

# CAA CAP 1616 Options Appraisal Assessment (Phase II Full)

<b>Title of airspace change proposal</b>		Liverpool ACP	
<b>Change sponsor</b>		Liverpool John Lennon Airport	
<b>Project no.</b>		2015-09	
<b>Case study commencement date</b>	18/11/2019	<b>Case study report as at</b>	12/12/2019

<b>Account Manager:</b> [Redacted]	[Grey]	<b>Airspace Regulator (Engagement &amp; Consultation):</b> [Redacted]	[Yellow]	<b>IFP:</b> [Redacted]	[Orange]	<b>OGC:</b> [Redacted]	[Dark Blue]
<b>Airspace Regulator (Technical):</b> [Redacted]	[Light Green]	<b>Airspace Regulator (Environmental):</b> [Redacted]	[Purple]	<b>Airspace Regulator (Economist):</b> [Redacted]	[Light Blue]	<b>ATM (Inspector ATS Ops):</b> [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

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**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 produced the Full Options Appraisal that is developed from their Initial Options Appraisal into a more detailed quantitative assessment carried out for both environmental and economic impacts.
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	Cost-benefit analysis conducted by the sponsor include the qualitative impacts in comparison to the 'do nothing' option and in terms of the noise impact the reasonable quantified and monetised assessment.  The sponsor stated it is disproportionate for them to quantify the economic benefit to individual airlines due to many variables associated with an airline's reactionary response to capacity limitations but since they were able to analyse the change in the fuel burn impact, the CAA concluded that it should be possible and proportionate for them to quantify the overall/high-level impact of the change in revenue of commercial airlines due to the given change in fuel burn impact as outlined in TAG Unit A3-Environmental Impact Appraisal. This analysis can be further developed by the sponsor at the Final Stage.  The rest of the impacts such as air quality, training costs, infrastructure and operational costs were assessed in line with CAP 1616 in a qualitative

		<p>manner and with the justification available to explain why it would be disproportionate for the sponsor to quantify such costs.</p>	
1.1.3	<p>Where options have been discounted, does the change sponsor clearly set out why?</p>	<p>The sponsor explained that they were required to run an initial discounting on the comprehensive list of viable options as they have 54 options for both RWY 27 and 09 for the eventual implementation at LJA due to the need of six separate noise assessments per option resulting in over 300 assessments involving weeks of data processing. So, a further round of qualitative assessment was undertaken to reduce these combinations of options and for the shortlist of options the sponsor kept two combinations for RWY 27 and three for RWY 09 which were qualitatively appeared to have the least environmental impact and were most operationally achievable. Their approach and rationale on the scaling the process this way is confirmed by the CAA for FOA.</p> <p>As a result of the quantified/monetised analysis on the shortlisted six operational combinations for the eventual implementation at LJA, the greatest potential environmental and economic benefits are appeared to be brought by options A-R and C-R. However, the sponsor explained the operational assessment was that these were unlikely to be realised due to operational delays that would be incurred in order to coordinate traffic with Hawarden Airfield and they explained further that they felt despite the operational inefficiencies, these two options could not be ruled out as the</p>	<p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>

		WebTAG results ranked these two 1 <sup>st</sup> and 2 <sup>nd</sup> according to their NPV of noise benefits. The sponsor's internal analysis which reports the figures of the savings in fuel burn also reveals that the higher savings in fuel burn would be achieved by these two options. The sponsor selected A-N as preferred option due to the higher benefit in noise and fuel burn in comparison to the rest of options excluding A-R and C-R. Option C-N is ranked 2 <sup>nd</sup> and the rest is ranked in the group of 'alternative options'.	
1.1.4	Has the change sponsor indicated their preferred option in the Options Appraisal (Phase II - Full)? [E23]	The sponsor selected A-N as preferred option due to the higher benefit in noise and fuel burn in comparison to the rest of options excluding A-R and C-R.	<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?	The FOA does not detail what evidence the change sponsor will collect for the next stage as the reasonable analysis is already provided for the shortlisted options. The CAA will highlight other issues that may be improved by the sponsor in this assessment form should the sponsor wants to improve their analysis on the Final Options Appraisal.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

2. Direct impact on air traffic control		Status
2.1	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	<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> There are no quantified impacts to ATC/ATM; all qualitative statements, state 'benefit' from ANSP Operational perspective. Given the process described, you would expect all the shortlisted combination options to offer an operational	

	benefit. There are no costs mentioned. [REDACTED]				
		Not applicable	Qualitative	Quantified	Monetised
2.1.2	Infrastructure changes	X			
2.1.3	Deployment	X			
2.1.4	Training	X			
2.1.5	Day-to-day operational costs / workload / risks	X			
2.1.6	Other (provide details)	X			
2.1.7	<p>Comments</p> <p>The sponsor stated all shortlisted options would bring benefits in terms of infrastructure, operational and deployment costs in comparison to the baseline option. The sponsor informed that the baseline option may be subject to current and future rationalisation programme e.g. TRENT VOR (as explained in FOA) which supports one of the arrival routes for LJLA and no additional infrastructure is required to maintain extant conventional procedures. The sponsor added maintaining access to ground-based equipment that is being removed has been considered by airports elsewhere in the UK and generally found to be prohibitively expensive or technologically infeasible due to equipment obsolescence.</p>				
2.2	<p>Are there direct beneficial impacts on air traffic control / management systems?</p> <p>If so, please provide details and how they have been addressed: Yes; the process described states that all the shortlisted combination options were all considered 'as requiring least ATC intervention and having least impact on neighbouring airports'. [REDACTED]</p>			<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
2.2.1	Examples of benefits considered	Not applicable	Qualitative	Quantified	Monetised
2.2.2	Reduced work-load		X		
2.2.3	Reduced complexity / risk		X		
2.2.4	Other (provide details)	X			

2.2.5	<p>Comments; There should be benefits to introducing these procedures, but they are not detailed in the Table (E2). Operational and capacity benefits are simply stated as have a 'benefit' and 'aligning with the AMS'. It is also stated that there will be 'No additional operational costs are predicted for the implementation of the new IFPs'. [REDACTED]</p> <p>The sponsor stated the shortlisted options would bring benefits in terms of other costs such as change in en-route and taxi delay costs compared to the baseline option. - [REDACTED]</p>	
2.3	<p>Where monetised, what is the net monetised impact on air traffic control (in net present value) over the project period? N/A</p>	
2.4	<p>Are the direct impacts on air traffic management analysed accurately and proportionately?</p> <p>The sponsor hasn't explained why the proposed options would bring benefits in comparison to the baseline in detail but it would be useful for the CAA and the stakeholders why the options would bring benefit by specifying the details for each shortlisted option.</p>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

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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	X	X
3.1.5	Other impacts		X		
3.1.6	<p>Comments</p> <p>The sponsor stated extant procedures have parameters that contribute to higher engine power settings, more track miles and consequently greater emissions. In addition to this, the opportunity to optimise aircraft performance through continuous climb/descent is said to be supported by PBN procedures.</p>				

	In terms of the area flown over / affected, the sponsor mentioned for instance the reason of the selection of option A-N as preferred option is due to the reduced noise impact on the communities of Bebington. The sponsor also said the second preferred option C-N is operationally equivalent to A-N but due to the greater noise impact than A-N in Bebington it was ranked as 2 <sup>nd</sup> preferred option.				
3.2	<p><b>Has the forecasting of traffic done reasonably using best available guidance (e.g. DfT WebTAG, the Green Book, Academic sources...etc?)</b></p> <p>The sponsor has not provided any forecast of traffic. The opening year and forecast year figures of fuel burn and CO2 for the Baseline, and for all options, assume that the fleet flying at LJLA would remain the same and the sponsor used the 2019 figures and predicted figures for the opening year (2021) and for the forecast year (2031) which are based on forecast growth assumptions made by LJLA as part of the Airport Master Plan. However, according to CAP 1616 the process requires traffic forecasts for a period of at least 10 years from the intended year of implementation for all permanent airspace changes. So, the sponsor is suggested to follow CAP 1616 Appendix B31., B32., B33., and B34 for a further development on the Full Options Appraisal.</p>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3	<b>What is the impact of the above changes (3.1) on the following factors?</b>				
		Not applicable	Qualitative	Quantified	Monetised
3.3.1	Noise			X	
3.3.2	Fuel Burn		X	X	
3.3.3	CO2 Emissions		X	X	
3.3.4	Operational complexities for users of airspace	X			
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	<b>Are the traffic forecast and the associate impact analysed proportionately and accurately according to available guidelines (e.g. WebTAG or the Green Book?)</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please see the answer to Question 3.2.

**3.5** **What is the total monetised impact of 3.3? (Provide comments)**  
 The total monetised impact is separately assessed for the noise and the greenhouse impact and the results were presented on the FOA for each shortlisted option as available below:

WebTAG assessment (noise)	Preferred	Preferred Alternative	Alternative 3	Alternative 6	Alternative 4 Env not realistic - delays	Alternative 5 Env not realistic - delays
NPV of change in noise (£, 2019 prices):	£5,570,675	£4,554,822	£4,574,690	£3,858,439	£5,948,503	£5,672,222
NPV of impact on sleep disturbance (£, 2019 prices):	£1,046,305	£755,611	£660,621	£667,675	£1,144,770	£1,621,198
NPV of impact on amenity (£, 2019 prices):	£4,094,341	£3,423,226	£3,586,097	£2,916,996	£4,332,312	£3,641,614
NPV of impact on AMI (£, 2019 prices):	£6,112	£6,112	£5,740	£5,569	£6,407	£6,407
NPV of impact on stroke (£, 2019 prices):	£168,941	£147,422	£128,444	£106,930	£185,308	£160,616
NPV of impact on dementia (£, 2019 prices):	£254,977	£222,450	£193,788	£161,270	£279,706	£242,387

  

WebTAG assessment	AN	CN	AP	CP	AR	CR
Overall Assessment NPV CO2E CO2 Equivalent emissions	£ 4,025	-£ 15,054	-£ 37,867	-£ 93,013	£ 116,465	£ 51,368
Quantitative Assessment NPV CO2 Equivalent emissions	£ 89,846	-£ 36,432	-£ 88,101	-£ 214,447	£ 267,858	£ 115,212

The CAA would suggest the sponsor to calculate the total NPV by using discount factors where necessary. An example of such cost benefit analysis is available on CAP 1616 Appendix E44 and Table E3. That sort of improvement on the current cost-benefit analysis then would give a better view on the overall score of each option shortlisted. The total NPV of the options enable the quick view on the ranking of the options appraised together with the impact on each business user that were anticipated to be affected by the change.

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	X																																																																																	
4.1.4	Airlines			X	X																																																																																	
4.1.5	Airports			X																																																																																		
4.1.6	Local communities			X																																																																																		
4.1.7	Wider Public / Economy			X	X	X																																																																																
4.1.8	<p><b>Comments</b></p> <p>The fuel burn and CO2e impact on GA and airlines were reported in metric tonnes for each shortlisted option and the information is as follows:</p> <table border="1"> <thead> <tr> <th></th> <th>Preferred</th> <th>Preferred Alternative</th> <th>Alternative 3</th> <th>Alternative 6</th> <th>Alternative 4 Env not realistic - delays</th> <th>Alternative 5 Env not realistic - delays</th> <th>Baseline Totals</th> </tr> </thead> <tbody> <tr> <td>Change in annual fuel burn in opening year (metric tonnes)</td> <td>-92</td> <td>20</td> <td>66</td> <td>178</td> <td>-226</td> <td>-114</td> <td>14319</td> </tr> <tr> <td>%Change in annual fuel burn in opening year</td> <td>-0.64%</td> <td>0.14%</td> <td>0.46%</td> <td>1.24%</td> <td>-1.58%</td> <td>-0.80%</td> <td></td> </tr> <tr> <td>Change in annual fuel burn in forecast year (metric tonnes)</td> <td>-107</td> <td>55</td> <td>121</td> <td>284</td> <td>-352</td> <td>-140</td> <td>20767</td> </tr> <tr> <td>% Change in annual fuel burn in forecast year</td> <td>-0.52%</td> <td>0.26%</td> <td>0.58%</td> <td>1.37%</td> <td>-1.69%</td> <td>-0.67%</td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th></th> <th>Preferred</th> <th>Preferred Alternative</th> <th>Alternative 3</th> <th>Alternative 6</th> <th>Alternative 4 Env not realistic - delays</th> <th>Alternative 5 Env not realistic - delays</th> <th>Baseline Totals</th> </tr> </thead> <tbody> <tr> <td>Change in annual CO2 in opening year versus baseline</td> <td>-291</td> <td>64</td> <td>210</td> <td>566</td> <td>-719</td> <td>-363</td> <td>45534</td> </tr> <tr> <td>% Change in annual CO2 in opening year versus baseline</td> <td>-0.64%</td> <td>0.14%</td> <td>0.46%</td> <td>1.24%</td> <td>-1.58%</td> <td>-0.80%</td> <td></td> </tr> <tr> <td>Change in annual CO2 in forecast year versus baseline</td> <td>-341</td> <td>175</td> <td>386</td> <td>903</td> <td>-1119</td> <td>-445</td> <td>66039</td> </tr> <tr> <td>% Change in annual CO2 in forecast year versus baseline</td> <td>-0.52%</td> <td>0.26%</td> <td>0.58%</td> <td>1.37%</td> <td>-1.69%</td> <td>-0.67%</td> <td></td> </tr> </tbody> </table> <p>The FOA mentioned that proposed shortlisted options would bring benefit to airports in terms of en-route and taxi delay costs in comparison to the baseline option.</p>		Preferred	Preferred Alternative	Alternative 3	Alternative 6	Alternative 4 Env not realistic - delays	Alternative 5 Env not realistic - delays	Baseline Totals	Change in annual fuel burn in opening year (metric tonnes)	-92	20	66	178	-226	-114	14319	%Change in annual fuel burn in opening year	-0.64%	0.14%	0.46%	1.24%	-1.58%	-0.80%		Change in annual fuel burn in forecast year (metric tonnes)	-107	55	121	284	-352	-140	20767	% Change in annual fuel burn in forecast year	-0.52%	0.26%	0.58%	1.37%	-1.69%	-0.67%			Preferred	Preferred Alternative	Alternative 3	Alternative 6	Alternative 4 Env not realistic - delays	Alternative 5 Env not realistic - delays	Baseline Totals	Change in annual CO2 in opening year versus baseline	-291	64	210	566	-719	-363	45534	% Change in annual CO2 in opening year versus baseline	-0.64%	0.14%	0.46%	1.24%	-1.58%	-0.80%		Change in annual CO2 in forecast year versus baseline	-341	175	386	903	-1119	-445	66039	% Change in annual CO2 in forecast year versus baseline	-0.52%	0.26%	0.58%	1.37%	-1.69%	-0.67%						
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4.2	<b>How are the above groups impacted by the ACP, especially (but not exclusively) looking at the following factors below:</b>																																																																																					
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	Positively
4.2.5	Other impacts	Positively
4.2.6	Comments	
4.3	<b>What is the overall monetised impacts associated with 4.1 and 4.2 the above?</b> N/A	
4.4	<b>What are the non-monetised but quantified impacts of the above? (Insert details of description)</b> Please refer to the quantified information given for fuel burn and CO2e emissions as an answer to Question 4.1.8.	
4.5	<p><b>What are the qualitative / strategic impacts described above?</b></p> <p>The FOA stated that it may become harder to efficiently integrate LJLA traffic into a system where neighbouring airports and the en-route ATS have adopted PBN as LJLA's reliance on conventional procedures would have a negative impact on the capacity of the overall UK airspace infrastructure due to inefficiencies in integration of this traffic; capacity in the Manchester TMA and at NATS Prestwick Centre in particular could be affected.</p> <p>It is further explained that LJLA would also fail to meet regulatory requirements and would fail to meet the airspace modernisation priorities including coordination with FASI (N). In addition, there is also a potential impact on resilience due to the current reliance on ground-based navigation aids; some of which may be subject to current or future rationalisation programmes. Hence, the sponsor proposed six combined options for RWY 27 and RWY 09 in order to align with AMS.</p>	
4.6	<b>What is the overall monetised benefits-costs ratio (BCR) of the policy? Is it more than 1?</b> N/A	
4.7	<p><b>Have the sponsors provided reasonable justification for the proportionality of analysis above?</b></p> <p>The sponsor hasn't conducted the economic impact of fuel burn change which would be an impact on General Aviation and commercial airlines. So, the CAA would suggest the sponsor to develop their Full Options Appraisal in relation to fuel burn quantification into a more detailed monetised analysis according to CAP 1616 process (Table E2).</p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
4.8	<b>If the BCR is less than 1, are the quantitative and qualitative strategic impacts proportional to the costs of the ACP?</b> N/A	

**5. Other aspects**

5.1	-
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**6. Summary of Assessment of Economic Impacts & Conclusions**

6.1	LJLA completed the Full Options Appraisal which was developed into a more detailed quantified and monetised analysis for the six viable combined options for RWY 27 and RWY 09. The main aim of the sponsor is to enable PBN procedures with regards to capacity and efficiency improvement and to meet with AMS principles. The sponsor carried out a very detailed and comprehensive noise assessment for each shortlisted option by using WebTAG noise workbook for daytime and night time noise assessment which reveals that all the proposed options were predicted to deliver a positive benefit over the baseline option in the forecast year. In terms of the fuel burn impact, proposed options would bring savings in fuel burn and CO2e emissions except the combined options C-N, A-P and C-P provided that from an overall NPV calculations, the increase in CO2e impact of the mentioned 3 options would not be disproportionate compared to greater benefits of reduced noise impact.
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**Outstanding issues?**

Serial	Issue	Action required
1	Traffic Forecasts	The Sponsor should seek to find ways to conduct traffic forecasts for a period of at least 10 years from the intended year of implementation as required under CAP 1616 process (CAP 1616 - Appendix B31., B32., B33. And B34.).
2	Valuing cost and benefits could have been developed in particular with regards to economic impact on GA and commercial airlines due to increased effective capacity, related training costs and subjected ANSP/Airport set-up costs.	The sponsor is suggested to find ways to improve monetisation for such costs in line with CAP 1616 E32. If possible, the sponsor should take a pragmatic approach to valuing the various costs and benefits which sometimes may mean the use of ranges rather than precise figures.
3	Cost-Benefit Analysis	Cost-benefit analysis does not show the total impact for all the monetised impacts listed on the cost benefit summary. So, the sponsor should try to provide the information for total NPV to enable a better comparison. A similar worked example is also available on CAP 1616 Table E3.

<b>CAA Full Options Appraisal Assessment Completed by</b>	Name	Signature	Date
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Airspace Regulator (Technical)	[REDACTED]	[REDACTED]	20/12/2019
Airspace Regulator (Economist)	[REDACTED]	[REDACTED]	20/12/2019
Airspace Regulator (Environmentalist)	[REDACTED]	[REDACTED]	20/12/2019
ATM – Inspector ATS (Ops)			Click or tap to enter a date.