| | |
|---|---|
| **Title of Airspace Change Proposal** | **London City Replications – Module B of London Airspace Management Programme (LAMP) Phase 1A** |
| **Change Sponsor** | **London City Airport Ltd** |
| **SARG Project Leader** | [redacted] |
| **Case Study commencement date** | **17 Feb 2015** |
| **Case Study report as at** | **28 July 2015** |
| **Report Reference** | **SARG/ERCD/AG/London City Replications LAMPV1.7** |

## Instructions

In providing a response for each question, please ensure that the 'Status' column is completed using the following options:

- **Yes**
- **No**
- **Partially**
- **N/A**

To aid the SARG Project Leader's efficient Project Management it may be useful that each question is also highlighted accordingly to illustrate what is resolved ( Green ), **not resolved** ( Amber ) or **not compliant** ( Red ) as part of the SARG Project Leader's efficient project management.

## 1. Introduction

This report describes the environmental considerations relevant to London City Airport's proposal to introduce RNAV arrival and departure procedures that replicate existing conventional procedures at the airport.

The objective of these changes is to introduce "RNAV Replications" of the current conventional procedures i.e. RNAV Standard Instrument Departures (SIDs) which replicate the current conventional SIDs, and arrival transitions which replicate the current concentration of arrival flight paths

The Airspace Change Proposal (ACP) has been submitted by London City Airport and it forms Module B of Phase 1A of the London Airspace Management Programme (LAMP).

This assessment is based upon information presented in the proposal document entitled "LAMP Phase 1A, Airspace Change Proposal – Module B, London City Airport RNAV Replications" (Issue 1.0, February 2015), plus associated consultation material and subsequent information received (from either the sponsor or NATS) as the result of queries raised with the sponsor following submission of the ACP.

## 2. Guidance to the CAA

| | | Status |
|---|---|---|
| 2.1 | **Is the proposal consistent with Government policy and/or guidance from Government to the CAA?** | Yes |

Guidance issued to the Civil Aviation Authority sets[1] out a framework for the environmental objectives that the CAA must consider when assessing airspace change proposals. In addition to these objectives, there may be other legitimate operational objectives, such as the overriding need to maintain an acceptable level of air safety, the desire for sustainable development or to enhance the overall efficiency of the UK airspace network, which need to be considered alongside these environmental objectives. The Government looks to the CAA to determine the most appropriate balance between these competing characteristics.

Flights over National Parks and AONBs are not prohibited by legislation[2] as a general prohibition against over-flights would be impractical. Government policy focuses on minimising the over-flight of more densely populated areas below 7,000 feet (amsl), but balances this with $CO_2$

[1] DfT, Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, January 2014

[2] National Parks and Access to the Countryside Act 1949, National Parks (Scotland) Act 2000, and "Duties on relevant authorities to have regard to the purposes of National Parks, Areas of Outstanding Natural Beauty (AONBs) and the Norfolk and Suffolk Broads Guidance Note", Defra 2005.

emissions between 4,000 and 7,000 feet (amsl). However, where it is practical to avoid over-flight of National Parks and AONBs below 7,000 feet (amsl), the Guidance asks that the CAA encourages this.

| 3. | Rationale for the Proposed Change | Status |
|---|---|---|
| 3.1 | **Does the rationale for the ACP include environmental reasons?** | Yes |

The sponsor sets out two reasons for the proposal, the second of which includes expected environmental benefits.

1. To replicate all the existing conventional routes with equivalent RNAV routes rather than designing new ones. The aim of replication is to match the existing conventional routes as closely as possible whilst in line with regulatory guidance and within the rules of what is allowed for RNAV routes. Approximately 70% of aircraft currently flying from London City Airport are equipped to fly RNAV routes; the remainder still rely on conventional navigation. Therefore the conventional routes will be retained for use alongside the proposed RNAV replications, until such time as RNAV1 is fully adopted, after which the conventional routes will be removed. There will be a transitional period to 2017 where the remaining airlines progressively adopt full RNAV1 operations with the aim that conventional procedures will be withdrawn by November 2019.

2. To enable connectivity with the RNAV route structure as proposed in the London Airspace Management Programme (LAMP) Phase 1 Airspace Change Proposal which NATS has submitted to the CAA concurrently with this proposal. The sponsor anticipates that end to end RNAV1 connectivity between the enroute network and the arrival and departure routes at the airport will enable the Air Traffic Control (ATC) network to operate more efficiently. As a result, the sponsor expects there to be environmental benefits achieved by enabling departures from London City to climb higher earlier, and repositioning higher level arrival routes to the airport over the Thames Estuary. As a result the combined LAMP proposal is expected to reduce both the $CO_2$ impact of each affected flight at the airport, and also the noise impact by reducing the time aircraft spend at 3,000-4,000 feet over parts of East London, Kent and Essex. The sponsor states that these anticipated benefits cannot be achieved without this proposal (Module B) to replicate the low level routes for London City Airport.

| 4. | Nature of the Proposed Change | Status |
|---|---|---|
| 4.1 | **Is it clear how the proposed change will operate, and therefore what the likely environmental impacts will be?** | Yes |

This proposal is intended to introduce RNAV1 replications of all SIDs and two RNAV arrival procedures at London City Airport. The aim is to introduce RNAV1 replications of the low altitude (i.e. below 4,000 feet) portions of the existing conventional London City SIDs and approach transitions to both runways. The EKNIV RNAV SIDs replicate and supersede the DVR and LYD conventional SIDs – the remaining SIDs (CLN, BPK and CPT) are replicated by individual SIDs.

Whilst the proposed change focuses on procedures below 4,000 feet, the consultation explained that "we are covering replication of departure routes to the north & north east above 4,000 feet in this consultation because these routes are outside the area currently being considered by NATS." In addition, the consultation covered Biggin Hill arrival routes where they are coincident with arrival routes for London City.

Since the changes proposed are replications of the existing conventional procedures, no changes to the classification or extent of controlled airspace are required.

The CAA's policy statement on Performance Based Navigation (PBN) SID replications defines a "replication" as – "The design of an RNAV or RNP procedure that follows the path over the ground of the nominal track of the existing conventional procedure as closely as possible. Note: it is the path over the ground of the designed conventional procedure and not the nominal centreline of the associated NPR or the current traffic concentration." In this respect, the sponsor confirms in its consultation document that "the CAA's emphasis for replication is on reproducing the design of the conventional route. With careful design it is possible to do this and to *also* match closely the current trajectories flown by the majority of flights; this is what we have sought to do for departures." Similarly the sponsor states "For arrivals there is currently no formal route to replicate. We have therefore agreed with the CAA that a replication is an RNAV defined route that matches the current concentration of flights seen in today's airspace."

Whether or not the proposed RNAV SIDs constitute valid replications in line with the CAA policy statement is an operational matter, and is addressed in the operational report for this ACP.

Section 6.7 of the sponsor's proposal document states that because the environmental impacts are "not expected to be significant, and in accordance with the CAA's policy on replication no analysis has been undertaken". The CAA policy statement on replications[2] sets out a number of requirements under Section 10, notably paragraphs 10.3 to 10.6 which are set out below:

> 10.3 Analysis of a PBN replication should normally consist of track, fleet and NPR assessments. This is deemed to meet the requirements for environmental assessment of CAP725.
>
> • The **track analysis** considers the degree of correlation between the centrelines of the PBN replication SID and the conventional SID.

[2] CAA Policy Statement "Guidance on PBN SID Replication for Conventional SID Replacement", dated 6 September 2013.

• The **fleet analysis** considers the forecast change in the concentration in traffic actually flown on the new PBN replication SID. This should consider both horizontal and vertical profiles.

• The **NPR analysis** considers the relationship between the established NPR (both centreline and swathe) for the centrelines of both the conventional SID and the PBN replication SID.

10.4 Density plots using representative periods of aircraft tracks will be required in order to portray existing and expected air traffic patterns and distribution. These density plots will also include the SIDs (existing conventional and new PBN replication) plus the NPR (centreline and swathe). If changes to the NPR are proposed, these must also be portrayed.

10.5 Vertical profiles of SIDs must also be considered and compared.

10.6 Where SID replications are within the spread of existing traffic and within the existing NPR swathe this will normally provide sufficient information to satisfy the core regulatory requirements for analysis and consultation for relatively simple SID replications. A minority of more complicated replications may require additional analysis and consultation.

For each of these requirements, the sponsor has addressed them as follows:

**Track Analysis**
The proposal cross-refers to the diagrams produced as part of the consultation material (Figures B1-B10 of Appendix B of the consultation). In addition, a summary diagram that compared conventional SIDs (magenta on the diagram) with RNAV SIDs (blue on the diagram) was provided with the submission. [NB This summary diagram does not include an illustration of the conventional 27 CLN SID.]

**Fleet Analysis**
The proposal cross-refers to the diagrams produced as part of the consultation material (Section 5.4 plus Figures 5-25).

**NPR Analysis**
Not applicable as London City Airport does not have any Noise Preferential Routes (NPRs).

**Density Plots**
The proposal cross-refers to the diagrams produced as part of the consultation material (Section 5.4 plus Figures 5-25).

**Vertical Profiles**

NATS on behalf of the sponsor advises that:

- "There is no change to the altitude restrictions on the replicated SIDs; they are in identical positions to the conventional SIDs."
- "Procedurally the profiles of the RNAV replication portions of the SIDs are the same as the conventional, however, the removal of the Stansted, Luton and Detling flows to DET (Modules A and D) and the new EKNIV SIDs will enable quicker tactical climb than is possible today on the SIDs heading south. We are not able to quantify this given its tactical basis but see Module C for a qualitative description."
- "Note also that the vertical profiles of the arrivals are expected to be improved from the tactical situation today which generates airborne delay for aircraft at around 4,000 feet. We are not able to quantify this given its tactical basis but for a qualitative description see Module C which describes the existing tactical control, and the proposed point merge structure."

| 4.2 | **Have alternative options been considered, and have the environmental impact of each alternative been assessed?** | Partially |
|---|---|---|

Three options were considered – Do Nothing plus two different coding options for the RNAV procedures.

**Do Nothing**

The option to "do nothing" and maintain the current conventional SIDs and arrival transitions would work in the short term. However, doing nothing would not enable the improvements set out in Section 3 above, 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 was discounted by the sponsor.

**Different RNAV Coding Options**

In designing the replications different permutations of RNAV coding were explored by the sponsor. Three different options for coding were considered and of these the "Direct to Fix" (DF) coding was selected as 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 DF waypoint type for the waypoint on the exit of the first turn.

The two other options considered were procedures based on using

- "Fly Over + Course to Fix" (FO CF) waypoints, and
- "Fly Over + Course to Fix/Track to Fix" (FO CF/TF) waypoints.

There are no statements from the sponsor that environmental factors were considered (other than the rationale for discounting the Do Nothing option – namely that it would not deliver environmental benefits). However, in choosing an option that best replicates the conventional procedures it should ensure that the key aim of replication is achieved and that any changes to environmental impacts are minimised.

| 5. | Noise | Status |
|---|---|---|
| 5.1 | **Has the noise impact been adequately assessed?** | Yes |

The proposal states "Since the proposed change is to replicate as closely as possible the existing routes, the impact on noise, tranquillity, visual intrusion is not expected to be significant, and in accordance with the CAA's policy on replication no analysis of these has been undertaken."

This is explained further in the sponsor's Consultation Feedback Report (paragraphs 4.25 & 4.26), which sets out why the airport's 57 dBA $L_{eq}$ noise contour would be unaffected by the proposed introduction of RNAV replicated procedures.

In both respects, the noise impacts have been adequately assessed, namely:

- The degree of assessment is in line with and satisfies the requirements of the CAA's PBN Replication policy;
- The proposed changes are very unlikely to affect the airport's $L_{eq}$ noise contours.

| 5.2 | **Has the noise impact been adequately presented in the consultation and the submitted proposal?** | Yes |
|---|---|---|

Whilst not quantitatively assessing the noise impact, the consultation provides confirmation that the use of RNAV technology for the departure and arrival routes will ultimately lead to a greater concentration of traffic over time, which will mean some people being overflown more often but also some people being overflown less often. As examples, the consultation states that:

- RNAV technology will lead to "an improved noise environment for the majority of people in the area."
- "Improved track keeping means that there will be less dispersion of aircraft either side of each of the routes; this would mean a reduction in the overall area regularly overflown, but an increase in the concentration of over-flights in some areas."

- "Once above 4,000 feet aircraft are often tactically vectored by ATC. This means that they are instructed by ATC to leave the SID, and hence above 4,000 feet the flight paths may be more dispersed; this is particularly the case for routes to the North East. For the other departure routes and the arrival routes we expect the application of RNAV to mean that aircraft will generally conform to the RNAV routes."

The concentration of traffic that results from using RNAV technology is in line with current Government policy which seeks to minimise the number of people overflown – though whilst it is true that some people that are currently overflown may experience fewer overflights, such concentration may also mean that some people (those most directly beneath the route) experience an increase in overflights.

In order to portray the current and anticipated traffic patterns and numbers of aircraft, the sponsor included track density diagrams and data on flight numbers in the consultation (Section 5.4). These show an expectation for traffic patterns to become more concentrated, particularly around any first turns for departures, but for the RNAV routes to generally result in traffic patterns that match the current traffic patterns. These illustrations of anticipated impact provide readers with an understanding of where aircraft will be expected to fly and the number of flights.

**Aircraft above 4,000 feet**

Whilst the majority of this Module relates to traffic below 4,000 feet as noted in Section 4.1 above, on the departure routes to the north and north-east, this Module encompasses traffic above 4,000 feet. These routes are:

- SIDs BPK 5T & 5U
- SIDs CPT 6T & 6U
- SIDs CLN 7T & 7U

For these routes, the consultation states that from the height at which ATC can tactically vector aircraft off the SID (4,000 feet), that the replication of the SID from that point is a technical exercise and will not have a significant change to either track positioning or concentration. The sponsor has not attempted to quantify changes above 4,000 feet as it is difficult to determine in a quantifiable manner to what extent tactical vectoring may change. However, from the impacts seen in other Airspace Changes that have replicated conventional SIDs with RNAV SIDs, RNAV may lead to a concentration of traffic up to 4,000 feet and this itself may have an effect on the concentration of tracks above 4,000 feet by changing the distribution of flights just prior to vectoring. Regardless of any change in positioning or concentration, what we can conclude is that any changes in aircraft flight tracks above 4,000 feet will be at sufficiently low levels of noise exposure and that changes

would be sufficiently limited such that any changes in the level of distribution of noise exposure would not be significant even if they are perceptible.

| 6. | Emissions | Status |
|---|---|---|
| 6.1 | **Has the impact on $CO_2$ emissions been adequately assessed?** | Yes |

As this Module largely reflects the replication of procedures below 4,000 feet, with no anticipated changes to track mileage or vertical profile, then there is no expected impact upon either fuel burn or $CO_2$ emissions. However, the proposal makes it clear that this Module is an "enabler" for the changes in Module C (which does have an expected $CO_2$ benefit) and the combined impacts that arise from all of the LAMP 1A Modules.

A summary of the impacts on $CO_2$ emissions from the LAMP Phase 1A Modules is attached at Appendix 1.

| 6.2 | **Has the impact on $CO_2$ emissions impact been adequately presented in the consultation and the submitted proposal?** | Yes |
|---|---|---|

In the consultation document the sponsor makes the following statement – "This proposal is to replicate existing conventional routes with RNAV alternatives in line with upcoming European Legislative requirements. In accordance with the CAA policy for RNAV replication, London City Airport is not required to undertake assessment of local air quality, $CO_2$ or noise contours. This is because the effect associated with these potential impacts is expected to be small as a consequence of the objective to replicate rather than change the existing routes." On the basis that these routes are RNAV replications, it is reasonable for the sponsor to have adopted this approach and omitted an assessment of $CO_2$ for this Module. The sponsor is correct to identify that the CAA policy is based upon the expectation that replication is unlikely to result in significant environmental impacts because the degree of change to aircraft currently using conventional procedures should be minor.

| 7. | Local Air Quality | Status |
|---|---|---|
| 7.1 | **Has the impact on Local Air Quality been adequately assessed?** | Yes |

As this Module largely reflects the replication of procedures below 4,000 feet, with no anticipated changes to track mileage or vertical profile below 1,000ft, and no anticipated increase in traffic as a direct result of the proposed change, then there is no expected impact upon Local Air Quality.

| 7.2 | **Has the impact on Local Air Quality been adequately presented in the consultation and the submitted proposal?** | Yes |
|---|---|---|

In the consultation document the sponsor makes the following statement – "This proposal is to replicate existing conventional routes with RNAV alternatives in line with upcoming European Legislative requirements. In accordance with the CAA policy for RNAV replication, London City Airport is not required to undertake assessment of local air quality, $CO_2$ or noise contours. This is because the effect associated with these potential impacts is expected to be small as a consequence of the objective to replicate rather than change the existing routes." On the basis that these routes are RNAV replications, it is reasonable for the sponsor to have adopted this approach and omitted an assessment of LAQ for this Module. The sponsor is correct to identify that the CAA policy is based upon the expectation that replication is unlikely to result in significant environmental impacts because the degree of change to aircraft currently using conventional procedures should be minor.

The proposal does state that there will be no impact upon Local Air Quality, though does not explain why. However, for the reasons outlined in 7.1 above, it is evident why there is no expected impact on LAQ.

| 8. | Tranquillity | Status |
|---|---|---|
| 8.1 | **Has the impact on tranquility been adequately considered?** | Yes |

The proposal states "Since the proposed change is to replicate as closely as possible the existing routes, the impact on noise, tranquillity, visual intrusion is not expected to be significant, and in accordance with the CAA's policy on replication no analysis of these has been undertaken."

| 8.2 | **Has the impact on tranquility been adequately presented in the consultation and the submitted proposal?** | Yes |
|---|---|---|

Whilst the proposal addresses tranquillity through the statement cited in 8.1 above, the consultation makes no specific reference to tranquillity. However, none of the proposed changes directly will result in a change in traffic over any Areas of Outstanding Natural beauty (AONBs) or National Parks.

| 9. | Visual Intrusion | Status |
|---|---|---|
| 9.1 | **Has the impact of visual intrusion been adequately considered?** | Yes |

The proposal states "Since the proposed change is to replicate as closely as possible the existing routes, the impact on noise, tranquillity, visual intrusion is not expected to be significant, and in accordance with the CAA's policy on replication no analysis of these has been undertaken."

| 9.2 | **Has the impact of visual intrusion been adequately presented in the consultation and the submitted proposal?** | Yes |
|---|---|---|

The proposal addresses visual intrusion through the statement cited in 9.1 above. The consultation document also includes a reference to visual intrusion – "This will however represent a change in noise and visual intrusion impact. Typically locations either side of the routes will be overflown less and will be exposed to less aircraft noise, while locations close to the route centreline will be overflown more, and hence will be exposed to more aircraft noise."

| 10. | Biodiversity | Status |
|---|---|---|
| 10.1 | **Has the impact upon biodiversity been adequately considered?** | Yes |

The proposal recognises that there is unlikely to be any impact upon biodiversity arising from this proposed change.

The CLN SID is positioned above both the Blackwater Estuary National Nature Reserve and the Colne Estuary National Nature Reserve. At this point along the SID aircraft will not only be at a height that is very unlikely to have any impact but there is also not expected to be any change in traffic pattern at this point either.

| 10.2 | **Has the impact upon biodiversity been adequately presented in the consultation and the submitted proposal?** | Yes |
|---|---|---|

The proposal states that there is no expected impact upon biodiversity. The consultation does not make a specific reference to biodiversity this is not issue based upon the likelihood of there being no impact upon biodiversity.

| 11. | Continuous Descent Approaches | Status |
|---|---|---|
| 11.1 | **Has the implementation of, or greater use of, CDAs been considered?** | No |

Arrival procedures above 4,000 feet were outside the scope of this Module of LAMP Phase 1A and so CDAs were not relevant.

| 12. | Impacts Upon National Parks and/or AONBs | Status |
|---|---|---|
| 12.1 | **Does the proposed change have an impact upon any National Parks or Areas of Outstanding Natural Beauty (AONBs)?** | No |

The statutory purposes of National Parks are to conserve and enhance their natural beauty, wildlife, and cultural heritage and to promote opportunities for the understanding and enjoyment of their special qualities by the public. The statutory purpose of AONBs is to conserve and enhance the natural beauty of their area. In exercising or performing any functions in relation to, or so as to affect, land in National Parks and

AONBs, the CAA is required to have regard to these statutory purposes under s.19 and Schedule 2 of the Civil Aviation Act 1982. This duty was re-stated in the revised Air Navigation Guidance issued in 2014.

This duty was also reiterated in the Aviation Policy Framework (March 2013) which stated "the CAA has legal duties to have regard to the purposes of National Parks and Areas of Outstanding Natural Beauty and must therefore take these into account when assessing airspace changes."

Whilst recognising this duty it is also true that flights over National Parks and AONBs are not prohibited by this legislation as a general prohibition against over-flights would be impractical.

This proposal (Module B) does not directly affect any traffic that flies over an AONB or a National Park.

| 13. | Traffic Forecasts | Status |
|---|---|---|
| 13.1 | **Have traffic forecasts been provided, are they reasonable, and have these been used to reflect the future impact of the proposal?** | Yes |

The sponsor states that the introduction of RNAV replications is not expected to have any influence on the rate of growth of traffic operating at the airport. For the purposes of the system wide $CO_2$ analysis, a level of growth has been assumed and the predicted traffic numbers (for 2016 and 2020) are presented in the Bridging ACP.

| 14. | Consultation | Status |
|---|---|---|
| 14.1 | **If undertaken, has evidence of non-aviation stakeholder consultation been provided?** | Yes |

The consultation for this proposal ran from 4 September to 27 November 2014. A consultation feedback report has been prepared by the sponsor.

The consultation cross-refers and directs readers to the related consultation on London City routes above 4,000 feet (which forms Module C on the proposals submitted to the CAA for LAMP 1A).

Consultees included all members of the London City Airport Consultative Committee. This included representatives local London Boroughs and Councils as well as community representatives. Press releases were issued as a means of raising public awareness and the

consultation material was also accessible on the sponsor's website. The Feedback report confirms that a large number of responses were received from members of the public.

| 14.2 | **Has account been taken of the results of the environmental factors raised by consultees or has evidence been provided to indicate why this has not been possible?** | Yes |
|---|---|---|

Analysis of the responses is presented in the sponsor's Consultation Feedback Report. Six key themes summarise the areas of most concern to respondents:

1. Extent of consultation.
   The sponsor confirmed that - "For the majority of stakeholders introduction of RNAV routes will result in no noticeable change in the over-flights to which they are currently exposed."

2. Concentration of flight paths.
   The sponsor explained that "In principle this upgrading of the air navigation system will result in flight paths being more concentrated along the route centrelines. However since the majority of aircraft already fly using informal "RNAV overlays" of the conventional routes, to a large extent this concentration has already happened over the course of many years. The introduction of published RNAV departure and arrival routes serves to formalise the use of RNAV, and will compel the minority of aircraft operators who do not already use RNAV, to adopt it." and
   "The change to the distribution of traffic either side of the route centre-line will take place gradually over a time frame of several years. This process has already been on-going for many years due to airlines adopting informal RNAV1 overlays. The percentage of aircraft operating from London City Airport which already navigate using RNAV1 is 70%. The remaining 30% are required to upgrade to RNAV1 before November 2017. Even with the introduction of the proposed RNAV1 routes, the conventional routes will still be available for use. Hence any change in the distribution of flights will not occur as a sudden step-change; rather, the transition to 100% RNAV1 navigation will take place gradually over the course of the next 2½ years."

3. Noise impact.
   The sponsor explained that "there will be very little change in the position of the routes, and subsequently very little change in the aircraft noise experienced by those beneath the routes" and "the transition to RNAV will have no discernible effect on the lateral dispersion of the traffic. There will be no significant change to the noise contours, hence no additional noise analysis has been performed."

4. Impact on Noise Preferential Routes (NPRs).
   The sponsor confirmed that "No NPRs are defined at London City Airport. Hence references to NPRs in the Government and CAA guidance are not relevant to London City airport."

5. Pollution/local air quality/$CO_2$ emissions.
   The sponsor explained that "This proposal will not result in a change in local air quality at the surface. Government guidance on airspace change states that, due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet above ground level will have a negligible impact on local air quality. This proposal will not significantly affect the positioning of flight paths below 1,000 feet. For $CO_2$ emissions, no benefit is claimed, however RNAV is an enabler for the wider LAMP, which does give significant $CO_2$ benefits."

6. Improved environmental performance and systemisation.
   The sponsor explained that several respondents supported the proposals on the grounds that the improved systemisation would make the aircraft track-keeping more consistent. This should also result in improved climb and descent profiles, which would burn less fuel and reduce $CO_2$ emissions. Pilots and aircraft operators supported the changes since they make aircraft approaches more predictable, which allows better descent planning (thus giving more consistent low-power, gliding descents). However, accepting that RNAV may lead to better flight profiles generally, it should be noted that elsewhere (such as the point 5 above) the sponsor has made it clear that this Module specifically does not result in a reduction in $CO_2$ emissions, but is an enabler for wider reductions across the LAMP Phase 1A Modules.

No changes to the RNAV replications designs have been made by the sponsor as a result of feedback from consultation. Key points for each theme are reflected above but more detailed discussion of these themes is presented in the Feedback Report as are responses to more specific questions raised by respondents. One such question and response that is worth noting is:

**Will more people be overflown?**
"No. By replicating the existing routes, the same areas/people will be overflown. Over time due to the increasing proportion of RNAV equipped aircraft there will be a small degree of concentration of the traffic along the route centre-line. This will result in fewer people being directly over-flown, but we expect the change to have only a marginal impact on people's experience of noise."

| 15. | Compliance with CAP 725 | Status |
|---|---|---|

| 15.1 | Have all environmental assessment requirements specified in CAP 725 been met, where applicable? | Yes |
|---|---|---|

All requirements have been met where applicable, as modified by the requirements in the CAA's policy statement on PBN Replications.

| 16. | Other Aspects | Status |
|---|---|---|
| 16.1 | Are there any other aspects of the ACP, that have not already been addressed in this report, that may have a bearing on the environmental impact? | Yes |

The sponsor does not expect the introduction of RNAV SIDs and arrival transitions at London City Airport to have any impact upon the General Aviation (GA) community, and therefore no indirect environmental impacts due to a change in GA traffic patterns. The sponsor confirms that representatives of GA organisations were consulted via the NATMAC and have either supported or made no objection to the proposal.

| 17. | Recommendations | Status |
|---|---|---|
| 17.1 | Are there any recommendations for the Post-Implementation Review? | |

Portrayal of traffic dispersions up to 7,000 feet (for representative periods) that enable a direct comparison between pre-implementation traffic patterns (as presented for the consultation and proposal) and post-implementation traffic patterns.

| 18. | Government Approval | Status |
|---|---|---|
| 18.1 | Is the approval of the Secretary of State for Transport required in respect of the environmental impact of the airspace change proposal? | No |

No – there is unlikely to be a significant detrimental environmental impact as a direct result of the changes proposed in this Module.

| 19. | Conclusions | |
|---|---|---|
| 19.1 | Can an overall environmental benefit be demonstrated (or justified/supported)? | No |

Considering this Module as an individual proposal there is no demonstrable overall environmental benefit:

- There will not be a significant noise impact (as demonstrated by the lack of change in Leq contours) but there will be an increase in noise impact for those residents that are located beneath the RNAV routes due to a concentration of traffic over time and therefore an increase

in the number of flights overhead. On the other hand, some residents should experience a reduction in noise impacts because they will have fewer flights overhead as a result of redistribution arising from concentration.

- There are unlikely to be any $CO_2$ emissions, LAQ, tranquillity, visual intrusion or biodiversity impacts as a direct result of these changes.

Considering this Module as an integral part of a wider change (LAMP Phase 1A):

- These changes are part of a wider series of changes and notably it is an enabler for the changes for London City traffic (covered in Module C). These changes when considered as a whole are expected to produce a reduction in fuel burn and $CO_2$ emissions.

**Outstanding Issues**

| Serial | Issue | Action Required |
|---|---|---|
| | | |
| | | |
| | | |

**Additional Compliance Requirements (to be satisfied by Change Sponsor)**

| Serial | Requirement |
|---|---|
| | |
| | |
| | |

**Environmental Assessment Sign-off/Approvals**

| | Name | Signature | Date |
|---|---|---|---|
| **Environmental Assessment completed by (ERCD representative)** | | | 28 July 2015 |
| **Environmental Assessment approved by (Head of ERCD)** | | | 22nd September 2015 |

## Appendix 1 – Fuel & $CO_2$ Assessment for LAMP Phase 1 A

### Explanatory notes on $CO_2$ assessment methodology

All figures in the following tables represent the change when compared with a "do nothing" scenario, with all other things being equal. They do not represent an absolute reduction.

The figures represent a fuel saving unless they are expressed as a negative (which represents a fuel increase).

The assessment method used for the LAMP Phase 1A $CO_2$ estimates calculated both an "enabled" fuel burn figure (which reflected the impact based solely of the theoretical flight-planned routes) and an "adjusted" fuel burn figure which sought to make an adjustment to reflect the fact that many aircraft fly routes that are shorter than their flight-planned routes because they are tactically vectored by Air Traffic Control.

Consultation for the various LAMP Phase 1A elements was undertaken by different sponsors depending upon the nature of the change (NATS, Stansted Airport, Gatwick Airport and London City Airport). However, not all elements that were consulted upon were progressed to become a formal Airspace Change Proposal. In particular, the majority of changes consulted upon in relation to aircraft operating at Gatwick Airport were not progressed and did not feature in the $CO_2$ assessment that was submitted to the CAA, other than some high-level changes for arrivals (the TIMBA STARs).

In addition to considering NATS' assumptions and methodology for its $CO_2$ analysis, in terms of assessing the adequacy of the resulting estimates, the impacts attributable to the Stansted Airport elements (Module A) were checked for reasonableness by the CAA. This determined that the sponsor's estimates were reasonable and was therefore used as an indicator that the estimates for the other Modules were also likely to be reasonable.

### Key points from the Bridging ACP document:

The following points help to explain the methodology adopted by NATS to estimate the system-wide impacts on $CO_2$ emissions.

- The $CO_2$ emissions report is a full system analysis covering all of the LAMP Phase 1A modules. It was completed in January 2015 and is based on real time simulation modelling, taking into account the final proposed design both in terms of routes and procedural flight levels. It therefore represents the most up to date and complete analysis of the expected fuel and $CO_2$ impact of the Airspace Change Proposal (ACP) and supersedes analyses undertaken by the sponsors during the design process.
- The report estimates that in 2016 the change would result in enabled fuel savings of 15,600 tonnes, rising to 18,200 tonnes by 2020. This is an 'enabled' fuel benefit, which is a measure of the difference that the proposal will make to the "trip fuel" that airlines will plan for.

- In the current operation aircraft are tactically vectored by Air Traffic Control for reasons of safety and efficiency. This occurs in today's airspace and would also occur in the future.
- Tactical vectoring means that not all trip fuel that airlines load onto a flight is used, because the distance actually flown is usually less than that planned for. As $CO_2$ is only generated from fuel which is burnt, this can mean that the enabled fuel benefit is likely to overestimate the $CO_2$ benefit if a straight conversion from the enabled fuel is undertaken. Therefore the report describes and applies a method for adjusting the results to avoid, as far as is practicable, overestimating actual fuel burn and therefore $CO_2$.
- NATS, as the sponsor, recognises that there are elements of the fuel and $CO_2$ assessment methodologies that remain subject to assumptions, in particular when translating enabled fuel reduction into actual $CO_2$ reduction. It took account of these factors as far as possible, and therefore reduced the $CO_2$ benefits on the basis of a comparison of modelled and actual fuel for today's traffic. This comparison indicated that a reduction of 21% to reflect the difference between enabled fuel and actual fuel was reasonable.
- The adjusted $CO_2$ estimate was a 39,400 tonne saving in 2016; rising to 46,000 by 2020 (this is adjusted down by 21% from the equivalent 'enabled' benefit).
- However, the dynamic nature of the air traffic environment both in terms of day-to-day operation and the long term effects of increasing traffic and technological advancement, mean that a degree of uncertainty remains and to account for this uncertainty NATS applied a range to the reported results in the ACP.
- The lower end of the range was not scientifically derived; it is simply 50% of the calculated value. However, it was NATS' view based upon its own operational and analytical experts that, as the calculated value represents "as close an approximation to the required adjustment as can be achieved, and then the lower end of the range more than covers the remaining uncertainty, and presents a sufficient benefit contributing to the overall justification for change."
- When applying this lower limit of 50%, the range of $CO_2$ reductions estimated by NATS for the entirety of LAMP Phase 1A are:
    - For 2016 = 19,000 to 40,000 tonnes
    - For 2020 = 23,000 to 46,000 tonnes
- It was noted that within the overall result there were some specific routes for which there will be a negative fuel/$CO_2$ impact, i.e. an increase. However, because these are the less-frequently-used routes, the net negative $CO_2$ impact is negligible when taken in the context of the overall estimated system benefit that is derived from the combined impacts of the LAMP Phase 1A modules.

**Predicted Annual Saving on Fuel (2016) – tonnes**

| | | Consultation | Module ACP | Bridging ACP (Table 52 – "Enabled" Fuel) | Bridging ACP (revised for runway split – Table 52 – "Enabled" Fuel)[1] | Further adjustment by CAA ("Enabled" Fuel) |
|---|---|---|---|---|---|---|
| Module A - Stansted | Base case | 2,000-4,000 | 2,000-4,000 | 5,131 | 4,271 | 4,298 |
| Module B – London City Replications | Base case | 0 | 0 | 0[2] | 0[2] | 0[2] |
| Module C – London City Network (plus Gatwick & Southend) | Base case | Part E = 2,500-5,000 for LCY<br>Additional 5% for Biggin Hill = 125-250<br>(same figures quoted in Part F and Part G)<br>No $CO_2$ assessment for Southend, therefore no benefit claimed in consultation but negligible impact expected. | No figures stated – but cross-reference to the figures in the Bridging ACP | LCY = 4,632<br>Gatwick (TIMBA STARs) & Southend = 4,229<br>**Total = 8,861[2]**<br>(no separate figures for Biggin Hill) | LCY = 4,136<br>Gatwick (TIMBA STARs) & Southend = 3,980<br>**Total = 8,116[2]**<br>(no separate figures for Biggin Hill) | LCY = 4,082<br>Gatwick (TIMBA STARs) & Southend = 3,959<br>**Total = 8,041[2]**<br>(no separate figures for Biggin Hill) |
| Module D – Luton & Northolt | Base case | No consultation undertaken | No figures stated – but cross-reference to the figures in the Bridging ACP | 1,854 | 1,836 | 1,815 |
| Module E – South Coast (Farnborough, Southampton, Bournemouth) | Base case | Figures for 2015:<br>Farnborough = -1,400<br>Southampton = -102<br>Bournemouth = -9 | -248 | -248 | -252 | -265 |
| **Total** | **Base case** | **3,114-7,739** | **7,835-9,835** | **15,598** | **13,971** | **13,889** |

[1] The original assessment presented in the Bridging ACP had assumed a simple runway usage of 50/50. This was subsequently revised during the CAA's consideration of the LAMP Phase 1A proposals to a more realistic 70 westerly/30 easterly runway usage, and the $CO_2$ assessment was modified by the sponsor to reflect this.

[2] The $CO_2$ impacts from London City that are reported in the Bridging ACP do not distinguish between those from the Replications (Module B) or the Network (Module C) and so the entire figure for London City is reflected in this table as being Module C.

**Predicted Annual Saving on Fuel (2020) – tonnes**

| | | Consultation | Module ACP | Bridging ACP (Table 52 – "Enabled" Fuel)) | Bridging ACP (revised for runway split – Table 52 – "Enabled" Fuel)[1] | Further adjustment by CAA ("Enabled" Fuel) |
|---|---|---|---|---|---|---|
| Module A - Stansted | Base case | 2,300-4,700 | 2,300-4,700 | 5,941 | 4,970 | 4,932 |
| Module B – London City Replications | Base case | 0 | 0 | 0[2] | 0[2] | 0[2] |
| Module C – London City Network (plus Gatwick & Southend) | Base case | Part E = 3,000-5,900 for LCY<br>Additional 5% for Biggin Hill = 150-295<br>(same figures quoted in Part F)<br>Part G= 2,900-5,800 for LCY<br>No $CO_2$ assessment for Southend, therefore no benefit claimed in consultation but negligible impact expected. | No figures stated – but cross-reference to the figures in the Bridging ACP | LCY = 6,255<br>Gatwick (TIMBA STARs) & Southend = 4,252<br>**Total = 10,507[2]**<br>(no separate figures for Biggin Hill) | LCY = 5,648<br>Gatwick (TIMBA STARs) & Southend = 4,381<br>**Total = 10,029[2]**<br>(no separate figures for Biggin Hill) | LCY = 5,514<br>Gatwick (TIMBA STARs) & Southend = 4,356<br>**Total = 9,870[2]**<br>(no separate figures for Biggin Hill) |
| Module D – Luton & Northolt | Base case | No consultation undertaken | No figures stated – but cross-reference to the figures in the Bridging ACP | 2,177 | 2,156 | 2,170 |
| Module E – South Coast (Farnborough, Southampton, Bournemouth) | Base case | Figures for 2019:<br>Farnborough = -1,700<br>Southampton = -113<br>Bournemouth = -10 | -400 | -399 | -402 | -418 |
| **Total** | **Base case** | **3,627-9,072** | **8,329-10,729** | **18,226** | **16,753** | **16,554** |

[1] The original assessment presented in the Bridging ACP had assumed a simple runway usage of 50/50. This was subsequently revised during the CAA's consideration of the LAMP Phase 1A proposals to a more realistic 70 westerly/30 easterly runway usage, and the $CO_2$ assessment was modified by the sponsor to reflect this.

[2] The $CO_2$ impacts from London City that are reported in the Bridging ACP do not distinguish between those from the Replications (Module B) or the Network (Module C) and so the entire figure for London City is reflected in this table as being Module C.

## Bridging ACP – Total Estimated $CO_2$ Reduction (tonnes)

These $CO_2$ figures are taken or derived from the Bridging ACP submitted to the CAA as part of LAMP Phase 1A Airspace Change proposal.

The "revised" figures represent the revision made by the sponsor to switch from a 50/50 runway usage assumption to a 70/30 usage assumption.

The "CAA adjusted" figures represents small adjustments made for roundings and other small inconsistencies in calculation.

A conversion figure of 3.18 has been used to convert fuel into $CO_2$ .

| | | | 2016 | 2020 |
|---|---|---|---|---|
| Based on Estimated Enabled Fuel Saving | Base case | original proposal | 49,600 | 57,962 |
| | | revised proposal | 44,428 | 53,278 |
| | | CAA adjusted total | 44,167 | 52,642 |
| | High case | original proposal | 55,314 | 62,566 |
| | | revised proposal | 49,662 | 57,488 |
| | | CAA adjusted total | - | - |
| Based on Estimated Actual Fuel Saving (i.e. adjusted for a 21% reduction from Enabled) | Base case | original proposal | 39,368 | 46,006 |
| | | revised proposal | 35,263 | 42,287 |
| | | CAA adjusted total | **34,892** | **41,587** |
| | High case | original proposal | 43,903 | 49,659 |
| | | revised proposal | 39,418 | 45,629 |
| | | CAA adjusted total | - | - |

Based on the above results, we would conclude that the approximate annual benefit (i.e. reduction when compared with a "Do Nothing" scenario) in $CO_2$ emissions as a result of the combined LAMP Phase 1A changes would be approximately **34,900 tonnes of $CO_2$ in 2016 and 41,600 tonnes in 2020**.

In acknowledging the fact that these estimates incorporate a number of assumptions derived from operational experience, NATS proposed a range of $CO_2$ impacts which set the lower limit at 50% of the derived estimate. (See the methodology notes at the start of this Appendix.) Applying the same 50% reduction to the figures in the table above in order to obtain a range, the result is:

- For 2016 = 17,450 to 34,900 tonnes of $CO_2$ saved
- For 2020 = 20,800 to 41,600 tonnes of $CO_2$ saved

If this lower limit was used as a pessimistic assumption for the estimated $CO_2$ saving, then the combined LAMP Phase 1A changes would be approximately **17,450 tonnes of $CO_2$ in 2016 and 20,800 tonnes in 2020**.