

CAA CAP 1616 Options Appraisal Assessment (Phase II Full)

Title of Airspace Change Proposal:	LAMP 2 Deployment 1.1 (LD1.1) FASI South		
Change Sponsor:	NATS		
ACP Project Ref Number:	ACP-2017-70		
Case study commencement date:	30/07/2021	Case study report as at:	03/09/2021

Account Manager: [REDACTED]	[GREY]	Airspace Regulator (Engagement & Consultation): [REDACTED]	[AMBER]	IFP: N/A	[AMBER]	OGC: N/A	[GREY]
Airspace Regulator (Technical): [REDACTED]	[GREEN]	Airspace Regulator (Environmental): [REDACTED]	[PURPLE]	Airspace Regulator (Economist): [REDACTED]	[BLUE]	ATM (Inspector ATS Ops): [REDACTED]	[RED]

Instructions

To aid the SARG project leader's efficient project management, please highlight the "status" cell for each question using one of the four colours to illustrate if it is:

Resolved - GREEN

Not Resolved – AMBER

Not Compliant – RED

Not Applicable - GREY

Guidance

The broad principle of economic impact analysis is **proportionality**; is the level of analysis involved proportionate to the likely impact from that ACP? There are three broad levels of economic analysis; qualitative discussion, quantified through metrics, and monetised in £ terms. The more significant the impact, the greater should be the effort by sponsors to quantify and monetise the impact.

1. Background – Identifying the impact of the shortlist of options (including Do Nothing (DN) / Do Minimum (DM))		Status	
1.1	Are the outcomes of DN/DM and DS scenarios clearly outlined in the proposal?	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
1.1.1	Has the change sponsor produced an Options Appraisal (Phase II - Full) which sets out how Initial appraisal is developed into a more detailed quantitative assessment, moving from qualitatively defined shortlist options to the selected preferred option? [E23]	Yes. The sponsor has developed the Full Options Appraisal, including more detailed qualitative and quantitative/monetised assessment of the shortlisted options: <ul style="list-style-type: none"> Option 4 – Systemised routes, FRA above FL305 (FL245 in S9); and Option 6 – Systemised routes, FRA above FL245. 	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1.1.2	Does each shortlist option include the impacts in comparison to the ‘do nothing / do minimum’ option, in particular: -all reasonable costs and benefits quantified -all other costs and benefits described qualitatively -reasons why costs and benefits have not been quantified	Yes, the shortlisted options are compared against the do-nothing option with all reasonable costs and benefits described qualitatively and quantitatively. This proposed airspace change is a scaled as a Level 2A change. Hence the sponsor provides a quantitative and monetised assessment of fuel burn and CO ₂ .	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1.1.3	Where options have been discounted, does the change sponsor clearly set out why?	The sponsor states that Option 6 is preferred to Option 4 because when combined with FRA 2 it shows higher net present values (NPV) benefits.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1.1.4	Has the change sponsor indicated their preferred option in the Options Appraisal (Phase II - Full)? [E23]	Yes, the preferred option is Option 6 – Systemised routes with FRA above FL245.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1.1.5	Does the Full Options Appraisal (Phase II - Full) detail what evidence the change sponsor will collect, and how, to fill in any evidence gaps and how this will be used to develop the Options Appraisal (Phase III - Final)? Does the plan for evidence gathering cover all reasonable impacts of the change?	This airspace change is scaled as a Level 2A ACP and the sponsor has provided quantitative and qualitative assessment for all the reasonable impacts as per CAP1616.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. Direct impact on air traffic control		Status	

2.1 <input type="checkbox"/> <input checked="" type="checkbox"/>	Are there direct cost impacts on air traffic control / management systems? If so, please provide below details of the factors considered and the level in which this has been analysed.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
2.1.1 <input type="checkbox"/> <input type="checkbox"/>	<i>Examples of costs considered (please add costs that have been discussed, and any reasonable costs that the Airspace Regulator (Technical) feels have NOT been addressed)</i>				
		Not applicable	Qualitative	Quantified	Monetised
2.1.2	Infrastructure changes	x			
2.1.3	Deployment		x	N/A	N/A
2.1.4	Training	x			
2.1.5	Day-to-day operational costs / workload / risks		x	N/A	N/A
2.1.6	Other (provide details)				
2.1.7	Comments: The sponsor states that the proposed airspace change will require some initial systems engineering amendments in the initial deployment phase, but it is not expected to change airport or air navigation service provides (ANSP) infrastructure nor the operational costs at the airport or ANSP. Since airlines update flight procedures using AIRAC, there will not be additional costs for commercial airlines, i.e., training costs and other costs. The proposed airspace change will have an impact on the air traffic controllers which will need to undertake some training (i.e., 120-150 controllers, 50 assistants at NATS Swanwick, including extensive use of NATS simulator facility, and support staff to run the simulator), some staff may only require briefings, and the military ANSP might also need a briefing before the deployment. The sponsor acknowledges that when controllers are in the conversion training the operational rostering becomes a factor during continuous service delivery.				
2.2 <input type="checkbox"/> <input checked="" type="checkbox"/>	Are there direct beneficial impacts on air traffic control / management systems? If so, please provide details and how they have been addressed:	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
		Not applicable	Qualitative	Quantified	Monetised
2.2.1	<i>Examples of benefits considered</i>				
2.2.2	Reduced work-load		x	N/A	N/A
2.2.3	Reduced complexity / risk		x	N/A	N/A
2.2.4	Other (provide details)				

2.2.5	Comments: This airspace change proposes the use of systemised PBN routes which will support a more efficient network design and would improve safety for aircraft with minimal ATC intervention.
2.3	Where monetised, what is the net monetised impact on air traffic control (in net present value) over the project period? N/A
2.4	Are the direct impacts on air traffic management analysed accurately and proportionately? Yes. The sponsor states that this ACP is not expected to change airport or air navigation service provider (ANSP) infrastructure, however some engineering amendments are expected in the initial deployment phase. <div style="float: right;"> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>

3. Changes in air traffic movements / projections				Status			
3.1	What is the impact of the ACP on the following and has it been addressed in the ACP proposal?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Not applicable	Qualitative	Quantified	Monetised		
3.1.1	Number of aircraft movements	x					
3.1.2	Type of aircraft movement	X					
3.1.3	Distance travelled	X					
3.1.4	Area flown over / affected	X					
3.1.5	Other impacts						
3.1.6	Comments: The sponsor does not provide information on the number or type of aircraft movements that will be affected by the proposed ACP. The airspace change only affects airspace above 7,000ft hence there will be no overflight below 7,000ft of AONBs, nominated quiet areas and National Parks.						
3.2	Has the forecasting of traffic done reasonably using best available guidance (e.g. DfT WebTAG, the Green Book, Academic sources...etc?) Yes, the sponsor uses the DfT WebTAG tables to estimate the environmental impacts. The WebTAG traffic inputs are obtained by using the NATS May 21 STATFOR extended forecast with year-on-year traffic growth. To estimate the fuel costs, the sponsor combines the IATA jet fuel price of 9 July 2021 and NATS May 21 STATFOR extended forecast. The methodology used is clearly explained and follows DfT WebTAG guidance and is consistent with CAP1616 requirements.			<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			

The sponsor includes a modelling assumptions section in the appendix, assumptions where the assumptions, the methodology, the datasets (i.e. fuel burn was calculated using NATS NEMO tool which uses BADA 4.2 data) and software (i.e., AirTOP ATC computer simulation software, RALPH re-processor v1.317 and NEMo post processor v2.6) used are fully explained.

3.3 What is the impact of the above changes (3.1) on the following factors?

Due to the interdependencies of this ACP with FRA D2 ACP, the sponsor has also provided a combined assessment of CO₂ and fuel burn for the two ACPs. The average calculated network fuel burn saving with respect to the do-nothing baseline for the change in isolation is estimated as:

- Option 4: 1.12kg fuel burn saving per flight, which would lead to an annual fuel saving of £215,974 in 2023 (based on 422,069 impacted flights in 2023), rising to £300,803 in 2033 (based on 587,073 impacted flights in 2033).
- Option 6: 0.89kg fuel burn saving per flight, which would lead to an annual fuel saving of £172,504 in 2023 (based on 422,069 impacted flights in 2023), rising to £240,260 in 2033, (based on 587,073 impacted flights in 2033).

The benefits arising from the reduction in greenhouse gas emissions are the following:

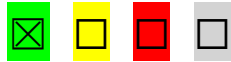
- Option4: monetised net present values (NPV) benefit is £401,907.
- Option 6: monetised NPV benefit is £320,999

In addition, the sponsor states that this analysis is based only on flight planned routes and does not include any holding, vectoring or streaming, implying that improvements in improvements in flight plan predictability could lead to further reduced delay and even higher benefits.

The assessment shows that taken in isolation the CO₂ emissions and fuel burn benefits of Option 6 are worse than that for Option 4, however this is a result of the additional airspace volume in Option 4 (between FL245-305). The sponsor argues that to make an accurate comparison between the options, the benefits across identical volumes of the combined LD1.1 and FRA D2 airspace should be considered. The benefits of Option 4 and Option 6 and their combined impacts when implemented in combination with FRA D2 in the airspace above are summarised below. These tables show that when Option 4 is combined with the implementation of FRA D2, then the total benefits are lower than the ones released by the combination of Option 6 and FRA D2 (see values highlighted with the red boxes).

- Combined CO₂e benefits for LD1.1 and FRA D2

		2023 CO ₂ e (T) reduction	2033 CO ₂ e (T) reduction	CO ₂ e (£ saved) (traded)	CO ₂ e (£ saved) (non-traded)
LD1.1 impacts	LD1.1 Option 4	1,500	2,089	321,731	401,907
	LD1.1 Option 6	1,198	1,669	256,892	320,999
FRA D2 impacts	LD1.1 Option 4	1,208	1,680	258,945	323,512
	LD1.1 Option 6	1,530	2,128	327,978	409,863
LD1.1 + FRA combined impacts	LD1.1 Option 4	2,708	3,769	580,675	725,419
	LD1.1 Option 6	2,728	3,797	584,870	730,862

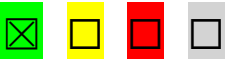
		- Combined fuel impact for LD1.1 and FRA D2			
		2023 Fuel (T) reduction	2033 Fuel (T) reduction	2023 Fuel saving (T)	2033 Fuel saving (T)
LD1.1 impacts	LD1.1 Option 4	472	657	215,974	300,803
	LD1.1 Option 6	377	525	172,504	240,260
FRA D2 impacts	LD1.1 Option 4	380	528	173,877	241,598
	LD1.1 Option 6	481	669	220,092	306,115
LD1.1 + FRA combined impacts	LD1.1 Option 4	852	1,185	389,851	542,401
	LD1.1 Option 6	858	1,194	392,596	546,375
		Not applicable	Qualitative	Quantified	Monetised
3.3.1	Noise	x			
3.3.2	Fuel Burn		x	x	x
3.3.3	CO2 Emissions		x	x	x
3.3.4	Operational complexities for users of airspace		x	N/A	N/A
3.3.5	Number of air passengers / cargo	x			
3.3.6	Flight time savings / Delays	x			
3.3.7	Air Quality	x			
3.3.8	Tranquillity	x			
3.4	<p>Are the traffic forecast and the associate impact analysed proportionately and accurately according to available guidelines (e.g. WebTAG or the Green Book?)</p> <p>The sponsor provides an assessment of the impacts which is proportionate for a Level 2A ACP. To estimate the ten-year traffic forecast (2023-2033) the sponsor uses NATS May 21 STATFOR extended forecast and it is in line with TAG and the Green Book.</p>				
3.5	<p>What is the total monetised impact of 3.3? (Provide comments)</p> <p>The sponsor provides the Net Present Value (benefit) obtained using WebTAG due to the reduction of greenhouse gas emissions per flight:</p> <ul style="list-style-type: none"> Option 4: NPV is £401,907; and Option 6: NPV is £320,999. 				

4. Benefits of ACP					Status
4.1	Does the ACP impact refer to the following groups and how they are impacted by the ACP?				
		Not applicable	Qualitative	Quantified	Monetised
4.1.1	Air Passengers	x			
4.1.2	Air Cargo Users	x			
4.1.3	General aviation users		x	N/A	N/A
4.1.4	Airlines		x	N/A	N/A
4.1.5	Airports		x	N/A	N/A
4.1.6	Local communities	x			
4.1.7	Wider Public / Economy		x	N/A	N/A
4.1.8	Comments: The proposed ACP is not going to change general aviation (GA) access to the extant controlled airspace (CAS) however it might be the case that this ACP will require an increase in CAS in some areas and reduction on others. The sponsor states that the proposed airspace classification has not been defined yet, but it is undertaking a review of the airspace bases aiming to releasing airspaces that is no longer required. The proposed ACP will increase the effective capacity of the airspace and despite its the economic impact will be positive it has not been quantified yet at this stage.				
4.2	How are the above groups impacted by the ACP, especially (but not exclusively) looking at the following factors below:				
4.2.1	Improved journey time for customers of air travel	N/A			
4.2.2	Increase choice of frequency and destinations from airport	N/A			
4.2.3	Reduced price due to additional competition because of new capacity	N/A			
4.2.4	Wider economic benefits	Providing an efficient deconflicted network with added connectivity to UK FIR exit areas yielding capacity benefits and a reduction in ATC complexity. This will increase the resilience of the ATC network.			

4.2.5	Other impacts	N/A
4.2.6	Comments: The main benefit arising from the connectivity to FRA at higher levels is the increased flight planning flexibility. This would allow aircraft operators to flight plan more efficiently and give them the option of avoiding capacity constrained areas, which would translate into the likelihood of less delays and improved resilience of the wider network.	

4.3 **What is the overall monetised impacts associated with 4.1 and 4.2 the above?**
 The sponsor provides the cost benefit analysis table for both options, highlighting the individual benefits of LD1.1 option 4 and option 6 and their combined results/benefits with the implementation of FRA in the above airspace.
 These tables below show that the monetised benefits (net present values over 10 years) of Option 6 are marginally greater than the ones Option 4 will generate, respectively £5,860,352 and £5,817,946.

CAP1616 cost-benefit example - FRA Option 1 implemented at FL305 (LD1 Op4)												
Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	NPV
Discount factor	1	0.965	0.931	0.899	0.867	0.837	0.808	0.779	0.752	0.726	0.700	
Option 1 - Full FRA (100% benefit)												
Net community benefit (CO2)	£36,062	£42,442	£46,250	£49,112	£51,002	£53,065	£54,605	£56,460	£60,564	£64,774	£68,121	
Net airspace users benefit (Fuel)	£173,877	£197,213	£210,025	£216,431	£219,634	£223,295	£225,583	£229,701	£234,734	£238,395	£241,598	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£209,939	£232,753	£241,830	£243,604	£241,464	£239,925	£236,772	£235,460	£237,084	£237,773	£237,307	£2,593,912
LD1.1 Option 4												
Net community benefit (CO2)	£44,821	£52,680	£57,448	£61,022	£63,342	£65,847	£67,831	£70,142	£75,260	£80,538	£84,705	
Net airspace users benefit (Fuel)	£215,974	£244,914	£260,833	£269,180	£272,679	£277,588	£280,641	£285,693	£291,978	£296,358	£300,803	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£260,794	£289,022	£300,343	£302,916	£299,804	£298,141	£294,460	£292,776	£294,828	£295,599	£295,352	£3,224,035
Combined: FRA Op1/LD1.1 Op4												
Net community benefit (CO2)	£80,883	£95,123	£103,698	£110,135	£114,344	£118,913	£122,436	£126,602	£135,824	£145,312	£152,825	
Net airspace users benefit (Fuel)	£389,851	£426,653	£438,475	£436,386	£426,924	£419,153	£408,796	£401,634	£396,088	£388,060	£379,833	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£470,733	£521,775	£542,173	£546,520	£541,269	£538,065	£531,232	£528,236	£531,912	£533,372	£532,659	£5,817,946
CAP1616 cost-benefit example - FRA Option 1 implemented at FL245 (LD1 Op6)												
Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	NPV
Discount factor	1	0.965	0.931	0.899	0.867	0.837	0.808	0.779	0.752	0.726	0.700	
Option 1 - Full FRA (100% benefit)												
Net community benefit (CO2)	£45,693	£53,769	£58,587	£62,233	£64,619	£67,213	£69,189	£71,521	£76,707	£82,024	£86,286	
Net airspace users benefit (Fuel)	£220,092	£249,376	£265,849	£274,543	£278,203	£282,779	£285,982	£291,015	£297,421	£301,539	£306,115	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£265,785	£294,417	£306,152	£308,945	£305,871	£303,850	£300,131	£298,302	£300,368	£300,846	£300,653	£3,285,320
LD1.1 Option 6												
Net community benefit (CO2)	£35,765	£42,094	£45,909	£48,721	£50,601	£52,624	£54,154	£56,001	£60,082	£64,266	£67,675	
Net airspace users benefit (Fuel)	£172,504	£195,620	£208,335	£215,002	£217,797	£221,717	£224,156	£228,191	£233,211	£236,709	£240,260	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£208,269	£230,867	£239,916	£241,929	£239,470	£238,164	£235,169	£233,824	£235,457	£236,041	£235,924	£2,575,031
Combined: FRA Op1/LD1.1 Op6												
Net community benefit (CO2)	£81,458	£95,863	£104,496	£110,954	£115,220	£119,837	£123,344	£127,522	£136,789	£146,290	£153,961	
Net airspace users benefit (Fuel)	£392,596	£429,421	£441,572	£439,920	£430,121	£422,177	£411,957	£404,605	£399,036	£390,597	£382,617	
Net sponsor benefit	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	£474,054	£525,284	£546,068	£550,874	£545,341	£542,014	£535,300	£532,127	£535,825	£536,887	£536,577	£5,860,352

4.4	What are the non-monetised but quantified impacts of the above? (Insert details of description) N/A	
4.5	What are the qualitative / strategic impacts described above? The sponsor states that this proposed airspace change is to modernise the airspace across the west of the London Flight Information Region (FIR). This will reduce complexity in this airspace and, consequently, reduce air traffic control workload and ensure a safe and efficient operation for the future. The implementation of this airspace change is coordinated with Free Route Airspace Deployment 2 (FRA D2), which aims to change the airspace above LD1.1, hence the main benefit arising from the connectivity to FRA at higher levels is the increased flight planning flexibility. This would allow aircraft operators to flight plan more efficiently and give them the option of avoiding capacity constrained areas, which would translate into the likelihood of less delay and improved resilience of the wider network.	
4.6	What is the overall monetised benefits-costs ratio (BCR) of the policy? Is it more than 1? The BCR is equal to 1	
4.7	Have the sponsors provided reasonable justification for the proportionality of analysis above? The airspace change is scaled as a Level 2A ACP. For environmental purposes only CO ₂ and fuel burn impacts require assessing. The sponsor has provided a monetised assessment of CO ₂ impacts using DfT's TAG Greenhouse Gases Workbook. The sponsor also provides a cost benefit analysis of the LD1.1 proposed change and the cumulative impact when considering the implementation and coordination with FRA D2.	
4.8	If the BCR is less than 1, are the quantitative and qualitative strategic impacts proportional to the costs of the ACP? N/A	

5. Other aspects	
5.1	Nil

6. Summary of Assessment of Economic Impacts & Conclusions	
6.1	The proposed airspace change (known as LD1.1) aims to modernise the airspace across the west of the London Flight Information Region (FIR), by reducing the complexity in this airspace and, consequently, reducing the air traffic control workload, ensuring a safe and efficient operation for the future. The implementation of this airspace change is coordinated with Free Route Airspace Deployment 2 (FRA D2), which aims to change the airspace above LD1.1, hence the main benefit arising from the connectivity to FRA at higher levels is the increased flight

planning flexibility. This would allow aircraft operators to flight plan more efficiently and give them the option of avoiding capacity constrained areas, which would translate into the likelihood of less delay and into an improved resilience of the wider network.

The Full Options Appraisal (FOA) fulfils the minimum requirements for a Level 2A ACP, as per CAP1616. The sponsor provides a qualitative and quantitative assessment of the environmental impacts, i.e., CO₂ and fuel burn, and the cost benefit analysis tables. Two options are assessed against the Do-Nothing baseline:

- Option 4 – Systemised routes, FRA above FL305 (FL245 in S9); and
- Option 6 – Systemised routes, FRA above FL245.

Due to the interdependencies of LD1.1 with the FRA D2, the sponsor shows: *i.* the impact that each option would have; and *ii.* the impacts/benefits of each option combined with FRA D2 in the above airspace.

The environmental results show that both options will contribute to a reduction in fuel burn that is translated a reduction in CO₂ emissions, however each individual option if taken in isolation will contribute to lower benefits than when considered in combination with FRA D2. The estimated benefits (net present value, NPV), due to the reduction of greenhouse gas emissions, are respectively equal to £401,907 for Option 4 and £320,999 for Option 6.

In conclusion, the cost benefits analysis shows that the monetised benefits (net present values over 10 years) of Option 6 are marginally greater than the ones Option 4 will generate, respectively £5,860,352 and £5,817,946 when both options are considered in combination with FRA D2. Therefore Option 6 is the preferred option.

Outstanding issues?

Serial	Issue	Action required

CAA Initial Options Appraisal Completed by	Name	Signature	Date
Airspace Regulator (Economist)	[REDACTED]	[REDACTED]	25/08/2021
Airspace Regulator (Environmental)	[REDACTED]	[REDACTED]	26/08/2021