstorm workshops	Similar to component D-9 but changing the "end-point" There are examples of time-banded SIDs used for respite in PLAS.	Supports respite	Wasted airspace (unless dynamic airspace), conformance monitoring required e.g. aircraft using the wrong letterbox, transition between activation may affect throughput, awareness of transition times	**Retained**
D-11	Misc	SIDs with a number of available letterboxes along the track for different performing aircraft	Identified at initial brainstorm workshops	A completely new concept. Aircraft would be deconflicted laterally, not assuming vertical separation. The letterboxes would be at different physical points in space which would have to be separated.	Continuous climbs, aircraft could fly optimal climb profile, 1 min intervals achievable, enables a performance based SID split, crews can choose desired route	May be difficult to assure separation, possible catch-ups, optimal 1 min intervals may not be possible, ground speed differentials may cause problems	**Retained**
D-12	Misc	Vertical performance-based SIDs	Identified at initial brainstorm workshops	A completely new concept and separation technique - requires further safety work to validate. Route are separated through different vertical performances/ splits rather than laterally. Future work may prove and support a reduction in wake separation. Could use the same lateral track over the ground.	1 min intervals achievable, less people overflown, less airspace used, throughput achievable, apply to any runway configuration	Tool assistance, different aircraft or airlines may have difficulties in maintaining a consistent and assured climb rate, safety concerns, very strict traffic mix required, not a very resilient design, potential severe wake effects particularly on steep climbs	**Retained**
D-13	Misc	Wrap-around SIDs	Identified at initial brainstorm workshops		Minimise impact of human TA QNH errors, 1 min intervals possible, direct routings, less/ no cross-overs, aircraft could be separated and independent, aircraft can split off in optimal directions, supports compass departures (simpler for the en-route network)	Extra RT, FMS coding, departure assistance tools required, fleet split may be needed, aircraft performance issues for required gradient, wrap-arounds dependent on arrivals and MAPs, tighter the turn - lower the aircraft, environmentally unfriendly, complex, track mileage, might constrain climb performance	**Retained**
D-14	Misc	Cross-over SIDs	Identified at initial brainstorm workshops **Dismissed - crossovers not to be part of the final EGLL solution.**	Assumes all stop-offs are contained within the procedure (up to 9,000ft). The SIDs and the cross-overs would be vertically coded i.e. not above/ below a specific altitude. If fully separated and segregated, this could work. Assumes TA has been raised or procedures permit a datum change. Discarded as part of the mathematical string workshop (19/06/18).	Flexibility, could be used for shortest route, supports compass departures (simpler for the en-route network), proven and used in today's operation	Severe complexity issues, separation issues (vertical separation required), departure assistance tools probably needed, level restrictions, environmentally unfriendly, severe dependencies, may constrain capacity, climb performance needs to be very closely monitored, may require conformance monitoring	**Dismissed**
D-15	Misc	Spiral/ orbital departures - routes from each departing runway peel off into several spiralled routes	Identified at initial brainstorm workshops **Dismissed - captured in D-13 & D-14**		Reduced cross-overs, geographically position aircraft on departure, noise dispersal, could be used as method for slow departures to gain height	Would probably not deliver throughput - optimal 1 min intervals, no respite options	**Covered by other component**
D-16	Misc	SIDs climb to separated levels (deconflicted), then transition to letterboxes at FL90 on QNH 1013	Identified at initial brainstorm workshops	New concept - TA mitigation. Assumes TA has not been raised. It would require 2 procedures, starting with a SID to altitude (either ATC clearance/ automatic initiation). Aircraft cannot get airborne and cross over to a FL. It might be possible to clear the TA before the level cap (don't have to wait until the waypoint). Could also be mirrored in the FMS. Most likely used as a sub-component.	Mitigation for TA QNH (human) errors, 1 min intervals possible, could rotate letterboxes, aircraft can split off in optimal directions, lends itself to compass departures and cross-overs	Would not allow continuous climbs, extra RT, FMS coding, splits on the ground may be difficult, departure assistance tools may be required, aircraft lower for longer (environmental & noise issues), conflict with other traffic, difficult to design other routes around, lack of resilience to adverse weather	**Retained**
D-17	Misc	SIDs merging into SIDs from other runways	Identified at initial brainstorm workshops **Dismissed - captured in D-9**			Only beneficial for FASI-S, severe complexity and separation issues, runway dependencies, effect on sequencing, assistance tools would probably be required	**Covered by other component**
D-18	Misc	Geographical compass departures	Identified at initial brainstorm workshops **Dismissed - captured in D-12 & D-14**		Minimise impact of human TA QNH errors, likely to provide shorter track miles, RNP separation, simpler for the en-route network	Would not allow continuous climbs, extra RT, unlikely to achieve 1 min intervals, FMS coding, splits on the ground may be difficult, departure assistance tools probably needed, large number of letterboxes, few respite options, incredibly complex, cross-overs, environmentally unfriendly	**Covered by other component**
D-19	Misc	Geographical compass departures - all to 6,000ft	Identified at initial brainstorm workshops **Dismissed - captured in D-13, D-14 & D-16**		Minimise impact of human TA QNH errors, departure assistance tool not likely required, simpler for the en-route network	Would not allow continuous climbs, extra RT, unlikely to achieve 1 min intervals, FMS coding, splits on the ground may be difficult, large number of letterboxes, few respite options, incredibly complex, cross-overs	**Covered by other component**
D-20	Misc	Tactical vector area at the runway end for departures	Identified at initial brainstorm workshops	This is a completely new concept. Open-ended departure route; aircraft get airborne then tactically vectored on headings. Chicago/ Washington concept.	Flexibility	Instantly lose departure metering, environmentally poor, loss of predictability, conflicts with using RNP routes, controller workload e.g. numerous instructions	**Retained**
D-21	Misc	Use reduced spacing (<3NM)/ TBS for departures	Created in the MDL-MLD east workshop.	This is a completely new concept. 2.5NM spacing is currently used on final approach at EGLL, radar separation proven for arrivals.	Increase throughput		**Retained**
D-22	Route	Departures take a hard left/ right turn in order to fly in the opposite direction (180°)	Created in the MDL-MLD east workshop. **Dismissed - captured in D-1 & D-13**	Very similar to Compton concept - not a new concept.	Frees up room for MAPs, avoids central London	Increased track mileage for some departures, operationally complex, different climb rates might make the turn difficult, integration with arrivals	**Covered by other component**