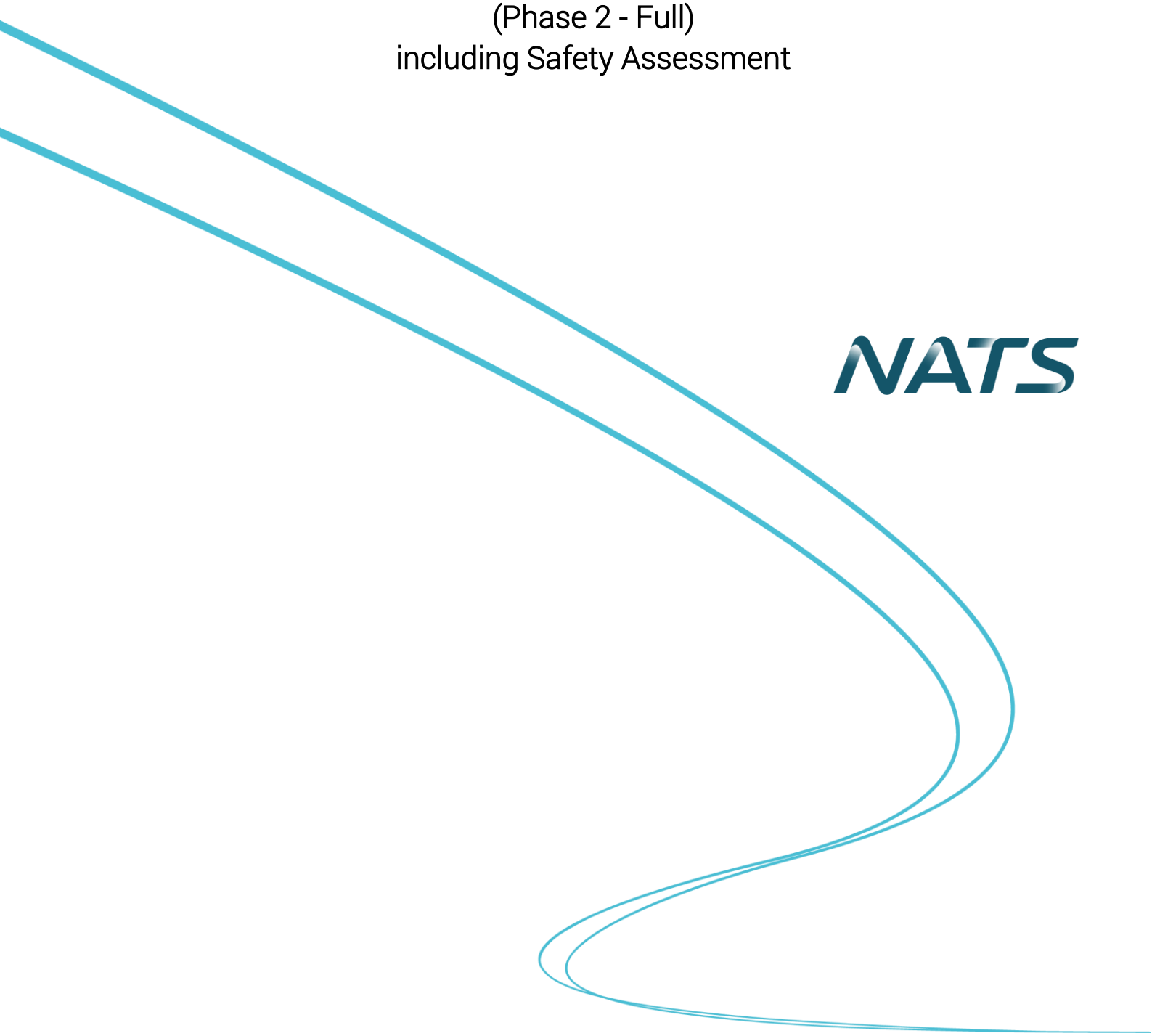
Free Route Airspace Deployment 1

Gateway documentation:
Stage 3 Consult

Step 3 Options Appraisal
(Phase 2 - Full)
including Safety Assessment



Roles

Action	Role	Date
Produced	**Airspace Change Specialist** NATS Future Airspace and ATM	04/09/2019
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Drafting and Publication History

Issue	Month/Year	Changes this issue
1.0	August 2019	Published to the CAA online portal
1.1	Sept 2019	Updated issue to reflect the agreed level of this proposal (2B).
1.2	Sept 2019	Updated following CAA feedback. First published issue.

Contents

1. Introduction

1.1 This document forms part of the document set in accordance with the requirements of the CAP1616 airspace change process.

1.2 This document aims to provide adequate evidence to satisfy CAP1616 Stage 3 Consult Gateway, Step 3 Options Appraisal (Phase 2 Full), including Safety Assessment.

1.3 The implementation of Free Route Airspace (FRA) is a mandated change and as such is not benefits driven.

2. Change Level

2.1 The changes proposed in this ACP impact flights above FL255. Hence in accordance with the Levels as defined in CAP1616, this proposal has been categorised as a Level 2B change.

2.2 In line with the requirements for a Level 2B change the environmental impact assessment has been conducted on the basis of CO_2 emissions. There would be no perceptible change to noise impacts to stakeholders on the ground; hence no noise analysis has been undertaken.

3. Options Appraisal (Phase 2 Full)

3.1 The baseline (do nothing) option does not achieve any improvement, modernisation or meet the mandated legal requirement. The ratings for the baseline option against each design principles are all amber 'no change' except for the Design Principle related to meeting the PCP requirements (DP10) which is not met.

3.2 This ACP proposes three alternative options which could be used to implement FRA in accordance with the mandated requirements.

- FRA Option 1. In which all ATS routes are removed.
- FRA Option 2. In which the ATS route structure is partially maintained.
- FRA Option 3. In which the entire ATS route structure is maintained, but aircraft are not constrained to flight plan the ATS routes within the FRA.

3.3 FRA Option 1 – ATS Routes Removed

FRA Option 1 is intended to comprise a FRA implementation across the Deployment 1 area with all ATS routes removed and RAD restrictions introduced in order to manage the flow of traffic in complex areas and transitioning into and out of FRA.

The CAP1616 Appendix E cost/benefit analysis is given below.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	The proposed changes to air traffic patterns are all above FL255 (circa 25,500ft). This is well above the 7,000ft threshold below which noise impacts are considered significant and analysis is required. The potential noise impacts are neither measurable nor describable.
Communities	Air quality	N/A	No changes below 1,000ft
Wider society	Greenhouse gas impact	Monetise and quantify	The proposed changes could enable a beneficial net reduction of CO_2e emissions of 12,214T in 2021. In 2031 there is forecast to be a reduction of CO_2e emissions of 14,189T for the year. The impact assessment indicates that c.320,103 flights per year would be impacted by the change by 2021, rising to 390,349 in 2031. WebTAG was used to assess the greenhouse gas impact over 10 years subsequent to the implementation of the proposed changes. The proportion of flights with origin and destination within the EU is 72.1%, with the remaining 27.9% originating from or destined to airports outside of the EU. In accordance with CAA guidance[1] the CO_2e emissions for flights within the EU are accounted for in WebTAG as traded (72.1%) and flights whose origin or destination are outside the EU are non-traded (27.9%)[2]. The FRA Option 1 concept would yield a positive Net Present Value benefit due to the reduction in CO_2 emissions per flight. The forecast reduction of CO_2e emissions in the opening year (2021) is 12,214T (traded and non-traded) p.a. which would further decrease to 14,189T of CO_2e saved p.a. in 2031. The monetised NPV benefit calculated by WebTAG due to the reduction in per-flight GHG emissions is £1,578,970. This benefit is the result of shorter average routes due to direct great circle routes in the deployment 1 free route airspace. The additional benefit of reduced fuel uplift and reduced CO_2e emissions due to the corresponding weight reduction have not been included. It must be noted that FRA will only enable this benefit. Actual trajectories planned within FRA will be determined by airspace users. The WebTAG GHG worksheet outputs are shown on page 13 (Appendix A:). Data used in compiling the WebTAG GHG results was as follows: Traffic figures from NATS Analytics report

Year	Number of Movements	PC Phase 2 Cross Border	
		Average Fuel Burn Change per Flight (kg)	Total Fuel Burn Change (kT)
2017	306,714	-24	-7,361
2021	320,103	-24	-7,682

Fuel burn is converted to CO_2e emissions using the ratio 3.18 (i.e. annual 24,429kT CO_2e (2021)). Due to the uncertainty regarding how operators will react and flight-plan within FRA, a conservative approach has been taken and forecast savings have been halved. The figures have been

[1]Guidance from the CAA economic specialist to NATS regarding classification of flights for traded vs non-traded GHG emissions directed that the CO_2e emissions for flights within the EU are accounted for as traded and flights whose origin or destination are outside the EU are non-traded. (email supplied) Note the proportions are derived from analysis of traffic by NATS.

[2] It is not possible to predict how the split may change in the future, hence our assumption is that it remains the same.

			grown year-on-year according to the NATS base traffic forecast figures to 2031 and these figures used as the WebTAG input.
Wider society	Capacity/ resilience	Qualitative	Increased flight planning flexibility would allow aircraft operators to flight plan efficiently and would give them the option of avoiding capacity-constrained areas. As forecast traffic levels grow, the ability to avoid restrictions by utilising alternative flight plan routes would reduce the likelihood of delay, thus improving the resilience of the wider route network.
General Aviation	Access	N/A	GA access to the higher level airspace above FL255 would be unchanged.
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Quantify	N/A – there is no forecast increase in air transport movements, passenger numbers or cargo carried as an outcome of this proposal. The flight-plan options this proposal would introduce could allow airlines to avoid capacity constrained areas and avoid consequential delay and cost. However this is not quantifiable, and no specific capacity increase is assumed or claimed by this proposal.
General Aviation/ commercial airlines	Fuel burn	Monetise	Analysis predicts a decrease in fuel burn, at a saving of £4,014,374 in 2021, increasing to become a saving of £4,663,352 in 2031 (both Net Present Value). This was based on the IATA jet fuel price of 10 May 19, at 669.96 USD per tonne converted to GBP at 0.78$/£ and presumes a constant fuel price and exchange rate. The forecast used was NATS 2018 base-case Forecast for traffic growth.
Commercial airlines	Training cost	N/A	N/A – there is not expected to be any airline training cost associated with FRA.
Commercial airlines	Other costs	N/A	Updates to FMS and flight planning systems will by the routine AIRAC updates. There are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	Qualitative and quantitative	The cost of implementation of the change, adaptation of systems is estimated to be £5 million
Airport/ Air navigation service provider	Operational costs	N/A	This proposal would not lead to changes in operational costs. The overhead associated with maintenance of the route network in the AIP would be reduced. However this benefit is small and not quantified.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	Approximately 120 PC controllers would require training. They would require the NATS simulator facility Support staff are required to run the simulator – data preparation, testing, simulator setup, pseudo pilots, feed sector controllers, training staff, safety analysts, output to be collated into a sim report. Some operational support staff may require briefings. The reduced availability of operational controllers during their conversion training means that operational rostering becomes a factor when considering continuous service delivery. The cost of training is estimated to be £1.5 million. NB NATS cannot quantify training costs for other ANSPs; however their acceptance of this proposal is a high-priority design principle. This proposal cannot be introduced without their agreement and it is assumed that any such training costs are acceptable to these agencies.

3.4 FRA Option 2 – ATS Routes Structure is Partially Maintained

FRA Option 2 comprises an FRA implementation across the Deployment 1 area where ATS routes are partially maintained in order to systemise traffic flows in complex areas. For this implementation option the majority of the impacts in the cost benefit are the same as for option 1. The benefits due to fuel savings and reduction in CO_2 emissions have been judged to be 75% of those for the Option 1.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	(Same as FRA Option 1) The proposed changes to air traffic patterns are all above FL255 (circa 25,500ft). This is well above the 7,000ft threshold below which noise impacts are considered significant and analysis is required. The potential noise impacts are neither measurable nor describable.
Communities	Air quality	N/A	(Same as FRA Option 1) No changes below 1,000ft
Wider society	Greenhouse gas impact	Monetise and quantify	The proposed changes would result in a beneficial net reduction of CO_2e emissions. This is estimated to be 9161T in 2021. In 2031 there is forecast to be a reduction of CO_2e emissions of 10,642T for the year. The impact assessment indicates that c.320,103 flights per year would be impacted by the change in 2021, rising to 390,349 in 2031. WebTAG was used to assess the greenhouse gas impact over 10 years subsequent to the implementation of the proposed changes. The proportion of flights with origin and destination within the EU is 72.1%, with the remaining 27.9% originating from or destined to airports outside of the EU. In accordance with CAA guidance the CO_2e emissions for flights within the EU are accounted for in WebTAG as traded (72.1%) and flights whose origin or destination are outside the EU are non-traded (27.9%). The FRA Option 1 concept would yield a positive Net Present Value benefit due to the reduction in CO_2e emissions per flight. The forecast reduction of CO_2e emissions in the opening year (2021) is 9161T (traded and non-traded) p.a. which would further decrease to 10,642T p.a. after 10 years. The monetised NPV benefit across 10 years calculated by WebTAG due to the reduction in per-flight GHG emissions is £1,184,228. This benefit is the result of shorter average routes due to direct great circle routes in the deployment 1 free route airspace. The additional benefit of reduced fuel uplift and reduced CO_2e emissions due to the corresponding weight reduction have not been included. It must be noted that FRA will only enable this benefit. Actual trajectories planned within FRA will be determined by airspace users. The methodology and data used are as per the FRA Option 1.
Wider society	Capacity/ resilience	Qualitative	Increased flight planning flexibility would allow aircraft operators to flight plan efficiently and would give them the option of avoiding capacity-constrained areas. In capacity constrained areas the route structure would be retained. As forecast traffic levels grow, the retention of some structure would assist in network resilience and capacity. The FRA would give operators the choice of avoiding restrictions by utilising alternative flight plan routes would reduce the likelihood of delay, thus further improving the resilience of the wider route network.
General Aviation	Access	N/A	(Same as FRA Option 1) GA access to the higher level airspace above FL255 would be unchanged.
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Quantify	(Same as FRA Option 1) N/A – there is no forecast increase in air transport movements, passenger numbers or cargo carried as an outcome of this proposal. The flight-plan options this proposal would introduce could allow airlines to avoid capacity constrained areas and avoid consequential delay and cost. However this is not quantifiable, and no specific capacity increase is assumed or claimed by this proposal.

General Aviation/ commercial airlines	Fuel burn	Monetise	Analysis predicts a decrease in fuel burn, at a saving of £3,010,780 in 2021, increasing to become a saving of £3,497,514 in 2031 (both Net Present Value). This was based on the IATA jet fuel price of 10 May 19, at 669.96 USD per tonne converted to GBP at 0.78$/£ and presumes a constant fuel price and exchange rate. The forecast used was NATS 2018 base-case Forecast for traffic growth.
Commercial airlines	Training cost	N/A	(Same as FRA Option 1) N/A – there is not expected to be any airline training cost associated with FRA.
Commercial airlines	Other costs	N/A	(Same as FRA Option 1) Updates to FMS and flight planning systems will by the routine AIRAC updates. There are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	Qualitative and quantitative	(Same as FRA Option 1) The cost of implementation of the change, adaptation of systems is estimated to be £5 million
Airport/ Air navigation service provider	Operational costs	N/A	This proposal would not lead to changes in operational costs. The overhead associated with maintenance of the route network in the AIP would be reduced (to a lesser extent than for Option 1). However this benefit is small and not quantified.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	(Same as FRA Option 1) Approximately 120 PC controllers would require training. They would require the NATS simulator facility. Support staff are required to run the simulator – data preparation, testing, simulator setup, pseudo pilots, feed sector controllers, training staff, safety analysts, output to be collated into a sim report. Some operational support staff may require briefings. The reduced availability of operational controllers during their conversion training means that operational rostering becomes a factor when considering continuous service delivery. The cost of training is estimated to be £1.5 million. NB NATS cannot quantify training costs for other ANSPs; however their acceptance of this proposal is a high-priority design principle. This proposal cannot be introduced without their agreement and it is assumed that any such training costs are acceptable to these agencies.

3.5 FRA Option 3 – ATS Routes Structure is Wholly Retained

FRA Option 3 comprises an FRA implementation across the Deployment 1 area where ATS routes are wholly retained. This gives aircraft operators the option of flying the routes if desired (or not). It also gives ATC the option of using the systemisation afforded by the ATS routes in areas where high traffic densities could impact capacity without systemisation of flows. For this implementation option the CAP1616 Appendix E cost/benefit analysis is given below..

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	(Same as FRA Option 1) The proposed changes to air traffic patterns are all above FL255 (circa 25,500ft). This is well above the 7,000ft threshold below which noise impacts are considered significant and analysis is required. The potential noise impacts are neither measurable nor describable.
Communities	Air quality	N/A	(Same as FRA Option 1) No changes below 1,000ft
Wider society	Greenhouse gas impact	Monetise and quantify	The proposed changes would result in a beneficial net reduction of CO_2e emissions. This is estimated to be of 4886T in 2021. In 2031 there is forecast to be a reduction of CO_2e emissions of 5676T for the year. The impact assessment indicates that c.320,103 flights per year would be impacted by the change by 2021, rising to 390,349 in 2031. WebTAG was used to assess the greenhouse gas impact over 10 years subsequent to the implementation of the proposed changes. The proportion of flights with origin and destination within the EU is 72.1%, with the remaining 27.9% originating from or destined to airports outside of the EU. In accordance with CAA guidance the CO_2e emissions for flights within the EU are accounted for in WebTAG as traded (72.1%) and flights whose origin or destination are outside the EU are non-traded (27.9%). The FRA Option 1 concept would yield a positive Net Present Value benefit due to the reduction in CO_2e emissions per flight. The forecast reduction of CO_2e emissions in the opening year (2021) is 4886T (traded and non-traded) p.a. which would further decrease to 5676T p.a. after 10 years. The monetised NPV benefit calculated by WebTAG due to the reduction in per-flight GHG emissions is £631,588. This benefit is the result of shorter average routes due to direct great circle routes in the deployment 1 free route airspace. The additional benefit of reduced fuel uplift and reduced CO_2e emissions due to the corresponding weight reduction have not been included. It must be noted that FRA will only enable this benefit. Actual trajectories planned within FRA will be determined by airspace users. The methodology and data used are as per the FRA Option 1.
Wider society	Capacity/ resilience	Qualitative	Increased flight planning flexibility would allow aircraft operators to flight plan efficiently and would give them the option of avoiding capacity-constrained areas. In capacity constrained areas the route structure would be retained. As forecast traffic levels grow, the retention of the ATS route structure would assist in network resilience and capacity. Having the option available to ATC to use the existing route structure to systemise the traffic flows in complex areas. The FRA would give operators the choice of avoiding restrictions by utilising alternative flight plan routes which would reduce the likelihood of delay, thus further improving the resilience of the wider route network.
General Aviation	Access	N/A	(Same as FRA Option 1) GA access to the higher level airspace above FL255 would be unchanged.
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Quantify	(Same as FRA Option 1) N/A – there is no forecast increase in air transport movements, passenger numbers or cargo carried as an outcome of this proposal. The flight-plan options this proposal would introduce could allow airlines to avoid capacity constrained areas and avoid consequential delay and cost. However this is not quantifiable, and no specific capacity increase is assumed or claimed by this proposal.

General Aviation/ commercial airlines	Fuel burn	Monetise	Analysis predicts a decrease in fuel burn, at a saving of £1,605,749 in 2021, increasing to become a saving of £1,865,341in 2031 (both Net Present Value). This was based on the IATA jet fuel price of 10 May 19, at 669.96 USD per tonne converted to GBP at 0.78$/£ and presumes a constant fuel price and exchange rate. The forecast used was NATS 2018 base-case Forecast for traffic growth.
Commercial airlines	Training cost	N/A	(Same as FRA Option 1) N/A – there is not expected to be any airline training cost associated with FRA.
Commercial airlines	Other costs	N/A	(Same as FRA Option 1) Updates to FMS and flight planning systems will by the routine AIRAC updates. There are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	Qualitative and quantitative	(Same as FRA Option 1) The cost of implementation of the change, adaptation of systems is estimated to be £5 million
Airport/ Air navigation service provider	Operational costs	N/A	This proposal would not lead to changes in operational costs. The overhead associated with maintenance of the route network in the AIP would remain (unlike for Option 1 & 2). Hence there would be no change from extant for this option.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	(Same as FRA Option 1) Approximately 120 PC controllers would require training. They would require the NATS simulator facility. Support staff are required to run the simulator – data preparation, testing, simulator setup, pseudo pilots, feed sector controllers, training staff, safety analysts, output to be collated into a sim report. Some operational support staff may require briefings. The reduced availability of operational controllers during their conversion training means that operational rostering becomes a factor when considering continuous service delivery. The cost of training is estimated to be £1.5 million. NB NATS cannot quantify training costs for other ANSPs; however their acceptance of this proposal is a high-priority design principle. This proposal cannot be introduced without their agreement and it is assumed that any such training costs are acceptable to these agencies.

Cost Benefit Comparison

The monetised benefits of each of the three options have been compared in the cost benefit analysis below. (note, there are no significant differences in the cost of implementation of the options).
The discount rate of 3.5% has been applied as per the standard rate given in the Treasury Green Book Annex A6.)

There is a significant degree of uncertainty in predicting how aircraft operators will use FRA. This has an impact on the relative magnitude of the benefit apportioned to each option. The justification for the allocation of benefits is described below:

Option 1 - Full FRA (100% benefit). With no route structure it is assumed that aircraft operators would flight plan direct great-circle routes where able, subject to RAD restrictions. This was the basis of the computer simulations and hence 100% benefit is apportioned.

Option 2 - Partial Routes (75% benefit). With an ATS route structure partially maintained, aircraft operators would be required to use these routes subject to RAD restrictions, where necessary and hence would not be able to flight plan direct great-circle routes in all cases. This would dilute the benefit of FRA. Using ATC expertise and experience[3] it was considered that the 75% of the benefit calculated for Full FRA would be likely to be realised by this option.

[3] From operation of the Direct Route Airspace since 2015, and experience of other ANSPs who have implemented FRA with ATS routes in place.

Option 3 - All routes retained (40% benefit). With the existing ATS route structure fully maintained, aircraft operators could flight plan via the existing routes or via direct great-circle routes, subject to RAD restrictions. Using ATC expertise and experience[4] it was considered that many flights would not utilise the FRA and as such that 40% of the benefit calculated for Full FRA would be likely to be realised by this option.

CAP1616 cost-benefit example												
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Year	0	1	2	3	4	5	6	7	8	9	10	NPV
Discount Rate (3.5%)	1	0.9662	0.9335	0.9019	0.8714	0.8420	0.8135	0.7860	0.7594	0.7337	0.7089	
Option 1 - Full FRA (100% benefit)												
Net community benefit (CO2)	£208,848	£248,884	£285,877	£320,757	£353,568	£387,903	£418,508	£447,099	£474,182	£501,403	£533,212	
Net airspace users benefit (Fuel)	£4,014,374	£4,113,103	£4,182,585	£4,244,039	£4,299,712	£4,391,102	£4,455,432	£4,514,318	£4,573,083	£4,630,291	£4,663,352	
Net sponsor benefit	-£6,500,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	-£2,276,778	£4,222,897	£4,190,364	£4,148,637	£4,100,519	£4,085,093	£4,043,005	£3,995,311	£3,947,034	£3,898,791	£3,839,150	£38,194,025
Option 2 - Partial Routes (75% benefit)												
Net community benefit (CO2)	£156,636	£186,663	£214,408	£240,568	£265,176	£290,928	£313,881	£335,324	£355,637	£376,052	£399,909	
Net airspace users benefit (Fuel)	£3,010,780	£3,084,827	£3,136,939	£3,183,029	£3,224,784	£3,293,326	£3,341,574	£3,385,738	£3,429,812	£3,472,718	£3,497,514	
Net sponsor benefit	-£6,500,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	-£3,332,584	£3,167,173	£3,142,773	£3,111,478	£3,075,389	£3,063,820	£3,032,254	£2,996,483	£2,960,276	£2,924,094	£2,879,363	£27,020,519
Option 3 - All routes retained (40% benefit)												
Net community benefit (CO2)	£83,539	£99,554	£114,351	£128,303	£141,427	£155,161	£167,403	£178,839	£189,673	£200,561	£213,285	
Net airspace users benefit (Fuel)	£1,605,749	£1,645,241	£1,673,034	£1,697,616	£1,719,885	£1,756,441	£1,782,173	£1,805,727	£1,829,233	£1,852,117	£1,865,341	
Net sponsor benefit	-£6,500,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	
Present value	-£4,810,711	£1,689,159	£1,676,146	£1,659,455	£1,640,208	£1,634,037	£1,617,202	£1,598,125	£1,578,814	£1,559,517	£1,535,660	£11,377,610

In summary Option 1 is the preferred option with NPV benefits to 2031 of:

Option 1 NPV benefit = £38.2m

Option 2 NPV benefit = £27.0m

Option 3 NPV benefit = £11.4m.

[4] Particularly from experience of other ANSPs who have implemented FRA with all ATS routes in place.

4. Safety Assessment

4.1 Options Appraisal Safety Assessment - Baseline

The current operation employs a published route structure and airline operators flight-plan to follow available routes. The published routes are supportive of strategic de-confliction between flights against active Special Use Airspace volumes (such as Danger Areas) and airspace with constrained radiotelephony or surveillance coverage. The routes also provide an operational framework that is conducive to Air Traffic Controllers' familiarity with traffic patterns, potential conflict points and practices for conflict avoidance/resolution. Flights into and out of the airspace volume (i.e. across boundaries with other Sectors and Air Traffic Control Units) are nominally managed via published waypoints.

In addition to flights following routes, some may be instructed to take a more direct path through the airspace. This is done in a tactical manner by Air Traffic Controllers based on their judgement that a different path can be followed safely.

Air Traffic Controllers are supported in their task by equipment functionality ('tools') that includes prediction of the trajectories that aircraft will follow. Predicted trajectories can be viewed by Controllers, and the tools use the former to identify potential areas of conflict for Controllers' attention. The tools also monitor the conformance of aircraft to their expected trajectories and highlight deviations. The tools support the Controllers in ensuring that the aircraft pass through the airspace safely separated from other aircraft, Danger Areas, and so on.

4.2 Options Appraisal Safety Assessment

Project activities so far have included Real Time Simulations (Development and Pre-ACP Validation) and associated Safety and Human Factors workshops.

The initial work[5] that has been done has indicated that the Air Traffic Controllers regard the FRA mode of operation as being very similar to that experienced today. Key factors underlying this are that direct routings that are (tactically) provided today are expected to be reflected in flight plans and that the tools will continue to support Controllers in foreseeing and resolving potential conflicts. Although reduced familiarity with where conflicts may occur is a possibility (due to the removal of the route structure) the tools are designed to provide adequate support in discerning and managing changes in this aspect.

A qualitative high-level safety appraisal indicates that nothing is presently foreseen in the three FRA options being proposed for consultation, which appears to have the potential to preclude maintenance of the existing level of safety performance undertaken within the current operation.

[5] It has not yet been possible to fully involve all ATC parties (such as the Military) or to exercise the final form of equipment functionality.

5. Conclusion and Next Steps

5.1 This proposal has been developed following the submission of a Statement of Need, reference DAP1916-2361. Its text was:

> In response to SESAR PCP Implementing Regulation EU716/2014, NATS intends to implement Free Route Airspace (FRA) in a phased manner across UK airspace. The SESAR PCP ATM Functionality 3 (AF3) states that Free Route shall be provided and operated in the airspace for which the Member States are responsible at and above flight level 310 in the ICAO EUR region by 1st January 2022. This ACP proposes the introduction of the first deployment of FRA across the majority of the Prestwick FIR in order to comply with this Implementing Regulation within the required timescale.

5.2 This document describes options which address the Statement of Need by the proposed introduction of Free Route Airspace across the majority of the Scottish UIR. This will meet PCP mandated requirements and Borealis Alliance commitments in respect of implementation of FRA.

5.3 Additionally, the options have been developed thus far with significant assistance, input, feedback and effort from senior MoD staff, senior representatives of all bordering ANSPs, representatives from airlines and flight planning service providers.
NATS thanks all these stakeholders and looks forward to continuing the development of this proposal.

5.4 Three options have been appraised and feedback on these will be requested from stakeholders during consultation.

5.5 Subject to CAA approval at the Stage 3 Gateway Assessment, this proposal will move on to Stage 3C - Consultation.

6. Appendix A: WebTAG Calculations for FRA Deployment 1

The data used for the inputs to WebTAG are given below.

6.1 Traffic forecasts

	Base Forecast	
Year	Base Growth Flights (000's)	Base Growth Rate
2021	2669	2.27%
2022	2735	2.46%
2023	2781	1.69%
2024	2822	1.47%
2025	2859	1.31%
2026	2919	2.13%
2027	2962	1.47%
2028	3001	1.32%
2029	3040	1.30%
2030	3079	1.25%
2031	3101	0.71%

Table 1 Base Case forecast traffic growth 2021-2031

The figures in Table 1 give the standard NATS base case traffic growth forecast for 2021 to 2031.

6.2 Computer modelling results

Year	Flights per year in FRA D1 area	Simulated Fuel saving (T)	Simulated CO_2 saving (T)	CO_2 saving /2	CO_2 saving traded 72.1%	CO_2 saving non-traded 27.9%	Fuel saving /2 (USD)	Fuel saving /2 (GBP)
2021	320,103	7,682	24,429	12,214	8,807	3,408	2,573,316	2,007,187
2022	327,849	7,871	25,030	12,515	9,023	3,492	2,636,605	2,056,552
2023	336,047	8,004	25,452	12,726	9,176	3,551	2,681,144	2,091,292
2024	343,378	8,121	25,826	12,913	9,310	3,603	2,720,538	2,122,020
2025	349,429	8,228	26,165	13,083	9,433	3,650	2,756,226	2,149,856
2026	354,548	8,403	26,721	13,361	9,633	3,728	2,814,809	2,195,551
2027	363,995	8,526	27,113	13,556	9,774	3,782	2,856,046	2,227,716
2028	371,376	8,639	27,471	13,736	9,903	3,832	2,893,793	2,257,159
2029	378,265	8,751	27,829	13,914	10,032	3,882	2,931,463	2,286,541
2030	384,800	8,861	28,177	14,088	10,158	3,931	2,968,135	2,315,146
2031	390,349	8,924	28,378	14,189	10,230	3,959	2,989,328	2,331,676

Table 2 Computer simulation results

The results calculated by NATS Analytics for the fuel saving and CO_2 savings (with 100% of the benefit realised) are given in Table 2, columns 3 and 4. Due to the uncertainties regarding how airlines will use the FRA, and to account for the use of tactical direct routings which occur in the current day operation, these figures have been halved in columns 5-9. This is to reduce any risk that benefits are over-stated.

6.3 WebTAG GHG Workbook output

Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NATS FRA Deployment 1

Present Value Base Year	2010
Current Year	2019
Proposal Opening year:	2021
Project (Road/Rail or Road and Rail):	road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£): £1,578,970

*positive value reflects a **net benefit** (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes): -146,295
(between 'with scheme' and 'without scheme' scenarios)

Of which Traded -105479

Change in carbon dioxide equivalent emissions in opening year (tonnes): -12,214
(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£): £2,601,273
(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a **net benefit** (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	-17829.72	-47325.68
Non-traded sector	0	0	-6899.44	-18313.26

Qualitative Comments:

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £2,368,455

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £789,485

Data Sources:
NATS FRA emissions analysis using AirTop Simulation
Traffic data: EUROCONTROL's Network Strategic Tool (NEST)
Aircraft performance: BADA v3.13/v4.2