NATS

Performance
through Innovation

LAMP Phase 1A

Airspace Change Proposal - Module C

London City Network Changes

Issue 2.0
March 2015
Doc ref. 4165/RPT/131 (Module C)

Prepared by:
[redacted]
Airspace Change Assurance

Issue	Month/ Year	Changes in this issue
Issue 1	February 2015	Initial issue submitted to CAA SARG.
Issue 2	March 2015	Up Issue with clarifications as per [redacted] . All changes in this Issue are marked in dark red

1 Introduction

This document has been produced by NATS Enroute Ltd who is the sponsor of this change. It provides full details of the proposed airspace change, and demonstrates compliance with CAA CAP725 requirements.

The proposed changes described herein, are to portions of the London City Airport and Biggin Hill arrival and departure routes above 4,000ft. Fifteen new STARs and six new arrival transitions will be introduced to facilitate RNAV1 arrival connectivity between the enroute airway structure and London City and Biggin Hill Airports. Five STARs to Gatwick will be realigned, and seven new STARs to Southend Airport will be introduced.

Six SIDs from London City are replicated along their entire length, ending at CLN, BPK and CPT VORs. For departures to the south, the six conventional SIDs to SAM, DVR & LYD are replaced by two RNAV SIDs to EKNIV.

The objective of these changes is to introduce a new, more efficient, system of RNAV routes to replace the current conventional procedures.

If the proposal is approved by the CAA, implementation of the airspace change will occur at an appropriate opportunity but, in any event not before 10th December 2015. (AIRAC 13/2015).

The consultation for this proposal ran from 15th October 2013 until 21st January 2014, a period of 14 weeks. The consultation document and the consultation feedback report are both attached with this ACP (refs LCY_A & LCY_B).

2 How to Read this ACP

This document forms Module C of the LAMP Phase 1 ACP package. The structure of the ACP is shown in Figure 1 below. (This document highlighted in red).

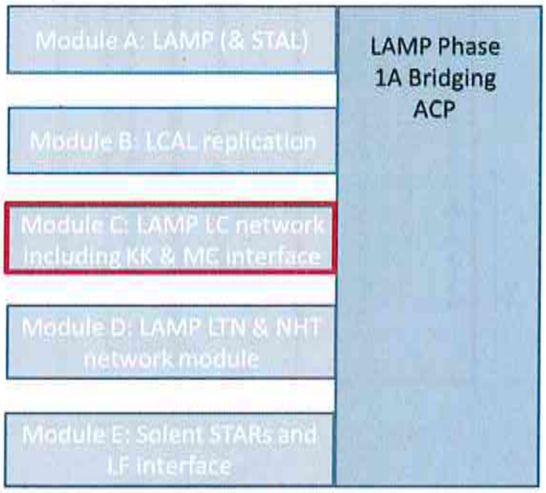

Figure 1: LAMP Phase 1 ACP structure

Much of the evidence of meeting CAP725 requirements has already been documented in the consultation material, feedback report and other technical documents.

This document is therefore designed to demonstrate compliance with CAP725 requirements. As such it provide cross references to relevant evidence where it exists elsewhere, as well as presenting additional detail where required.

Reference Documents

All referenced documents are provided as part of the ACP. The document map below details the reference documents for all modules of the ACP.

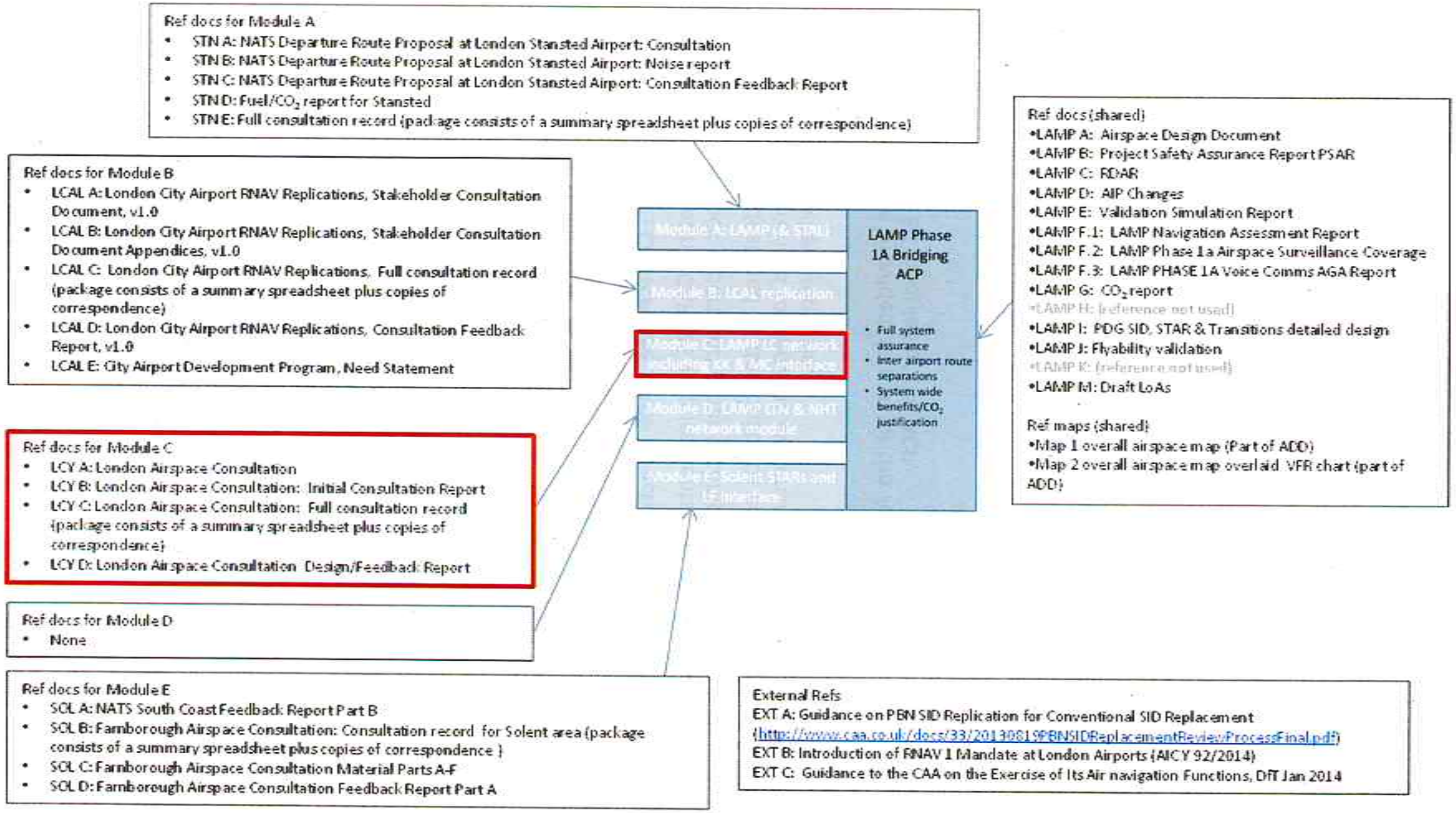

Figure 2: Document Map & References

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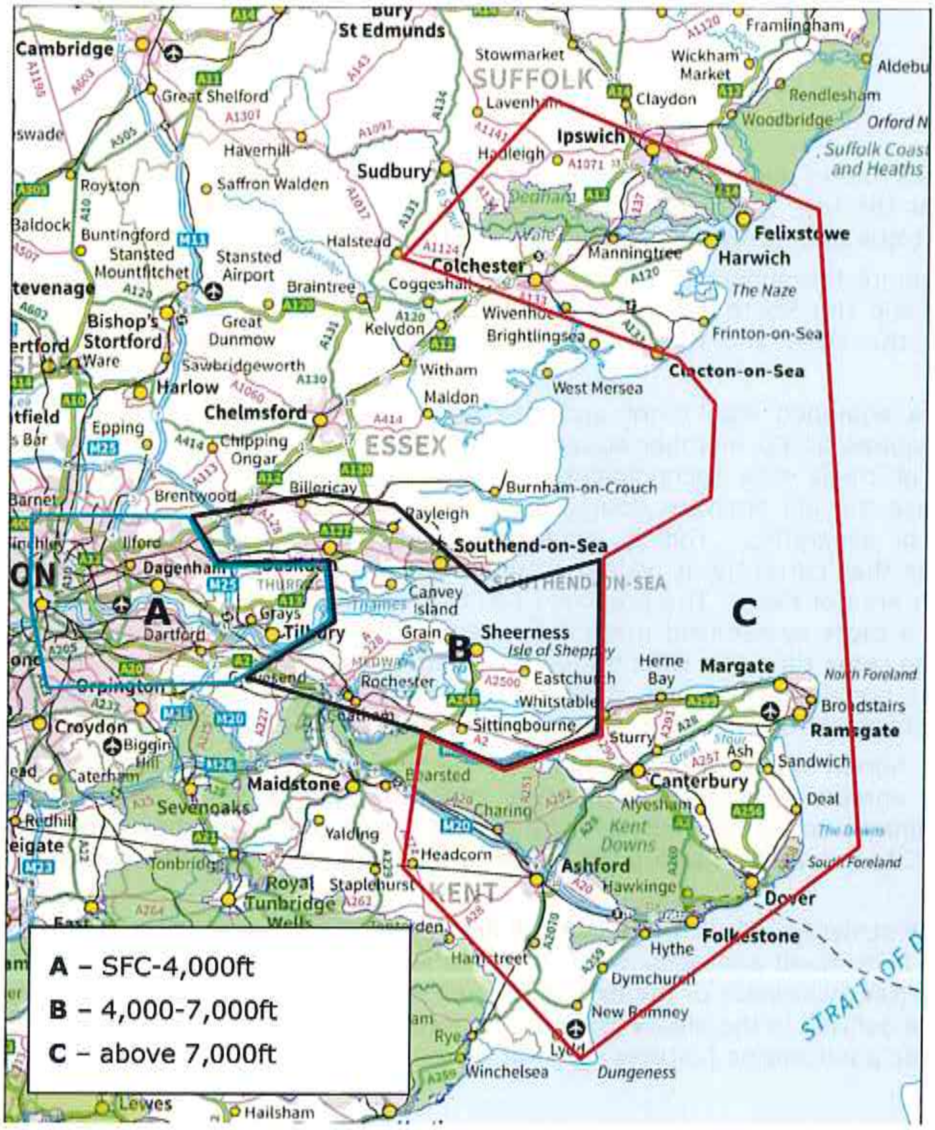

Figure 3: Consultation areas

The proposed SIDs and RNAV arrival transitions for London City Airport extend across the areas A, B & C as shown in Figure 3 above.

Area A covers the low level aspects of the design (below 4,000ft). In this area the changes proposed are limited to RNAV replication of the extant SIDs & arrival procedures. Consultation regarding the changes proposed for area A was carried out by the London City Airport RNAV Replication consultation (ref LCAL_A). The LAMP Phase 1A ACP Module B covers the changes proposed in this area.

Areas B and C are the areas where aircraft are above 4,000ft, and cover the network aspects of the design. The changes proposed in this area are described in **this** module of the ACP.

Whilst the ACPs are divided at the 4,000ft points, procedure design compliance and flyability validation has been performed for the end to end procedures, and are detailed in ref LAMP_I (SIDS, STARS & Transitions, detailed procedure design & draft charts).

3 Justification

Air travel plays a crucial role in supporting economic growth and prosperity, particularly for an island nation such as the UK. It is a part of modern life that we all take for granted; for business, international trade and leisure, flying is central to today's lifestyle.

Airlines and airports require the support of efficient airspace. The basis of today's airspace structure over London and the South East was established many decades ago when there were fewer aircraft in the skies and the navigation technology available was much less sophisticated.

Most aircraft today are equipped with more accurate RNAV navigation technology. New European legislation requires all EU member states, including the UK, to revise our airspace to maximise the use of these new technologies. At the same time, this gives us the opportunity to modernise the old airspace structures, to improve efficiency and reduce the environmental impact of air traffic. This is increasingly necessary as our skies become busier. One example is that currently arrivals to London City are sequenced by ATC using radar vectoring over an area of Kent. The proposed point merge structure over the Thames estuary would provide a more systemised method for sequencing the inbound aircraft with greater accuracy. At the same time this will position the flights over water, and hence reduce the noise impact on the population of Kent. The geometries of airspace structures such as point merge are only achievable using modern navigation systems such as RNAV.

The changes proposed herein will provide seamless connectivity between the London City runways and the RNAV enroute structure. Currently aircraft leave the enroute airways, and join a STAR which terminates some distance from the airport. From that point they expect to be given vectors by ATC to guide them to a point at which they can join one of the published instrument approaches.

With the proposed RNAV structure, the RNAV STAR will link to an RNAV transition, which in turn will connect to the instrument approach procedure (see example in Figure 4). Hence pilots will have much better awareness of the expected route in advance, and the route from airway to runway will be defined in the aircraft's FMS. Vectoring by ATC will only necessary for sequencing (using the point merge features) and for giving shortcuts, when traffic levels permit.

At the network level the new RNAV arrivals & departure procedures will enable the ATC network to operate more efficiently, in a much more systemised manner.

The RNAV replication of the lower altitude portions (below 4,000ft) of the conventional procedures, enables the higher level network to be seamlessly linked to the airport by contiguous procedures. This permits the many benefits of RNAV for the higher altitude portions to be secured, whilst keeping the changes in the noise-sensitive lower altitude portions to an absolute minimum. (see ACP Module B for details of the replication portions).

The improved systemisation of the network, combined with the RNAV replication of the portions below 4,000ft, enables environmental benefits such as facilitating improved descent profiles, reducing track mileage through more efficient sequencing using point merge. For a breakdown of the environmental benefits see the LAMP Phase 1 bridging ACP.

The introduction of RNAV1 procedures is further justified by the requirement to conform to European legal requirements and proposed CAA mandates as detailed below.

Approximately 70% of aircraft flying from London City are equipped to fly RNAV routes; the remainder still rely on conventional navigation. We therefore propose to accommodate aircraft which are not capable of using RNAV1, until such time as RNAV1 is fully adopted. The CAA is planning to mandate that from 9th November 2017 an RNAV1 operations approval or equivalent authorisation is required for all IFR GAT flights inbound and outbound to/from the major London airports. Furthermore all airports in the London area must replace conventional procedures by November 2019. After implementation of the RNAV routes at London City (planned for December 2015) the majority of those aircraft which are approved for RNAV1 will use the new routes. There will then be a transitional period to 2017, where the remaining airlines progressively transition to full RNAV1 operations. The conventional procedures will be withdrawn after November 2019.

4 Current Airspace Description

4.1 Existing Airspace & Traffic Routings

For details of the existing airspace and current traffic routings, please refer to ref. LCY_A (Consultation Doc), Part E Section 2 Pages E6 to E14.

4.2 Traffic Figures

This proposal would not have any influence on the rate of growth of traffic operating within the airspace. For the purposes of the system wide CO_2 analysis a level of growth has been assumed. These predicted traffic numbers are presented in the Bridging ACP which discusses network impacts.

4.3 Aircraft Types

Aircraft type data for all LAMP Phase 1A routes are given in the Bridging ACP.

4.4 Operational Efficiency, Complexity, Delays & Choke Points

The arrivals sequencing procedures currently in use at London City Airport are described in detail in the London Airspace Consultation, Part F (Proposed changes to London City, London Biggin Hill and London Southend routes above 7,000ft over parts of Kent, Essex and Suffolk) section 2.6- 2.11. If aircraft need to be delayed for sequencing they are often vectored within the surrounding airspace. This results in aircraft flying at low level extensively over parts of Kent and Essex. This method of sequencing is ad-hoc, and techniques can vary between ATC watches and individual controllers. This introduces complexity which limits the system's maximum capacity, and can result in delays when traffic levels are high.

5 Proposed Airspace Description

5.1 Objectives/Requirements for Proposed Design

The objective of this Module of the LAMP Phase 1A ACP is to improve environmental and operational efficiency for London City arrivals, and departures to the south. The proposed solution is to improve approach sequencing by implementing an RNAV1 point merge system with dedicated contingency holds over the sea, and realigned RNAV1 SIDs heading towards DVR and LYD. To achieve this, changes are also proposed for some Biggin Hill arrivals which share the London City arrival route structures for flight planning purposes, and also for Gatwick and Southend STARs that cross the area of the proposed point merge structure.

This module of the ACP (Module C) is concerned with the higher altitude network portions of the procedures (above circa 4,000ft), and the interfaces with the lower ATS route structure.

5.2 Proposed New Airspace/Route Definition & Usage

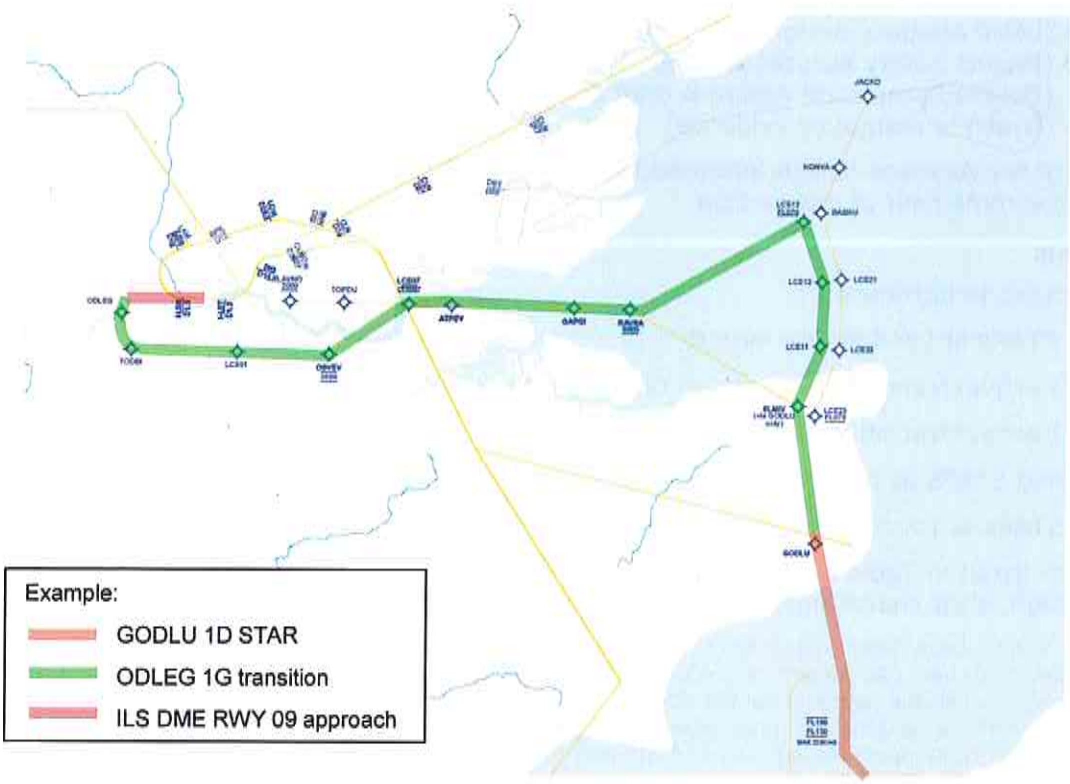

Figure 4: Overview of proposed LC network design

Note aircraft can be instructed by ATC to turn-in to the merge point at any point along the merge arcs (see ref LAMP_A for definitive map).

The proposed design for the network aspect of the London City Airport LAMP design is shown in Figure 4.

An interactive electronic version of this map is included in the LAMP Airspace Design Document (ref LAMP_A) with layers (e.g. routes, holds, protected areas, etc) which can be selected and turned on/off.

For arrivals at London City Airport the proposed design is based on a point merge structure positioned over the Thames Estuary. This will be used to sequence the arrivals. New contingency holds will be introduced at OKVAP (to the south, over the English Channel), GODLU (near Dover) and JACKO (to the north over the English Channel). Fifteen new STARs and six new arrival transitions will be introduced to facilitate RNAV1 arrival connectivity between the enroute airway structure and the airport (see ref LAMP_I: detailed procedure design & draft charts). There are six STARs from the north, entering the point merge via JACKO, and nine from the south entering the point merge via GODLU.

It is proposed that Biggin Hill airport arrivals will also use the same STARs and point merge system.

For departures from London City Airport, the proposed RNAV1 SIDs are replications of the existing conventional SIDs up to the points defined in the LAMP ACP Module B (London City RNAV Replications, Page 8 Table 3). Six SIDs are replicated along their entire length, ending at CLN, BPK and CPT VORs. For departures to the south, the six conventional SIDs to SAM, DVR & LYD are replaced by two RNAV SIDs to EKNIV; Module B of the ACP covers their replication up to c.4000ft, while the realignment of the tail from c.4,000ft upwards is covered in this ACP.

Five TIMBA STARs to Gatwick are also subject to change. And new STARs are introduced for Southend from the South and East.

The complete airspace description and assurance is presented as end to end procedures in the following documents found with the Bridging ACP:

- LAMP_A (LAMP Airspace design Definition v7.0)
- LAMP_B (Project Safety Assurance Report)
- LAMP_I (Detailed procedure design & draft charts),
- LAMP_J (flyability assurance evidence)

Key features of the Airspace design information contained within these detailed documents is presented in the remainder of this section.

5.2.1 Arrivals

This ACP proposes to introduce:

- 15 new STARs at London City Airport
- 4 RNAV1 arrival transitions at London City Airport
- 2 RNAV1 arrival transitions at Biggin Hill Airport
- 5 realigned STARs at London Gatwick Airport
- 7 new STARs at London Southend Airport

The STARs are listed in Table 1 and the transitions in Table 2 below. The proposed detailed procedure design, draft charts and RNAV coding tables are given in ref LAMP_I.

The Southend STARs have been designed to provide connectively to the GEGMU hold that is being implemented along with new CAS as part of a separate ACP led by Southend. At the time of writing the CAS have been approved, while the approval for the GEGMU hold is subject to IFP compliance checks. Southend will seek to implement the GEGMU hold once approved, either before, or at latest alongside LAMP Phase 1A. Descriptions of this hold, its operation and the CAS are part of the Southend ACP rather than LAMP (note that the hold is provided on the PDG STAR plates provided with LAMP Phase 1A, but their implementation remains the responsibility of Southend airport). The Southend STARs included in this LAMP ACP are wholly contained within existing airspace which for the purposes for this ACP includes the CAS being implemented by Southend as it will be in place before LAMP Phase 1A is implemented. The Southend STARs will therefore operate as all other STARs in the London TMA, being used for flight planning purposes, and flown by the aircraft FMS unless ATC instruct the pilot otherwise. All aircraft on the Southend STARs will be in a radar monitored environment and vectored where appropriate. The STARs are fully supported by Southend Airport.

Airfield/Level Restriction	New STAR name	Old STAR name	Airway feeding STAR	Route
EGLC EGKB (FL175-)	JACKO 1A	SPEAR 1A	L9	KENET – WCO – BOMBO – BKY – BRAIN – CLN – JACKO
EGLC EGKB	JACKO 1B	SPEAR 1B	L608	SUMUM – LOGAN – JACKO
EGLC EGKB	JACKO 1D	SPEAR 1B	L980	XAMAN – LOGAN – JACKO
EGLC EGKB (FL245-)	JACKO 1H	SPEAR 2H	UN615/L10	HON – ROGBI – TIXEX – ODVOD – ROPMU-NUDNA – INLIM – JACKO
EGLC EGKB (FL245+)	JACKO 1L	SPEAR 1L	UL975/UL10	WAL – LISTO – PEDIG – ROGBI – ODVOD – ROPMU - NUDNA – INLIM – JACKO
EGLC EGKB (FL245+)	JACKO 1M	SPEAR 1M	UN615	MCT – PEDIG – ROGBI – ODVOD – ROPMU-NUDNA — INLIM – JACKO
EGLC EGKB (FL175+)	GODLU 1A	N/A	Y3	BEDEK – BIG – UMTUM – GODLU
EGLC EGKB (FL100-FL120)	GODLU 1C	ALKIN 3C	L9	KONAN – GODLU
EGLC EGKB	GODLU 1D	ALKIN 3D	L613	RATUK – SOVAT – ERKEX – OKVAP – GODLU (see example in Figure 3)
EGLC EGKB	GODLU 1F	ALKIN 3F	M189	NEVIL – OSPOL – NETVU – SOXUX – OKVAP – GODLU
EGLC EGKB (FL105+)	GODLU 1G	ALKIN 3F	L980	DOMUT – KATHY – BIDVA – EVEXU – SOXUX – OKVAP – GODLU
EGLC EGKB (FL175-)	GODLU 1H	ALKIN 3F	L620	SAM – BIDVA – EVEXU – SOXUX – OKVAP – GODLU
EGLC EGKB (FL175+)	GODLU 1J	N/A	M185	GIBSO – BEGTO – AVANT – BIG – UMTUM - GODLU
EGLC	GODLU 1K	N/A	L980	XAMAN – TRATO -GODLU
EGLC	GODLU1L	N/A	L608	SUMUM – TRATO - GODLU
EGKK	TIMBA 4B	TIMBA 3B	UT421	KUNAV – AMDUT – TIMBA
EGKK	TIMBA 1J	TIMBA 3E	Y76	ERING – ABTUM – ARNUN – LARCK - TIMBA
EGKK (FL125-)	TIMBA 3F	TIMBA 2F	L9	KONAN – ARNUN – LARCK – TIMBA
EGKK	TIMBA 1K	TIMBA 3E	L610	TEBRA – ABTUM – ARNUN – LARCK - TIMBA
EGKK	TIMBA 2G	TIMBA 1G	M189	NEVIL – OSPOL – NETVU - ELDAX – AMDUT – TIMBA
EGMC	GEGMU 1B	N/A	L608	SUMUM – LOGAN – JACKO – UPKES - GEGMU
EGMC	GEGMU 1D	N/A	L980	XAMAN – LOGAN – JACKO – UPKES - GEGMU
EGMC	GEGMU 1F	N/A	L613	RATUK - SOVAT - ERKEX - OKVAP - ATSAP - ADVAS - GEGMU
EGMC	GEGMU 1G	N/A	M189	NEVIL - OSPOL -NETVU - SOXUX - OKVAP - ATSAP - ADVAS - GEGMU
EGMC	GEGMU 1J	N/A	L620	SAM - BIDVA - EVEXU - SOXUX - OKVAP - ATSAP - ADVAS - GEGMU
EGMC	GEGMU 1K	N/A	L980	DOMUT - KATHY - BIDVA - EVEXU - SOXUX - OKVAP - ATSAP - ADVAS - GEGMU
EGMC	GEGMU 1N	N/A	L620	GIBSO – BEGTO – AVANT – BIG – UMTUM – GODLU ATSAP - ADVAS - GEGMU

Table 1 New STARS

Airfield	Transition name	Runway	Route
EGLC	ODLEG 1G	09	GODLU – ELMIV - KW027 - KW033 - KW031 – RAVSA – GAPGI – ROVSU – OVBUS – OSVEV – XEVDU – TODBI – ODLEG – FM Leg 050°M (see example in Figure 3)
EGLC	ODLEG 1J	09	JACKO – NONVA – BABKU – KW022 – KW045 – KW024 – RAVSA - GAPGI – ROVSU – OVBUS – OSVEV – XEVDU – TODBI – ODLEG – FM Leg 050°M
EGLC	LAVNO 1G	27	GODLU – ELMIV - KW027 - KW033 - KW031 – RAVSA – GAPGI – ROVSU – OVBUS – TODPU – LAVNO – ILS27
EGLC	LAVNO 1J	27	JACKO – NONVA – BABKU – KW022 – KW045 – KW024 – RAVSA - GAPGI – ROVSU – OVBUS – TODPU - LAVNO – ILS27
EGKB	OSVEV 1G	21	GODLU – ELMIV - KW027 - KW033 - KW031 – RAVSA – GAPGI – ROVSU – OVBUS – OSVEV – FM leg 274°M
EGKB	OSVEV 1J	21	JACKO – NONVA – BABKU – KW022 – KW045 – KW024 – RAVSA - GAPGI – ROVSU – OVBUS – OSVEV – FM leg 274°M

Table 2 New RNAV Arrival Transitions

Note: all procedure names in the above tables are working names, to be confirmed by the CAA.

5.2.2 Departures

This ACP module (C) details changes to the portions of the LC RNAV SIDs to EKNIV (to the south) above 4,000ft, as listed in Table 3. The two EKNIV RNAV1 SIDs supersede the existing conventional DVR, LYD and SAM SIDs, with connectivity from EKNIV to these points provided by new airways M91 (to LYD then existing airways to SAM or elsewhere as required) and M87 (to DVR via UMTUM and L9); this connectivity if shown in Figure 5. This table also provides the location of the point below which the routes will be replicated as described in the ACP Module B. The waypoints LCN06 & LCE03 are new RNAV waypoints which delineate the point at which the replication ends (as detailed in ACP Module B). Beyond these points the EKNIV SIDs follow a new alignment as detailed in ref. LAMP_I (Detailed Procedure Design).

Procedure design compliance and flyability for the end to end procedures are also detailed in ref. LAMP_I (Detailed Procedure Design).

Procedure	Runway	Start point of replication	End point of replication	Entire procedure?	End of procedure
EKNIV 1A*	27	EGLC	LON R075 D25.5 (**LCN06**) (51 36 08.68N 000 11 18.82E)	No	EKNIV
EKNIV 1H*	09	EGLC	LON R081 D27.0 (**LCE03**) (51 33 46.90N 000 14 36.66E)	No	EKNIV

Table 3 New LCY SIDs with replication end points (*SID designators are working names)

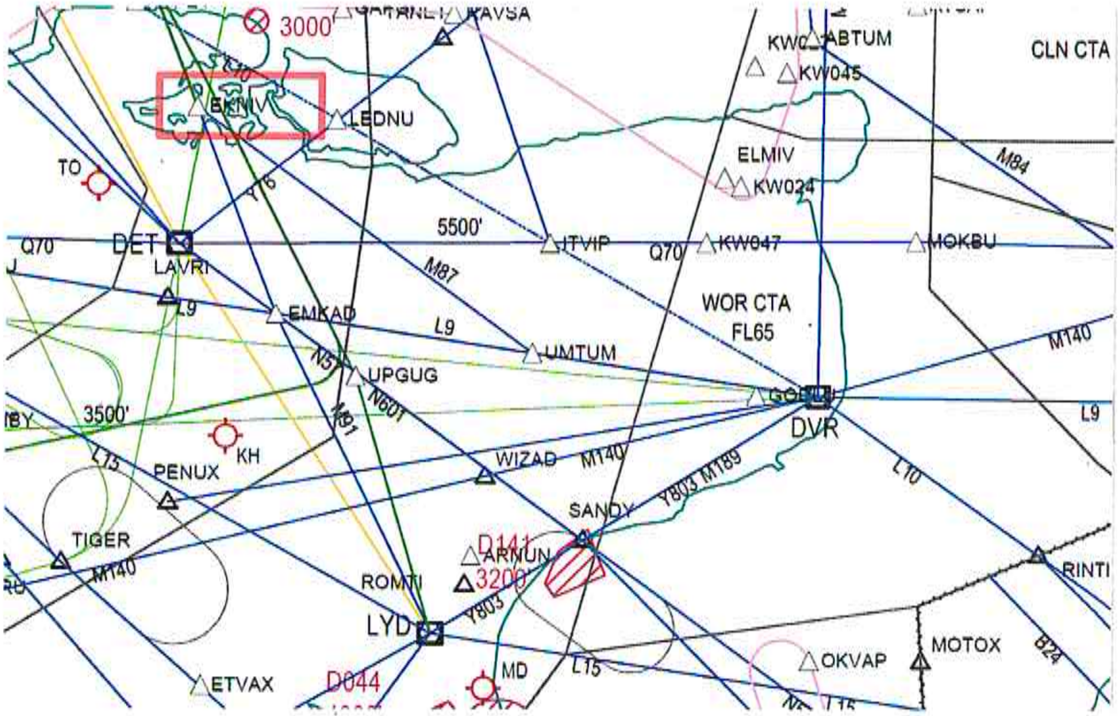

Figure 5: Airway connectivity from EKNIV

5.2.3 Controlled Airspace

Changes to the extent of controlled airspace are required over the Thames estuary. These are required to accommodate the point merge structure, and require the lowering of the CAS base in some areas. NATS has also taken the opportunity to review existing CAS and as a consequence can raise the base in another area, and also simplify boundaries in a further area. All these changes are shown in Figure 6 and Table 4 below.

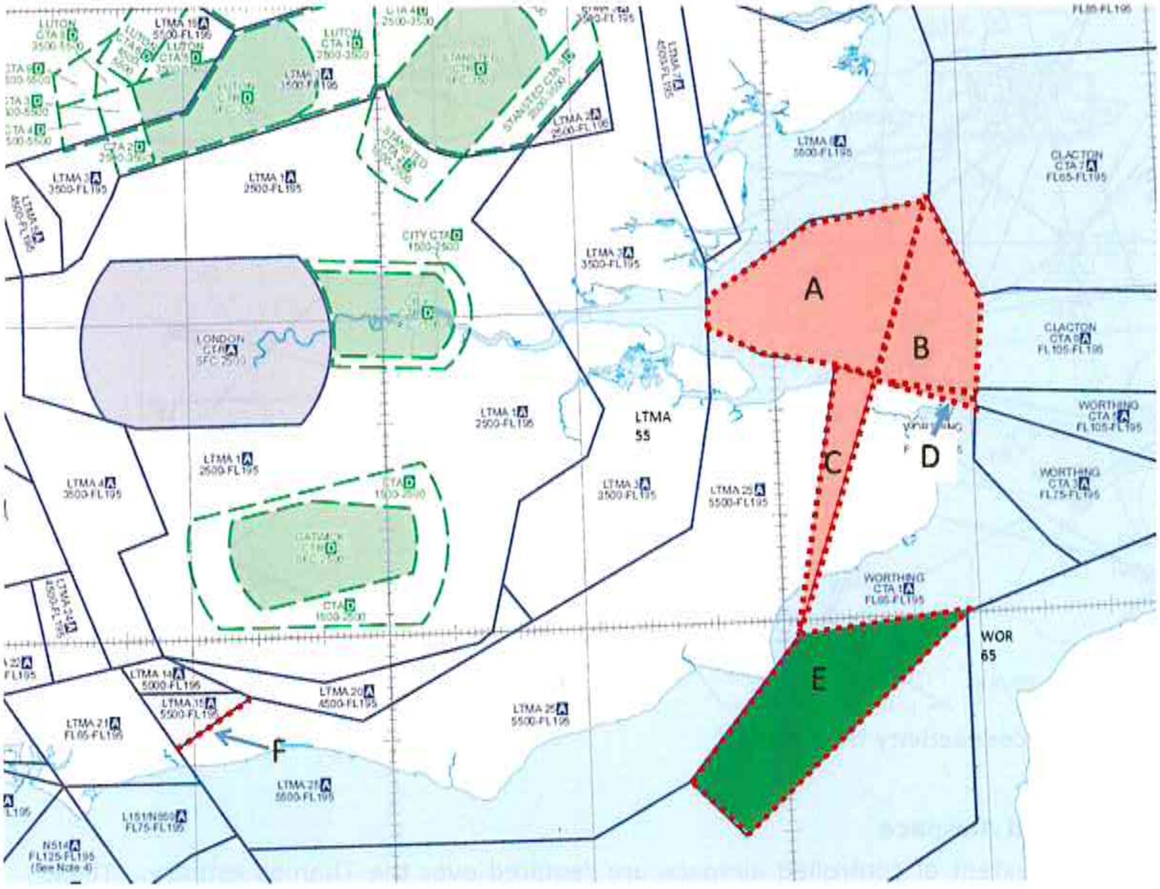

Figure 6: Proposed changes to CAS bases

Area	Current Base-Ceiling	Proposed
A	CLN CTA FL85-195	LTMA 5500ft-FL195 becomes part of LTMA 8 (lowered for PM)
B	CLN CTA FL85-195	CLN CTA FL65-FL195 (lowered for PM)
C	WOR CTA FL65-195	LTMA 5500ft-FL195 becomes part of LTMA 8 (lowered for PM)
D	WOR CTA FL85-195	WOR CTA FL65-FL195 (lowered for PM)
E	WOR CTA FL65-195	WOR CTA FL75-195 (raised)
F	Division between LTMA 15 and LTMA 25; both 5500ft –FL195	Remove LTMA 15 and combine areas LTMA 8/15/25 for simplicity (LTMA 8 also subsumes areas A & C)

Table 4 Changes to Airspace Bases

The coordinates of the areas subject to change, as listed in Table 4, are given in the draft AIP Change Request, ref LAMP_D.

5.3 Procedural Usage

Flight plans will follow the RNAV1 route structure as per the AIP definitions. Hence aircraft levels and lateral positioning will follow those promulgated in the procedures, with the exception of point merge, which requires that the "turn-in point" is dictated by ATC and hence subject to variation. This results in the inbound tracks being spread across the width of the point merge fan.

Figure 7 shows typical trajectories for the proposed airspace structure, taken from the real time simulations. Further analysis of the real time simulation data and additional plots are available in ref LAMP_E.

5.4 Tactical Usage

In practice, flights on all of the STARs will often be under tactical control. This will lead to a spread of traffic around the promulgated routes. Tactical intervention is expected to lessen as a result of RNAV, however, interaction with other flights will mean that tactical intervention on STARs will still be commonplace. Particularly in the time period before the rest of the TMA is modernised to the RNAV1 standard (LAMP Phase 2).

To maximise efficiency, flights will often be tactically vectored direct from the holding points to the merge point, as illustrated in Figure 7. Both of these potential direct flows are shown by the red arrows in Figure 7. (Note that this figure shows a limited sample from the real time simulation and therefore not all track variation is depicted, hence the enhancement with the arrows).

While Biggin Hill arrivals will flight plan via the point merge system, they may often be given direct routes from the southern hold towards Biggin; therefore covering a broad swathe as shown by the dotted red arrow over Kent. This is effectively no change from the tactical routings used today. London City flights may occasionally also be given similar direct routes; however this would not normally be expected.

The direct routes over Kent are also shown in Figure 9 which shows spot heights for a different sample of real time simulation data. The red spots over Kent signify Biggin Hill arrivals on direct routes descending through 7,000ft.

The spread of traffic around the STARs leading to the holds is demonstrated in Figure 8 and Figure 9.

Variation in aircraft speed and performance will result in a spread of flights especially in the turns as can be seen in Figure 7.

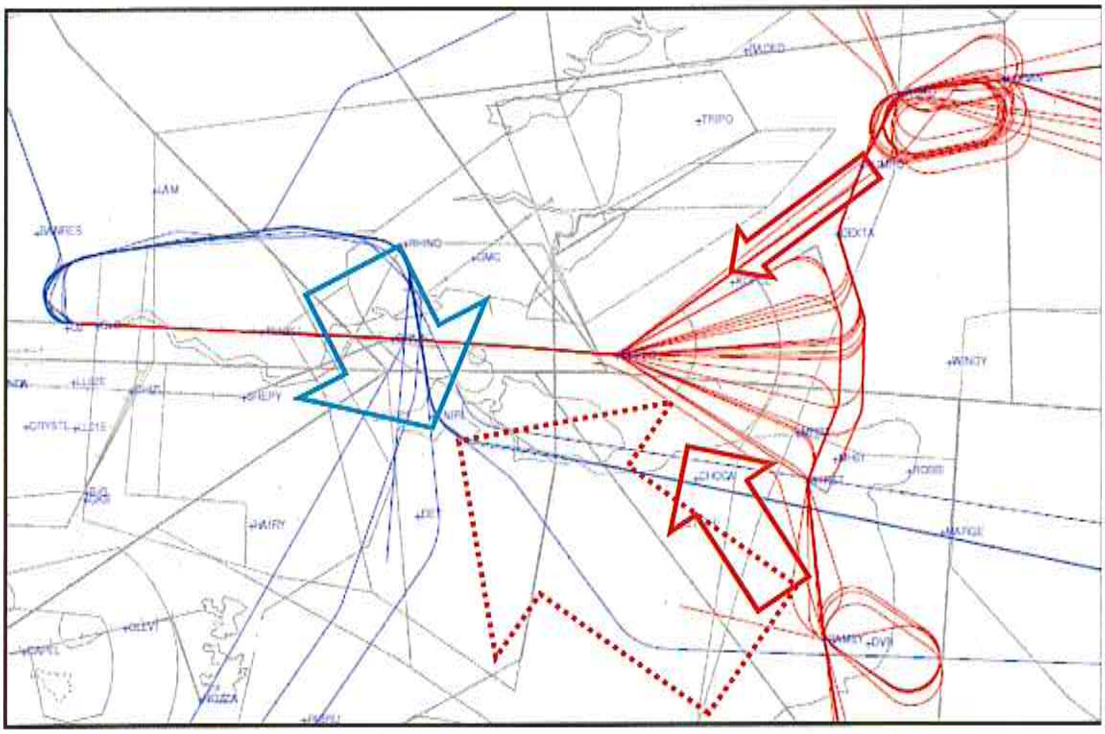

Figure 7: Typical London City & Biggin Hill trajectories from real time simulation recordings

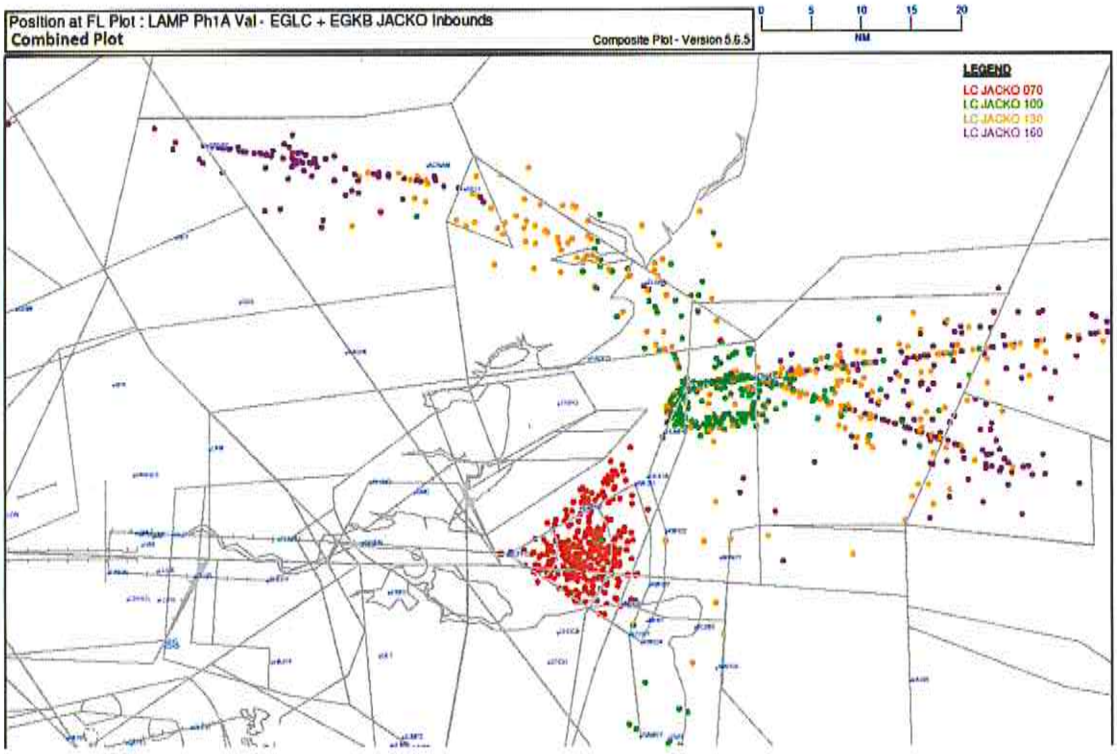

Figure 8: Spot height plots for London City and Biggin Hill arrivals via JACKO

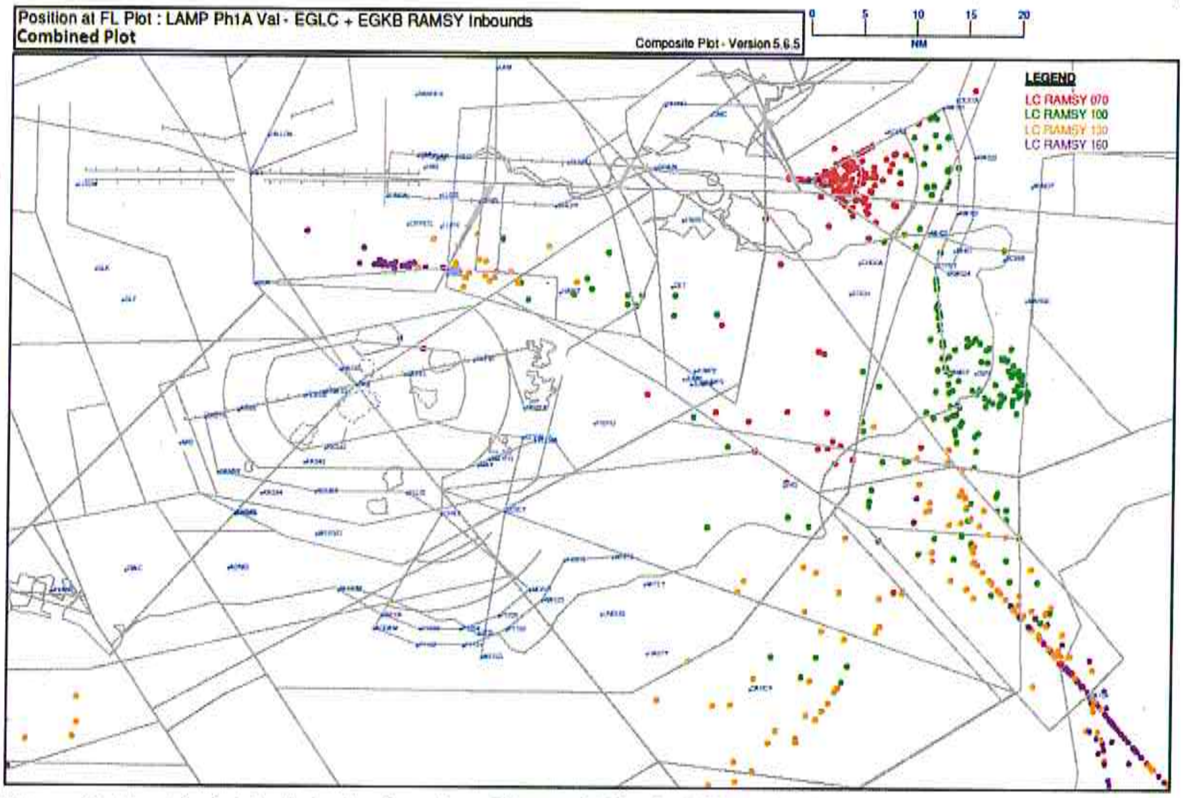

Figure 9: Spot height plots for London City and Biggin Hill arrivals via GODLU (working name RAMSY)

5.5 Non-RNAV1 capable aircraft

All aircraft operating at London City Airport must currently be RNAV5 capable. The proposed new SIDs & arrival transitions require RNAV1 capability. An RNAV1 mandate which includes London City will come into force on 9th November 2017. However since initially not all aircraft operating at the airport will be RNAV1 capable, the conventional procedures will remain available for use for those aircraft/crews that are not RNAV1 equipped/certified. ATC will be aware of traffic that is not RNAV1 capable (it will be marked on the strip, and the strips for non-RNAV1 aircraft will be placed in cream coloured holders to clearly differentiate them) and this traffic will be sequenced accordingly, using ATC vectoring.

All aircraft will be able to file RNAV5 STARs to the JACKO/GODLU holds. Any non-RNAV1 aircraft will flight plan JACKO to hold and then SPEAR – ALKIN or GODLU to hold and then DET-ALKIN. RTS experience confirms that ATC will vector the non-RNAV1 aircraft along the sequencing legs and then towards the merge point in sequence, and then vector to establish on the ILS. The aircraft will be vectored along the same tracks as the RNAV traffic (with slightly broader tolerances) and will be manually merged into the sequence of other arriving aircraft.

The PSAR (Bridging Module ref LAMP B) refers to the mix of traffic and the Real Time Simulation (see Bridging Module ref LAMP E) were conducted using a mix of RNAV & non RNAV traffic as based on current predictions. This formed the basis of the follow on HazIDs which concluded the Phase 1A operation is meets the safety acceptance criteria.

It has been assumed that additional complexity from mixed RNAV1 certification will reduce as the proportion of certified traffic increases towards 100%.

6 Impacts Summary

6.1 Units Affected by the Proposal

This proposal affects operations at London Terminal Control (NATS) and aircraft to/from London City, Biggin Hill, Gatwick and Southend airports.

The proposal is sponsored by NATS, Supported by London City and Southend airports. Gatwick Airport do not object to the proposal.

6.2 Safety Issues/Analysis

The proposed procedures have been designed in accordance with ICAO PANS-OPS RNAV procedure design criteria (ref. LAMP_I). Flyability validation of the procedures has been undertaken on representative aircraft types (ref. LAMP_J).

Full safety analysis and RDAR are provided as part of the LAMP Phase 1A bridging ACP.

6.3 Military Implications & Consultation

There are no impacts upon Military operations. The military has been consulted on the change and have no objection. See consultation record ref. 7400000038.

6.4 General Aviation Airspace Users Impact & Consultation

The introduction of RNAV SIDs and arrival transitions as detailed herein will change the CAS boundaries as described in 5.2.3, however NATS is not aware of any specific impact on GA activity other than a general reduction in the Class G available. Representatives of GA organisations were consulted via the NATMAC and have either supported or made no objection to the proposal (see ref LCY_B).

6.5 Commercial Air Transport Impact & Consultation

The benefits of RNAV SIDs and arrival transitions are recognised and supported by the airline community.

Representatives of all airlines whom operate from LCY were consulted, and have either supported or made no objection to the proposal (see ref LCY_B).

6.6 CO_2 Environmental Analysis Impact & Consultation

Analysis of the fuel/CO_2 savings and the cost benefits are given in the LAMP Phase 1 bridging ACP.

6.7 Local Environmental Impacts & Consultation

Local environmental impacts capture the predicted impacts of changes on noise, tranquillity, visual intrusion, local air quality & biodiversity.

6.7.1 Consultation

The LAMP London City network consultation commenced on 15th October 2013 and closed on 21st January 2014 – a period of 14 weeks. The consultation document (refs. LCY_A) which described the changes was sent to NATMAC stakeholders, all members of the London City Airport Consultative Committee, and representatives of all airlines which operate from the airport. The full stakeholder list is given in Appendix A of the Consultation Appendices (ref LCY_A).

Initial analysis of the responses is presented in the Network Initial Consultation Feedback Report (ref. LCY_B).

Analysis of how the design was influenced by consultation feedback is presented in the Consultation Design/Feedback Report (ref. LCY_D).

The questions and key themes which were raised during consultation are presented in section 5 & 7 of the Network Initial Consultation Feedback Report (ref. LCY_B).

A link to the feedback document was also sent by email to all those involved in the consultation.

6.7.2 Noise Impact

L_{eq} Contours: not required since all changes related to this module are above 4,000ft.

SEL Footprints: required since changes are below 7,000ft & within 25km of airport.

80dBA SEL footprint for arrivals – these have not been produced. The CAA have agreed that the "proposed corridor" (consultation swathe) diagrams (see ref LCY_A London Airspace Consultation Stakeholder Consultation Document Figures E8 & E9), can be used as an alternative to 80dBA SEL footprints[1].

L_{max} data was presented in the consultation to illustrate the maximum noise impact of a typical over-flight at various levels. E.g. consultation LAC Part F, page F31

Aircraft type	% of flights	7,000-8,000ft	11,000-12,000ft	15,000-16,000ft
Typical Departure E190/E170[28]	29.1	56 dBA	<55dBA	<55dBA
Noisiest Departure A318	1.5	58-59dBA	56dBA	<55dBA

Table F5: Typical Noise (L_{max}) at various heights[29]

[1] Ref. A Green, H Howells, 16 May 2012

6.7.3 Tranquillity

It is appreciated that the AONBs beneath the areas being considered are tranquil areas. The Kent Downs and High Weald AONBs are beneath the current or proposed traffic flows. The best indication of impact on tranquillity in these areas is by reference to the noise impacts referenced in section 6.7.2 above. It should be stressed that the noise impact results for flights at typical altitudes were less than 59dBA Lmax . Background noise levels would typically be between 30 and 40dBA. The detectability of over-flying aircraft will depend on a number of factors including background noise levels, wind, precipitation, humidity, cloud cover and the hearing and visual acuity of the observer.

6.7.4 Visual intrusion

Under current arrangements aircraft will already be visible from most locations beneath the proposed airspace.

Visual sighting of an aircraft will depend on a number of factors such as slant range of the aircraft, visibility and cloud cover, contrast against background and individual visual acuity. It will also depend on the type of activity in which the observer is engaged and whether the sighting is cued, either by detection of previous aircraft flying the same route, or by aircraft noise. The probability of visual sighting will be increased if an aircraft forms a contrail but it should be noted that meteorological conditions necessary for contrail formation (cold and humid air) rarely occur below 25,000 feet, so would not occur at the altitudes under consideration here.

Analysis completed using meteorological data indicates that approximately 25% of the time it would not be possible to achieve a visual sighting of aircraft at 4,000ft or above in this region due to cloud, mist, fog or haze.

6.7.5 Local Air Quality

Due to atmospheric mixing, aircraft emissions at altitudes above 1,000ft above ground level do not have significant impact on the air quality at ground level[2]. The altitude of the changes proposed are all above 4,000ft. Hence no assessment of local air quality has been performed for this proposed change.

6.7.6 Biodiversity

There will be no affect on flora and fauna.

6.8 Economic Impact

London City Airport is not aware of any established methodology that is widely accepted as providing a complete and robust economic valuation of the environmental impacts of changes to airspace structure. Furthermore, London City Airport does not base the case for change on an economic valuation of environmental impact and therefore does not propose to attempt to provide or develop such analysis.

[2] ICAO Airport Air Quality Manual states that: "Differences to emissions above 1000ft AGL will have little impact on changes in ground-level concentrations."

7 Analysis of Options

Various options have been considered throughout the design stage of the project. The design as presented in section 5, is the chosen option. The proposed detailed procedure design, draft charts and RNAV coding tables for the SIDs, STARs & Transitions are given in ref LAMP_I. All other options listed below were considered but discounted.

7.1 Do Nothing

The option to "do nothing" and maintain the current conventional SIDs & arrival transitions would work in the short term. However doing nothing would not allow the improvements as described in section 3 (Justification), and would not fulfil the mandate for the introduction of RNAV procedures, which has to be complied with by 2019.

Therefore, to enable a benefit now and to comply with the upcoming regulatory mandate, the do nothing option has been discounted.

7.2 Different RNAV Coding Permutations

In designing the replications there were several different permutations of RNAV coding which could have been used. Three different options for coding were discussed with CAA Procedure Design regulators at the Framework Briefing. It was agreed that of these the ARINC 424 "Direct to Fix" (DF) coding was the best fit for replication of the first turn after take-off for the London City SIDs and this fulfilled all requirements for replication. Hence the proposed SIDs use the ARINC 424 DF waypoint type for the waypoint on the exit of the first turn.

The two other options considered were procedures based on using ARINC 424

- "Fly Over + Course to Fix" (FO CF) waypoints, and
- "Fly over + course to fix/track to fix" (FO CF/TF) waypoints.

8 Airspace Description Requirement

CAP 725, Appendix A Paragraph 5, provides a list of requirements for a proposed airspace description. These are listed below:

	CAA CAP725, Appendix A paragraph 5 Requirement. "The proposal should provide a full description of the proposed change including the following:"	**Description for this Proposal**
a	The type of route or structure; e.g. Airway, UAR, Conditional Route, Advisory Route, CTR, SIDs/STARs, Holding Patterns, etc;	See Section 5
b	The hours of operation of the airspace and any seasonal variations;	The proposed routes will be available H24, 365 days of the year.
c	Interaction with domestic and international en-route structures, TMAs or CTAs with an explanation of how connectivity is to be achieved. Connectivity to aerodromes not connected to CAS should be covered;	See Section 5 and ref LAMP_I (Procedure Design and Draft Charts)
d	Airspace buffer requirements (if any);	The D138 complex is designated for Live Firing/Unmanned Aircraft Operations. As such there are no buffer requirements; aircraft may fly in the airspace adjacent to the active Danger Area. There is currently an overlap of CAS and the Danger Area. The proposed lowered base of Class A airspace as described in Section 5.2.3 (area A) will increase the overlap but this will be managed through the same procedures that are in place today i.e. Controllers will receive a strip to alert them to DA activity and will radar monitor to ensure the DA is not infringed. The centre-line of the point merge structure transitions (i.e. ODLEG 1G transition) is 1.43nm from the D138 boundary at the closest point.
e	Supporting information on traffic data including statistics and forecasts for the various categories of aircraft movements (Passenger, Freight, Test and Training, Aero Club, Other) and Terminal Passenger numbers;	See the Bridging ACP section 4.2.
f	Analysis of the impact of the traffic mix on complexity and workload of operations;	Impact of mix of RNAV1 & non-RNAV 1 capable aircraft, described in section 5.5
g	Evidence of relevant draft Letters of Agreement, including any arising out of consultation and/or Airspace Management requirements;	No LoAs are affected.
h	Evidence that the Airspace Design is compliant with ICAO Standards and Recommended Practices (SARPs) and any other UK Policy or filed differences, and UK policy on the Flexible Use of Airspace (or evidence of mitigation where it is not);	See ref LAMP_I.

i	The proposed airspace classification with justification for that classification;	Proposal to lower CAS as described in section 5.2.3 (i.e. reclassification of some airspace from Class G to Class A)
j	Demonstration of commitment to provide airspace users equitable access to the airspace as per the classification and where necessary indicate resources to be applied or a commitment to provide them in-line with forecast traffic growth. 'Management by exclusion' would not be acceptable;	The changes to airspace classification are detailed in section 5.2.3 Access to the airspace will be granted equitably to any users, providing they meet the requirements of the airspace classification.
k	Details of and justification for any delegation of ATS.	n/a

9 Operational Impact

CAA CAP725, Appendix A Paragraph 7, provides a list of requirements for operational impact. These are listed below:

	CAA CAP725, Appendix A paragraph 7 requirements. "An analysis of the impact of the change on all airspace users, airfields and traffic levels must be provided, and include an outline concept of operations describing how operations within the new airspace will be managed. Specifically, consideration should be given to:"	**Evidence of Compliance/Proposed Mitigation**
a	Impact on IFR General Air Traffic and Operational Air Traffic or on VFR General Aviation (GA) traffic flow in or through the area;	See Section 6.4
b	Impact on VFR operations (including VFR Routes where applicable);	No impact (see Section 6.4)
c	Consequential effects on procedures and capacity, i.e. on SIDs, STARs, and/or holding patterns. Details of existing or planned routes and holds;	See Section 5
d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace;	The new SIDs and STARs have no impact on airport operations other to provide a higher level structure for delivering aircraft to the airports and in the case of the London City SIDs for departing aircraft (see section 5)
e	Any flight planning restrictions and/or route requirements.	See Section 5

10 Supporting Infrastructure & Resources

CAA CAP725, Appendix A Paragraph 6, provides a list of requirements for supporting infrastructure/resources. These are listed below:

	CAA CAP725, Appendix A Paragraph 6, general Requirements	**Evidence of Compliance/Proposed Mitigation**
a	Evidence to support RNAV and conventional navigation as appropriate with details of planned availability and contingency procedures.	A full report of Nav coverage is provided in Bridging Module ref LAMP F.1. This demonstrates more than adequate excessive redundancy for RNAV DME/ DME coverage in the airspace in question above 3500ft. The existing conventional SIDs will remain available to support non-RNAV equipped aircraft, until the RNAV mandate comes into force.
b	Evidence to support primary and secondary surveillance radar (SSR) with details of planned availability and contingency procedures.	A full report of radar coverage is provided in Bridging Module ref LAMP F.2. This demonstrates coverage redundancy: above 6000ft the airspace in question is covered by 5 or more SSR and PSR sensors. Radar coverage availability is planned to be 100%. Contingency is as extant, with multiple redundancy of sensors providing adequate contingency.
c	Evidence of communications infrastructure including R/T coverage, with availability and contingency procedures.	A full report of communications coverage is provided in Bridging Module ref LAMP F.3. Comms coverage in the new airspace (lowered bases) is sufficient above 5000ft. Contingency is as extant and is as described in the communication coverage report (e.g. a contingency channel is provided for each primary channel).
d	The effects of failure of equipment, procedures and/or personnel with respect to the overall management of the airspace must be considered.	The proposed flight procedures are contained within ATC sectors where appropriate contingency procedures already exist and are well proven.
e	The Proposal must provide effective responses to the failure modes that will enable the functions associated with airspace to be carried out including details of navigation aid coverage, unit personnel levels, separation standards and the design of the airspace in respect of existing international standards or guidance material.	The proposed flight procedures are contained within ATC sectors where appropriate contingency procedures already exist and are well proven. Evidence of Navaid coverage is as described in (a) above. Personnel levels and separation standards are as extant. Design of procedures and airspace are in accordance with CAP778 and PANS-OPS (see Bridging Module ref LAMP I).
f	A clear statement on SSR code assignment requirements is also required.	No changes to the extant methods of SSR code allocation to traffic using the proposed procedures are required.
g	Evidence of sufficient numbers of suitably qualified staff required to provide air traffic services following the implementation of a change.	The introduction of RNAV1 procedures will not require any changes to staffing requirements.

11 Airspace & Infrastructure Requirements

CAA CAP725, Appendix A Paragraphs 11-14, provides a list of requirements for airspace and infrastructure. These are listed below:

	CAA CAP725, Appendix A paragraph 11: General Requirements	**Evidence of Compliance/Proposed Mitigation**
a	The airspace structure must be of sufficient dimensions with regard to expected aircraft navigation performance and manoeuvrability to fully contain horizontal and vertical flight activity in both radar and non-radar environments;.	CAS is being extended as described in section 5.2.3
b	Where an additional airspace structure is required for radar control purposes, the dimensions shall be such that radar control manoeuvres can be contained within the structure, allowing a safety buffer. This safety buffer shall be in accordance with agreed parameters as set down in DAP Policy Statement 'Safety Buffer Policy for Airspace Design Purposes Segregated Airspace';	Not applicable.
c	The Air Traffic Management (ATM) system must be adequate to ensure that prescribed separation can be maintained between aircraft within the airspace structure and safe management of interfaces with other airspace structures;	The proposed LCY RNAV replication environment will be managed much the same as the airspace is managed today. ATC will monitor separations as per today, and better track keeping will help ensure separations are maintained.
d	Air Traffic Control (ATC) procedures are in place to ensure required separation between traffic inside a new airspace structure and traffic within existing adjacent or other new airspace structures;	See section 5.2.
e	Within the constraints of safety and efficiency, the airspace classification should permit access to as many classes of user as practicable;	There are no proposed changes to airspace classification or access
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation.	The new CAS boundaries will be published in the UK AIP. Promulgation will be 2 AIRAC cycles for the AIP. The changes will be incorporated into the VFR maps when they are updated by the CAA.
g	Pilots shall be notified of any failure of navigational facilities and of any suitable alternative facilities available and the method of identifying failure and notification should be specified;	Failure of navigational facilities will be promulgated by NOTAM and ATC will provide navigational assistance using radar when necessary.
h	The notification of the implementation of new airspace structures or withdrawal of redundant airspace structures shall be adequate to allow interested parties sufficient time to comply with user requirements. This is normally done through the AIRAC cycle;	Changes will be published via the normal AIRAC cycles. Two AIRAC cycle notice will be given.
i	There must be sufficient R/T coverage to support the ATM system within the totality of proposed controlled airspace.	R/T coverage is demonstrably adequate for the task.

j	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered;	LoAs will be reviewed and may require to be changed. See section 6 for affected units & LoAs.
k	Should there be any other aviation activity (low flying, gliding, parachuting, microlight site, etc.) in the vicinity of the new airspace structure and no suitable operating agreements or ATC Procedures can be devised, the Change Sponsor shall act to resolve any conflicting interests;	n/a

	CAA CAP725, Appendix A paragraph 12: ATS Route Requirements	**Evidence of Compliance/Proposed Mitigation**
a	There must be sufficient accurate navigational guidance based on in-line VOR/DME or NDB or by approved RNAV derived sources, to contain the aircraft within the route to the published RNP value in accordance with ICAO/EuroControl Standards;	The proposed procedures, airways, SIDs STARs & transitions are contained within airspace populated with numerous routes where navigation coverage is more than adequate with multiple redundancy of RNAV derived sources (see Bridging Module ref LAMP F.1) and the navaid system is demonstrably apposite for the task.
b	Where ATS routes adjoin Terminal Airspace there shall be suitable link routes as necessary for the ATM task;	See section 5.2.
c	All new routes should be designed to accommodate P-RNAV navigational requirements.	The proposed procedures are specifically designed for RNAV use.

	CAA CAP725, Appendix A paragraph 13: Terminal Airspace Requirements	**Evidence of Compliance/Proposed Mitigation**
a	The airspace structure shall be of sufficient dimensions to contain appropriate procedures, holding patterns and their associated protected areas;	CAS amendments are described in Section 5.2.3; these provide sufficient containment for the proposed procedures where existing airspace is not sufficient. See Section 5 and refs LAMP_I & LAMP_D.
b	There shall be effective integration of departure and arrival routes associated with the airspace structure and linking to designated runways and published IAPs;	See Section 5 and refs LAMP_I & LAMP_D.
c	Where possible, there shall be suitable linking routes between the proposed terminal airspace and existing en-route airspace structure;	See Section 5 and refs LAMP_I & LAMP_D.
d	The airspace structure shall be designed to ensure that adequate and appropriate terrain clearance can be readily applied within and adjacent to the proposed airspace;	See Section 5 and refs LAMP_I & LAMP_D.

e	Suitable arrangements for the control of all classes of aircraft (including transits) operating within or adjacent to the airspace in question, in all meteorological conditions and under all flight rules, shall be in place or will be put into effect by Change Sponsors upon implementation of the change in question (if these do not already exist);.	See Section 5
f	Change Sponsors shall ensure that sufficient VRPs are established within or adjacent to the subject airspace to facilitate the effective integration of VFR arrivals, departures and transits of the airspace with IFR traffic;	Not applicable
g	There shall be suitable availability of radar control facilities;	No change to extant availability
h	Change Sponsors shall, upon implementation of any airspace change, devise the means of gathering (if these do not already exist) and of maintaining statistics on the number of aircraft transiting the airspace in question. Similarly, Change Sponsors shall maintain records on the numbers of aircraft refused permission to transit the airspace in question, and the reasons why. Change Sponsors should note that such records would enable ATS Managers to plan staffing requirements necessary to effectively manage the airspace under their control;	No change to extant monitoring methods (UKFDB) or traffic levels expected as a consequence of this proposal.
i	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure.	Implementation of RNAV arrivals will give pilots improved capability to execute CDAs with more accuracy.

	CAA CAP725, Appendix A paragraph 14: Off Route Airspace Requirements	**Evidence of Compliance/Proposed Mitigation**
	There are no proposed changes to off route airspace structures.	

12 Appendices

Appendix A: Proposed Amendments to the AIP - See ref LAMP_D