LAMP Phase 1a: Post Implementation Review

PIR Benefits Assessment

Version 1.0

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Acceptance

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Referenced Documents

List of documents referenced in this publication:

Ref	Title	Report Reference
1	LAMP Phase 1a: ACP Environmental Benefits Report	4165/RPT/144

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1. Executive Summary

A Post-Implementation Review (PIR) has been undertaken to assess the environmental impact of the London Airspace Management Programme Phase 1a (LAMP P1a) airspace change which was introduced into the Swanwick operation on 4 February 2016.

An update to the procedural benefits estimate from the LAMP P1a shows that the procedural benefit has risen from the ACP estimate(ref1) of 15.6kT in 2016 to 17.1kT, as a result of traffic growth since the original assessment.

The review shows that the airspace change has resulted in an actual fuel burn benefit of 407T and a CO_2 benefit of 1,294T based on actual flights from 1 March 2016 to 3 February 2017, when compared to the same flights and date range in 2015/16. This looks unfavourable when compared to the procedural benefits estimates conducted prior to implementation; however, the baselines used for each comparison differ because the actual baseline includes the benefits provided by tactical vectoring which makes them difficult to compare.

2. Introduction

The London Airspace Management Programme Phase 1A (LAMP P1a) airspace change was introduced with the aim of improving safety, reducing CO_2 emissions and increasing capacity in the airspace around London.

This Post-Implementation Review (PIR) assesses the environmental impact of the LAMP P1a change.

Previously calculated enabled benefits considered the impact of the changes to the procedures that affect fuel uplift requirements and did not include potential tactical re-routing already employed to reduce emissions and fuel burn. This document provides an update to the procedural benefits and a comparison of the actual fuel burn and CO_2 change due to LAMP P1a.

3. Method

3.1. Assessment of Procedural Change

To update the procedural fuel burn/CO_2 change figure for LAMP P1a, this document provides an update to Table 52 in the LAMP Phase 1a: ACP Environmental Benefits Report [ref1]. This has been achieved by updating the « Number of Movements » column in Table 52 to reflect the actual number of flights between 4 4th February 2016 and 3 3rd February 2017 and can be found in the results section below.

The data source used to obtain this information was the fctFlight_STATS table in the NATS Business Intelligence Data Warehouse (BI DW). A full list of affected flows is provided in Appendix A.

3.2. Assessment of Actual Change

The actual change in fuel burn/CO_2 due to the LAMP P1a airspace change has been assessed using the following method :

1. The assessment of the benefits of LAMP P1a has been conducted using actual radar trajectories and their associated modelled fuel burn.
2. The fuel burn of flights between 1st March 2016 and 3rd February 2017 has been analysed and compared to a baseline using the same period in 2015/16.
3. The period between 4th February 2016 and 29th February 2016 has been excluded to enable the change to 'bed-in'. It has been concluded that any change in fuel burn during this period would not be reflective of typical operations. The same period in the baseline has also been removed.
4. Only flows which were affected by the LAMP P1a airspace change have been considered. A full list of these is given in Appendix A. The data source used to obtain this information was the fctFlight_STATS table in the NATS BI DW.
5. The total fuel burn in UK airspace was assessed in both the baseline and sample period.
6. Due to changing traffic between the baseline and the current traffic only the aircraft types with movements in both years in any given flow were included in the analysis. This was to ensure that any change in fuel burn was a result of the change in procedure and not due to a shift in aircraft type proportions.
7. The average change in fuel burn per aircraft type per flow was calculated for the baseline and LAMP P1a traffic. This was then multiplied by the total number of movements in the LAMP P1a sample for each aircraft type to give the annual fuel burn change.
8. The fuel burn for each flight has been calculated using BADA v3.13.
9. The total number of movements included all traffic between 4th February 2016 and 3rd February 2017.

4. Results

The results of the LAMP P1a PIR environmental assessment are summarised in the following sections.

4.1. Procedural Assessment

Table 1 shows the summary of the enabled procedural fuel burn change for the affected airports in LAMP P1a, split by arrivals and departures. The results show that the fuel burn benefit is 17.1kT. This is an increase of 1.5kT when compared to the estimate in the ACP benefits assessment (ref1). As can be seen when compard with Table 2, this additional benefit comes from the additional number of flights at EGLC, EGSS and EGGW.

	Arrivals			Departures			
Airport	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Overall Airport Fuel Benefit (Tonnes)
EGLC	40,685	85	3,458	19,292	85	1,640	**5,098**
EGSS	N/A	N/A	N/A	27,666	205	5,672	**5,672**
EGGW	N/A	N/A	N/A	14,272	180	2,569	**2,569**
EGWU	N/A	N/A	N/A	949	50	47	**47**
EGKK	68,962	60	4,138	N/A	N/A	N/A	**4,138**
EGLF	5,021	15	75	1,194	-90	-107	**-32**
EGHH	740	-60	-44	258	-150	-39	**-83**
EGHI	1,897	-65	-123	1,084	-20	-22	**-145**
EGMC	4,824	-35	-169	N/A	N/A	N/A	**-169**
TOTAL	**122,129**	**60**	**7,335**	**64,715**	**151**	**9,760**	**17,095**

Table 1: Enabled fuel burn savings split by airport

Table 2 below shows the inital Table 52 in the LAMP Phase 1a: ACP Environmental Benefits Report [ref1].

	Arrivals			Departures			
Airport	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Overall Airport Fuel Benefit (Tonnes)
EGLC	36,119	85	3,026	19,051	85	1,606	**4,632**
EGSS	N/A	N/A	N/A	25,135	205	5,131	**5,131**
EGGW	N/A	N/A	N/A	9,955	180	1,810	**1,810**
EGWU	N/A	N/A	N/A	868	50	44	**44**
EGKK	66,447	60	4,437	N/A	N/A	N/A	**4,437**
EGLF	5,881	15	94	1,446	-90	-132	**-38**
EGHH	1,057	-60	-54	242	-150	-36	**-89**
EGHI	1,720	-65	-119	142	-20	-3	**-121**
EGMC	5,518	-35	-208	N/A	N/A	N/A	**-208**
TOTAL	**116,742**	**61**	**7,176**	**56,839**	**148**	**8,420**	**15,598**

Table 2: ACP assessment enabled fuel burn savings split by airport

4.2. Assessment of Actual Benefits

4.2.1. Detailed Breakdown

The following sections given a detailed breakdown of the actual fuel burn change due to the LAMP P1a airspace change.

4.2.1.1. London City

Table 3 shows the actual fuel burn and CO_2 results for affected London City arrival flows. The results show that the fuel burn and CO_2 has increased by 4,035T and 12,832T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Arrivals via KENET	Arrivals via BEDEK	3,064	-286	-878	-2,791	-40
Arrivals via MCT	Arrivals via MCT	6,837	-268	-1,834	-5,832	-62
Arrivals via WAFFU	Arrivals via NEVIL	2,878	-58	-166	-528	-24
Arrivals via SOVAT	Arrivals via SOVAT	10,223	-45	-461	-1,465	-12
Arrivals via WAL	Arrivals via WAL	3,344	-176	-588	-1,870	-63
Arrivals via LOGAN	Arrivals via XAMAN & SUMUM	14,339	-8	-109	-346	-4
TOTAL		**40,685**	**-99**	**-4,035**	**-12,832**	**-25**

Table 3: London City arrivals fuel burn and CO_2 change by flow.

Table 4 shows the actual fuel burn and CO_2 results for the affected London City departure flows. The results show that the fuel burn and CO_2 has decreased by 257T and 816T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Departures via LYD	Departures via LYD	8,943	41	366	1,164	4
Departures via DVR	Departures via UMTUM	10,349	-11	-110	-348	-3
TOTAL		**19,292**	**13**	**257**	**816**	**0**

Table 4: London City departures fuel burn and CO_2 change by flow.

4.2.1.2. Stansted

Table 5 shows the actual fuel burn and CO_2 results for the affected Stansted departure flow. The results show that the fuel burn and CO_2 has decreased by 3,557T and 11,310T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Departures via DET	Departures via KONAN	27,666	129	3,557	11,310	1
TOTAL		**27,666**	**129**	**3,557**	**11,310**	**1**

Table 5: Stansted departures fuel burn and CO_2 change by flow.

4.2.1.3. Luton

Table 6 shows the actual fuel burn and CO_2 results for the affected Luton departure flow. The results show that the fuel burn and CO_2 has decreased by 678T and 2,157T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Departures via DET	Departures via DVR	14,272	48	678	2,157	-2
TOTAL		**14,272**	**48**	**678**	**2,157**	**-2**

Table 6: Luton departures fuel burn and CO_2 change by flow.

4.2.1.4. Northolt

Table 7 shows the actual fuel burn and CO_2 results for the affected Northolt departure flow. The results show that the fuel burn and CO_2 has increased by 1T and 4T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Departures via DET	Departures via DVR	949	-1	-1	-4	-2
TOTAL		**949**	**-1**	**-1**	**-4**	**-2**

Table 7: Northolt departures fuel burn and CO_2 change by flow.

4.2.1.5. Gatwick

Table 8 shows the actual fuel burn and CO_2 results for the affected Gatwick arrival flows. The results show that the fuel burn and CO_2 has decreased by 178T and 567T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Arrivals via TANET	Arrivals via ERING & TEBRA	27,325	27	737	2,344	2
Arrivals via KUNAV	Arrivals via KUNAV	41,637	-13	-559	-1,777	-2
TOTAL		**68,962**	**3**	**178**	**567**	**0**

Table 8: Gatwick arrivals fuel burn and CO_2 change by flow.

4.2.1.6. Farnborough

Table 9 shows the actual fuel burn and CO_2 results for the affected Farnborough arrival flows. The results show that the fuel burn and CO_2 has increased by 34T and 108T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Arrivals via GIBSO	Arrivals via GIBSO	207	-36	-7	-23	-6
Arrivals via KATHY	Arrivals via KATHY	785	-9	-7	-23	1
Arrivals via KUNAV	Arrivals via KUNAV	767	-8	-6	-19	-1
Arrivals via SUBIP	Arrivals via SUBIP	3,232	-4	-13	-42	0
TOTAL		**5,021**	**-7**	**-34**	**-108**	**-1**

Table 9: Farnborough arrivals fuel burn and CO_2 change by flow.

Table 10 shows the actual fuel burn and CO_2 results for the affected Farnborough departure flow. The results show that the fuel burn and CO_2 has increased by 55T and 174T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Departures via DVR	Departures via DVR	1,194	-46	-55	-174	-11
TOTAL		**1,194**	**-46**	**-55**	**-174**	**-11**

Table 10: Farnborough departures fuel burn and CO_2 change by flow.

4.2.1.7. Bournemouth

Table 11 shows the actual fuel burn and CO_2 results for the affected Bournemouth arrival flow. The results show that the fuel burn and CO_2 has increased by 1T and 4T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Arrivals via WAFFU	Arrivals via ELDAX	740	-2	-1	-4	1
TOTAL		**740**	**-2**	**-1**	**-4**	**1**

Table 11: Bournemouth arrivals fuel burn and CO_2 change by flow.

Table 12 shows the actual fuel burn and CO_2 results for the affected Bournemouth departure flow. The results show that the fuel burn and CO_2 has increased by 7T and 23T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Departures via DVR	Departures via DVR	258	-28	-7	-23	-6
TOTAL		**258**	**-28**	**-7**	**-23**	**-6**

Table 12: Bournemouth departures fuel burn and CO_2 change by flow.

4.2.1.8. Southampton

Table 13 shows the actual fuel burn and CO_2 results for the affected Southampton arrival flow. The results show that the fuel burn and CO_2 has increased by 21T and 68T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Arrivals via WAFFU	Arrivals via ELDAX	1,897	-11	-21	-68	-4
TOTAL		**1,897**	**-11**	**-21**	**-68**	**-4**

Table 13: Southampton arrivals fuel burn and CO_2 change by flow.

Table 14 shows the actual fuel burn and CO_2 results for the affected Southampton departure flow. The results show that the fuel burn and CO_2 has increased by 26T and 84T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Departures via DVR	Departures via DVR	1,084	-24	-26	-84	-5
TOTAL		**1,084**	**-24**	**-26**	**-84**	**-5**

Table 14: Southampton departures fuel burn and CO_2 change by flow.

4.2.1.9. Southend

Table 15 shows the actual fuel burn and CO_2 results for the affected Southend arrival flows. The results show that the fuel burn and CO_2 has increased by 81T and 259T respectively.

Baseline Flow	LAMP Flow	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Total Actual CO2 Benefit (Tonnes)	Track Mileage Benefit per Flight (NM)
Arrivals via NEVIL	Arrivals via NEVIL	2,214	-38	-83	-265	-10
Arrivals via RATUK	Arrivals via RATUK	757	0	0	1	0
Arrivals via SUMUM	Arrivals via SUMUM	421	4	2	5	5
Arrivals via XAMAN	Arrivals via XAMAN	1,432	0	0	-1	-2
TOTAL		**4,824**	**-17**	**-81**	**-259**	**-5**

Table 15: Southend arrivals fuel burn and CO_2 change by flow.

4.2.2. Summary

Table 16 shows the summary of the actual fuel burn change for the affected airports in LAMP P1a, split by arrivals and departures. The results show that the overall fuel burn benefit is 407T. This equates to 1,294T of CO_2.

	Arrivals			Departures			
Airport	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Number of Movements (Annual)	Actual Fuel Benefit per flight (kg)	Total Actual Fuel Benefit (Tonnes)	Overall Airport Fuel Benefit (Tonnes)
EGLC	40,685	-99	-4,035	19,292	13	257	**-3,779**
EGSS	N/A	N/A	N/A	27,666	129	3,557	**3,557**
EGGW	N/A	N/A	N/A	14,272	48	678	**678**
EGWU	N/A	N/A	N/A	949	-1	-1	**-1**
EGKK	68,962	3	178	N/A	N/A	N/A	**178**
EGLF	5,021	-7	-34	1,194	-46	-55	**-89**
EGHH	740	-2	-1	258	-28	-7	**-8**
EGHI	1,897	-11	-21	1,084	-24	-26	**-48**
EGMC	4,824	-17	-81	N/A	N/A	N/A	**-81**
TOTAL	**122,129**	**-33**	**-3,995**	**64,715**	**68**	**4,402**	**407**

Table 16: Actual fuel burn savings split by airport

5. Summary and Conclusions

A PIR has been undertaken to assess the environmental impact of the LAMP P1a airspace deployment after 1 year of implementation.

An update to the procedural benefits estimate from the LAMP P1a shows that the procedural benefit has risen from the ACP estimate[1] of 15.6kT in 2016 to 17.1kT, as a result of traffic growth since the original assessment.

The results of the review conclude that the LAMP airspace changes resulted in an actual fuel burn benefit of 407T over the 1 year period analysed. This equates to 1,294T of CO_2. This looks unfavourable when compared to the procedural benefits estimates conducted prior to implementation; however, the baselines used for each comparison differ because the actual baseline includes the benefits provided by tactical vectoring which makes them difficult to compare.

Appendix A: Flows Analysed

Provides a list of flows analysed in this report.

Airport	Baseline Flow	LAMP Flow
EGLC	Arrivals via KENET Arrivals via MCT Arrivals via WAFFU Arrivals via SOVAT Arrivals via WAL Arrivals via LOGAN Departures via LYD Departures via DVR	Arrivals via BEDEK Arrivals via MCT Arrivals via NEVIL Arrivals via SOVAT Arrivals via WAL Arrivals via XAMAN & SUMUM Departures via LYD Departures via UMTUM
EGSS	Departures via DET	Departures via KONAN
EGGW	Departures via DET	Departures via DVR
EGWU	Departures via DET	Departures via DVR
EGKK	Arrivals via TANET Arrivals via KUNAV	Arrivals via ERING & TEBRA Arrivals via KUNAV
EGLF	Arrivals via GIBSO Arrivals via KATHY Arrivals via KUNAV Arrivals via SUBIP Departures via DVR	Arrivals via GIBSO Arrivals via KATHY Arrivals via KUNAV Arrivals via SUBIP Departures via DVR
EGHH	Arrivals via WAFFU Departures via DVR	Arrivals via ELDAX Departures via DVR
EGHI	Arrivals via WAFFU Departures via DVR	Arrivals via ELDAX Departures via DVR
EGMC	Arrivals via NEVIL Arrivals via RATUK Arrivals via SUMUM Arrivals via XAMAN	Arrivals via NEVIL Arrivals via RATUK Arrivals via SUMUM Arrivals via XAMAN

End of report