Swanwick Airspace Improvement Programme
Airspace Development 5
LAC West – ATS Route Connectivity Improvements

SAIP AD5 LAC West Connectivity

Gateway documentation:
Stage 3 Consult

Steps 3A and 3B Full Options Appraisal

NATS Uncontrolled

Roles

Action	Role	Date
Produced	Airspace Change Specialist NATS Future Airspace and ATM	11/01/2019
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References

Ref No	Description	Hyperlinks
1	SAIP AD5 CAA web page – progress through CAP1616	(link)
2	Stage 1 Statement of Need	(link)
3	Stage 1 Assessment Meeting Presentation	(link)
4	Stage 1 Assessment Meeting Minutes	(link)
5	Stage 1 Design Principles	(link)
6	Stage 2 Design Options	(link)
7	Stage 2 Design Principle Evaluation	(link)
8	Stage 2 Initial Options Safety Appraisal	(link)
9	Stage 2 Level 1 Compliance Paper	(link)
10	Stage 3 Consultation Strategy	(link)

Contents

1. Introduction

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

This document aims to provide adequate evidence to satisfy
Stage 3 Consult Gateway, Step 3A Draft Consultation Document.
See Stage 1 Gateway Design Principles for full details of the proposed Design Principles [Ref 5]. The design options were assessed against each of the Design Principles, as described in the Stage 2 Design Principle Evaluation [Ref 7].

Previous documents [Refs 6, 7, 8] alongside stakeholder engagement [Ref 10] have reduced the number of design options to a shortlist of four. Since Stage 2 these final four designs have changed slightly, as a result of feedback from development simulations and operational experts. We are proposing to split two of the four proposed blocks of CAS around EGBB vertically, with the upper sections (FL105 – FL145 for the northern block; and FL155 – FL195 for the southern block) available H24. This will enable increased vectoring however we do not anticipate this negatively impacting any stakeholders.

NATS have specified a preferred design, which is termed Design Option 1B; this seeks to maximise flexibility for controllers facilitating Birmingham traffic through a larger volume of CAS and appropriate FUA timings. It also proposes additional routes and CAS for Birmingham arrivals and departures; a unidirectional tactical offload route and CAS for Heathrow arrivals; and a number of new high-level ATS Routes. As mentioned above, alongside the other three options, our proposed design has changed slightly since the Stage 2 documents. We are proposing to vertically split two of the four blocks of CAS around EGBB.

2. Level 1 vs Level 2, and scalability

2.1 The following options in this proposal would technically be a Level 1 airspace change under CAP1616. This is due to the proposed CAS volume close to Birmingham International Airport, with a base of FL65. This would not change commercial aircraft traffic patterns below 7,000ft but could, potentially theoretically, change some GA traffic patterns, outside CAS, below 7,000ft.

2.2 We analysed radar data for June 2018 in the vicinity of the lowest proposed CAS volume. In that region, 94% (4,904) of relevant transponding aircraft operated at FL65 or lower. This means only 6% (284) of such flights would be affected by this proposed change. We contend that the actual impact is likely to be even lower, as the proposal would only affect GA flights during FUA hours of activation, excluding all flights operating in core weekday daytime hours. The numbers operating outside the peak of summer would also likely be far smaller.

2.3 Only the transponder codes of aircraft outside of controlled airspace (CAS), not participating in an air traffic service, are recorded, hence analysis of aircraft types is not possible. However, typically the types of aircraft operating at the levels in question, outside CAS, would be small, private, piston-engined General Aviation aircraft.

2.4 The impacts of implementing CAS at FL65 could be one of three possibilities:

- Such flights descend to cross the base at FL65 or thereabouts;
- They route around the new CAS at their previous level (no change in noise impact); or
- They request a clearance from ATC to enter the proposed CAS at their current level (above FL65, no change in noise impact).

It is impossible to predict what proportion of the potential maximum 6% would choose which of these courses of action.

2.5 Describing the potential noise or visual impacts to people on the ground of a potential descent to FL65 of a small number of outside-CAS light aircraft traffic, types unknown, is not realistically possible. The greatest likelihood is that changes to such noise or visual impacts would not be discernible.
94% of outside-CAS flights in the region are below FL65 and would remain so, which would be far more

noticeable to an observer on the ground than some of the 6% of flights at higher levels which would descend to c.FL65, the rest of the 6% could maintain the same level as per the previous paragraph.

2.6 We assess that noise metrics are not possible to measure given this scenario (or are well below the thresholds usually prescribed for noise impact studies). Thus there would be no discernible change in impact on the subject of tranquillity and also no discernible change in impact on the subject of biodiversity. There are no changes below 1,000ft and therefore no impacts on local air quality.

2.7 NATS provided an additional paper (Ref 9) demonstrating compliance with CAP1616 under the unusual circumstances of a provisional Level 2 proposal becoming a Level 1 proposal at Stage 2. This document provided adequate evidence to satisfy compliance with Stage 1 requirements in respect of stakeholder engagement on Design Principles. It also provided adequate evidence that there would be no discernible change in impact for ground-based stakeholders.
This was provided as part of our evidence base for Stage 2 which was passed in January 2019.

2.8 We contend that the environmental analysis requirements for this proposal should be scaled equivalent to a Level 2 change, i.e. CO_2 emissions only. The following Options Appraisal (Phase 1 Initial) has been written in this manner.

3. Options Appraisal (Phase 2 Full)

3.1 The baseline (do nothing) option does not achieve any kind of improvement, modernisation or systemisation. Design principles are met by default, i.e. 'no change' hence their evaluations are mostly amber (partially met).

3.2 The final four combined design options all focus on the following areas of airspace development:

- Establish appropriate CAS and ATS Routes for Birmingham arrivals and departures via the MOSUN area
- Provision of offload route(s) and appropriate CAS for some traffic inbound to Heathrow
- Establish or revise a number of high-level ATS Routes in the West End Sector Group
- Amend the boundary of TRA 002, in conjunction with the MoD

3.3 The four options differ as described below:

3.3.1 NATS preferred option - Design Option 1B:
a larger Class C/ D volume near Birmingham; with Class C/ D for the other volumes;
active evenings/ overnights/ mornings during weekdays and active H24 at weekends (except for the additional H24 vertical splits of CAS covered in Paragraph 3.4 below).
This is NATS preferred option as it provides maximum flexibility for ATC.

3.3.2 Design Option 1A:
a larger Class C/ D volume near Birmingham, with Class C/ D for the other volumes;
active evenings/ overnights/ mornings, 7 days a week (except for the additional H24 vertical splits of CAS covered in Paragraph 3.4 below).

3.3.3 Design Option 2A:
a smaller Class C/ D volume near Birmingham; with Class C/ D for the other volumes;
active evenings/ overnights/ mornings, 7 days a week (except for the additional H24 vertical splits of CAS covered in Paragraph 3.4 below).

3.3.4 Design Option 2B:
a smaller Class C/ D volume near Birmingham; with Class C/ D for the other volumes;
active evenings/ overnights/ mornings during weekdays and active H24 at weekends (except for the additional H24 vertical splits of CAS covered in Paragraph 3.4 below).

3.4 Since the Stage 2 submission, we are also proposing an additional change across all four of the above design options. We are proposing to split two of the four proposed blocks of CAS around EGBB vertically, with the upper sections (FL105 – FL145 for the northern block; and FL155 – FL195 for the southern block) available H24.

3.5 These additional proposed upper sections of H24 CAS do not have any impact on the options appraisal presented herein. The proposed H24 CAS would all be above 7,000ft hence not having any impact to communities on the ground. They would not affect the environmental impact of this overall proposal as the proposed routes would all be contained within the lower sections of CAS, which would operate under FUA timings. The upper sections of H24 CAS would be used for tactical vectoring. The impact on GA would also be caused by the lower sections of FUA CAS, rather than the upper H24 sections.

3.6 The main difference between the above design options is the increased net saving in fuel burn and CO_2 emissions that Design Options 1B (NATS' preferred option) and 2B would offer, in comparison to Design Options 1A and 2A. This is due to the increased FUA timings, enabling an increased environmental benefit.

3.7 On top of the aforementioned environmental benefit, NATS' preferred Design Option 1B (and 1A) also contain a larger block of Class C/ D CAS which provides increased ATC flexibility, when compared to Design Options 2A or 2B.

3.8 The following four tables were based on key analyses described in CAP1616 Table E2 on pages 160-162. These tables compare the four design options with the baseline do-nothing scenario.

3.9 Design Option 1B – NATS preferred option

A larger Class C/ D volume near Birmingham with Class C/ D for the other volumes;
Birmingham, Heathrow routes and CAS active evenings/ overnights/ mornings during weekdays and active H24 at weekends;
except for the H24 upper section of two blocks of CAS around Birmingham.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	Changes to commercial air traffic patterns are all above 7,000ft. The potential noise impacts caused by a small number of non-commercial GA-type flights, descending to FL65 at certain times under certain conditions, is 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 would result in a beneficial net saving in fuel burn of -1,806T in 2020, for the associated regions. In 2030 there would be an increased forecast fuel burn saving of -2,238T for the year. The impact assessment indicates that c.184, 000 flights would be impacted by the change by 2030. The forecast used was NATS 2017 Annual Base Forecast to produce the annualised numbers. WebTAG was used to assess the greenhouse gas impact over time from the proposed changes, for the traded sector. This design option would yield a positive Net Present Value which reflects a benefit i.e. a CO_2 emissions reduction. There would be a reduction of CO_2 in the opening year (2020) of -5,743T which would further decrease to -72,252T over a 60 year appraisal period. WebTAG was also used to show the overall Net Present Value of CO_2 emissions reduction for the traded sector was calculated at £788,142. Traded and non-traded flights were categorised as intra-EU for traded (72.1%) and all other flights as non-traded (27.9%). These figures were calculated by looking at the origin and destination for UK arrivals, departures and overflights, in 2017. These benefits have arisen from the proposed shorter routes for Birmingham arrivals/ departures and the new high-level ATS routes which offer more direct routings and therefore less track mileage. The proposed Heathrow offload route will result in a small increase of fuel usage and CO_2; however there is a still an overall benefit and large reduction in fuel/ CO_2. The worksheet outputs are shown on Page 18. (Appendix A: WebTAG Output for Design Options 1B (NATS' preferred option) and 2B)
Wider society	Capacity/ resilience	Qualitative	Increased flightplanning options can allow aircraft operators to avoid capacity-constrained areas. As forecast traffic levels grow, the ability to avoid restrictions by utilising alternative flightplan routes would reduce the likelihood of delay, thus improving the resilience of the wider route network.
General Aviation	Access	N/A	The main change in impact to GA users would be from the most northern block of new proposed CAS, near to Birmingham. This has been proposed as having a base of FL65 and up to FL145. It would increase the area Birmingham radar can use for tactical vectoring, for their arrivals and departures. The CAS volume is proposed as Class C/ D which allows for VFR GA transit, partially mitigating the potential impact. The GA use of this airspace is dependent on weather conditions and seasonality, but can be assumed to exist generally throughout the year. This proposal is expected to cause a relatively low impact on GA users with 94% of GA currently flying at FL65 or lower, in this region. Design Option 1B would establish a larger CAS volume at low level, active more often than Design Option 1A. All four options could account for the establishment of a notifiable segregation mechanism, if required for planned special events in specific

			geographical areas, further mitigating potential impacts on GA access.
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 flightplan 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 by this proposal.
General Aviation/ commercial airlines	Fuel burn	Monetise	Analysis predicts a decrease in fuel usage and burn, at a saving of £759,311in 2020, increasing to become a saving of £940,940 in 2030 (both Net Present Value). This was based on the IATA jet fuel price of 28 Dec 18, at 532.2 USD per tonne converted to GBP at 0.79$/£ and presumes a constant fuel price and exchange rate. The forecast used was NATS 2017 Annual Base Forecast.
Commercial airlines	Training cost	N/A	N/A – it is not proportionate to attempt to quantify airline training costs.
Commercial airlines	Other costs	N/A	N/A – there are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	N/A	N/A – there would be no costs attributable to infrastructure.
Airport/ Air navigation service provider	Operational costs	N/A	N/A – this proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	Approximately 140 LAC/ LTC controllers would require full 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. 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.

3.10 Design Option 1A

A larger Class C/ D volume near Birmingham, with Class C/ D for the other volumes;
Birmingham, Heathrow routes and CAS active evenings/ overnights/ mornings, 7 days a week;
except for the H24 upper section of two blocks of CAS around Birmingham.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	Changes to commercial air traffic patterns are all above 7,000ft. The potential noise impacts caused by a small number of non-commercial GA-type flights, descending to FL65 at certain times under certain conditions, is 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 would result in a beneficial net saving in fuel burn of -1,732T in 2020, for the associated regions. In 2030 there would be an increased forecast fuel burn saving of -2,157T for the year. The impact assessment indicates that c.184, 000 flights would be impacted by the change by 2030. The forecast used was NATS 2017 Annual Base Forecast to produce the annualised numbers. WebTAG was used to assess the greenhouse gas impact over time from the proposed changes, for the traded sector. This design option would yield a positive Net Present Value which reflects a benefit i.e. a CO_2 emissions reduction. There would be a reduction of CO_2 in the opening year (2020) of -5,508T which would further decrease to -69,742T over a 60 year appraisal period. WebTAG was also used to show the overall Net Present Value of CO_2 emissions reduction for the traded sector was calculated at £760,627. Traded and non-traded flights were categorised as intra-EU for traded (72.1%) and all other flights as non-traded (27.9%). These figures were calculated by looking at the origin and destination for UK arrivals, departures and overflights, in 2017. These benefits have arisen from the proposed shorter routes for Birmingham arrivals/ departures and the new high-level ATS routes which offer more direct routings and therefore less track mileage. The proposed Heathrow offload route will result in a small increase of fuel usage and CO_2; however there is a still an overall benefit and large reduction in fuel/ CO_2. The worksheet outputs are shown on Page 19. (Appendix B: WebTAG Output for Design Options 1A and 2A)
Wider society	Capacity/ resilience	Qualitative	Increased flightplanning options can allow aircraft operators to avoid capacity-constrained areas. As forecast traffic levels grow, the ability to avoid restrictions by utilising alternative flightplan routes would reduce the likelihood of delay, thus improving the resilience of the wider route network.
General Aviation	Access	N/A	The main change in impact to GA users would be from the most northern block of new proposed CAS, near to Birmingham. This has been proposed as having a base of FL65 and up to FL145. It would increase the area Birmingham radar can use for tactical vectoring, for their arrivals and departures. The CAS volume is proposed as Class C/ D which allows for VFR GA transit, partially mitigating the potential impact. The GA use of this airspace is dependent on weather conditions and seasonality, but can be assumed to exist generally throughout the year. This proposal is expected to cause a relatively low impact on GA users with 94% of GA currently flying at FL65 or lower, in this region. Design Option 1A would establish a larger CAS volume at low level, but active less often than Design Option 1B. All four options could account for the establishment of a notifiable segregation mechanism, if required for planned special events in specific geographical areas, further mitigating potential impacts on GA access.

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 flightplan 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 by this proposal.
General Aviation/ commercial airlines	Fuel burn	Monetise	Analysis predicts a decrease in fuel usage and burn, at a saving of £728,199in 2020, increasing to become a saving of £906,885 in 2030 (both Net Present Value). This was based on the IATA jet fuel price of 28 Dec 18, at 532.2 USD per tonne converted to GBP at 0.79$/£ and presumes a constant fuel price and exchange rate. The forecast used was NATS 2017 Annual Base Forecast.
Commercial airlines	Training cost	N/A	N/A – it is not proportionate to attempt to quantify airline training costs.
Commercial airlines	Other costs	N/A	N/A – there are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	N/A	N/A – there would be no costs attributable to infrastructure.
Airport/ Air navigation service provider	Operational costs	N/A	N/A – this proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	Approximately 140 LAC/ LTC controllers would require full 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. 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.

3.11 Design Option 2A

A smaller Class C/ D volume near Birmingham with Class C/ D for the other volumes; Birmingham, Heathrow routes and CAS active evenings/ overnights/ mornings, 7 days a week; except for the H24 upper section of two blocks of CAS around Birmingham.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	Changes to commercial air traffic patterns are all above 7,000ft. The potential noise impacts caused by a small number of non-commercial GA-type flights, descending to FL65 at certain times under certain conditions, is 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 would result in a beneficial net saving in fuel burn of -1,732T in 2020, for the associated regions. In 2030 there would be an increased forecast fuel burn saving of -2,157T for the year. The impact assessment indicates that c.184, 000 flights would be impacted by the change by 2030. The forecast used was NATS 2017 Annual Base Forecast to produce the annualised numbers. WebTAG was used to assess the greenhouse gas impact over time from the proposed changes, for the traded sector. This design option would yield a positive Net Present Value which reflects a benefit i.e. a CO_2 emissions reduction. There would be a reduction of CO_2 in the opening year (2020) of -5,508T which would further decrease to -69,742T over a 60 year appraisal period. WebTAG was also used to show the overall Net Present Value of CO_2 emissions reduction for the traded sector was calculated at £760,627. Traded and non-traded flights were categorised as intra-EU for traded (72.1%) and all other flights as non-traded (27.9%). These figures were calculated by looking at the origin and destination for UK arrivals, departures and overflights, in 2017. These benefits have arisen from the proposed shorter routes for Birmingham arrivals/ departures and the new high-level ATS routes which offer more direct routings and therefore less track mileage. The proposed Heathrow offload route will result in a small increase of fuel usage and CO_2; however there is a still an overall benefit and large reduction in fuel/ CO_2. The worksheet outputs are shown on Page 19. (Appendix B: WebTAG Output for Design Options 1A and 2A)
Wider society	Capacity/ resilience	Qualitative	Increased flightplanning options can allow aircraft operators to avoid capacity-constrained areas. As forecast traffic levels grow, the ability to avoid restrictions by utilising alternative flightplan routes would reduce the likelihood of delay, thus improving the resilience of the wider route network.
General Aviation	Access	N/A	The main change in impact to GA users would be from the most northern block of new proposed CAS, near to Birmingham. This has been proposed as having a base of FL65 and up to FL145. It would increase the area Birmingham radar can use for tactical vectoring, for their arrivals and departures. The CAS volume is proposed as Class C/ D which allows for VFR GA transit, partially mitigating the potential impact. The GA use of this airspace is dependent on weather conditions and seasonality, but can be assumed to exist generally throughout the year. This proposal is expected to cause a relatively low impact on GA users with 94% of GA currently flying at FL65 or lower, in this region. Design Option 2A would establish a smaller CAS volume at low level, less often than Design Option 2B. All four options could account for the establishment of a notifiable segregation mechanism, if required for planned special events in specific geographical areas, further mitigating potential impacts on GA access.

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 flightplan 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 by this proposal.
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Commercial airlines	Other costs	N/A	N/A – there are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	N/A	N/A – there would be no costs attributable to infrastructure.
Airport/ Air navigation service provider	Operational costs	N/A	N/A – this proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	Approximately 140 LAC/ LTC controllers would require full 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. 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.

3.12 Design Option 2B

A smaller Class C/ D volume near Birmingham with Class C/ D for the other volumes;
Birmingham, Heathrow routes and CAS active evenings/ overnights/ mornings during weekdays and active H24 at weekends;
except for the H24 upper section of two blocks of CAS around Birmingham.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	N/A	Changes to commercial air traffic patterns are all above 7,000ft. The potential noise impacts caused by a small number of non-commercial GA-type flights, descending to FL65 at certain times under certain conditions, is 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 would result in a beneficial net saving in fuel burn of -1,806T in 2020, for the associated regions. In 2030 there would be an increased forecast fuel burn saving of -2,238T for the year. The impact assessment indicates that c.184, 000 flights would be impacted by the change by 2030. The forecast used was NATS 2017 Annual Base Forecast to produce the annualised numbers. WebTAG was used to assess the greenhouse gas impact over time from the proposed changes, for the traded sector. This design option would yield a positive Net Present Value which reflects a benefit i.e. a CO_2 emissions reduction. There would be a reduction of CO_2 in the opening year (2020) of -5,743T which would further decrease to -72,252T over a 60 year appraisal period. WebTAG was also used to show the overall Net Present Value of CO_2 emissions reduction for the traded sector was calculated at £788,142. Traded and non-traded flights were categorised as intra-EU for traded (72.1%) and all other flights as non-traded (27.9%). These figures were calculated by looking at the origin and destination for UK arrivals, departures and overflights, in 2017. These benefits have arisen from the proposed shorter routes for Birmingham arrivals/ departures and the new high-level ATS routes which offer more direct routings and therefore less track mileage. The proposed Heathrow offload route will result in a small increase of fuel usage and CO_2; however there is a still an overall benefit and large reduction in fuel/ CO_2. The worksheet outputs are shown on Page 18. (Appendix A: WebTAG Output for Design Options 1B (NATS' preferred option) and 2B).
Wider society	Capacity/ resilience	Qualitative	Increased flightplanning options can allow aircraft operators to avoid capacity-constrained areas. As forecast traffic levels grow, the ability to avoid restrictions by utilising alternative flightplan routes would reduce the likelihood of delay, thus improving the resilience of the wider route network.
General Aviation	Access	N/A	The main change in impact to GA users would be from the most northern block of new proposed CAS, near to Birmingham. This has been proposed as having a base of FL65 and up to FL145. It would increase the area Birmingham radar can use for tactical vectoring, for their arrivals and departures. The CAS volume is proposed as Class C/ D which allows for VFR GA transit, partially mitigating the potential impact. The GA use of this airspace is dependent on weather conditions and seasonality, but can be assumed to exist generally throughout the year. This proposal is expected to cause a relatively low impact on GA users with 94% of GA currently flying at FL65 or lower, in this region. Design Option 2B would establish a smaller CAS volume at low level, more often than Design Option 2A. All four options could account for the establishment of a notifiable segregation mechanism, if required for planned special events in specific geographical areas, further mitigating potential impacts on GA access.

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 flightplan 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 by this proposal.
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Commercial airlines	Training cost	N/A	N/A – it is not proportionate to attempt to quantify airline training costs.
Commercial airlines	Other costs	N/A	N/A – there are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	N/A	N/A – there would be no costs attributable to infrastructure.
Airport/ Air navigation service provider	Operational costs	N/A	N/A – this proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative and quantitative	Approximately 140 LAC/ LTC controllers would require full 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. 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.

4. Options Appraisal Safety Assessment – Baseline (no change scenario)

Birmingham Arrivals and Departures

4.1 Birmingham arrivals and departure traffic, which routes via the MOSUN region, currently leaves CAS when transiting between the Birmingham area and the Cotswold CTAs. This is according to the times and conditions in the AIP (AD 2.EGBB, section 2.22 para 2 refers).

4.2 NATS (NERL) AC and Birmingham Radar control this traffic when operating within CAS, whilst an ATSOCAS is provided by either Western Radar or RAF(U) Swanwick, subject to availability.

4.3 This is a complex procedure and requires a large amount of coordination, monitoring and controller interactions – with pilots and between controllers.

4.4 A 'controller interaction' is typically a radio transmission with a pilot or a telephone call with a controller colleague, within the same centre or adjacent approach units. Each time a controller interacts with either a pilot or a controller, the other party must repeat the decision/instruction to ensure accuracy.

4.5 Thus a single controller interaction is comprised of at least two events – the outbound instruction or request, and the returning confirmation check, known as a 'readback'. When controller interactions with pilots get busy, it is known as a high RT loading. RT loading is one of the major limiting factors to the operating efficiency of an air traffic control sector.

4.6 There are also currently limited flightplanning options for flights between the Midlands area to/ from the southwest, which do not support a predictable environment for Birmingham aircraft operators.

4.7 This means that controllers manage the flights in a tactical way. Controllers offer, where possible, more optimal routings than those flightplanned. This can take the aircraft into ATC sectors not originally covered by the flightplan.

Heathrow Offload Routes

4.8 If the Heathrow OCK hold is currently at or near capacity, Heathrow arrivals can be rerouted to the BNN hold; often this occurs at late notice.

4.9 This relates to Oceanic and Irish traffic inbound to Heathrow, from the S23 – TC SW – OCK flow; affecting around 2,600 flights in 2017.

4.10 This can lead to a highly complex tactical operation for NATS (NERL) AC controllers, which can create an unsustainable increase in cockpit and controller workload; as a result of increased monitoring and controller interactions (as described above).

4.11 This is the current situation, and is managed in the relevant regions. However part of the justification behind this proposal is to circumvent situations of high complexity, and the potential associated safety risk which can arise.

5. Options Appraisal Safety Assessment – All Four Design Options

Birmingham Arrivals and Departures

5.1 The flows proposed would provide a modernisation and partial systemisation of the region, whereby the handling of flights would be much more predictable.

5.2 The proposal aims to provide more systemised, predictable flightplanning options for Birmingham arrivals and departures which would be fully contained within the proposed CAS volumes thus reducing overall controller and cockpit workload.

5.3 The proposed volumes of CAS would contain Birmingham arrivals and departures within CAS. This is a more predictable air traffic environment during the hours of operation, and logically flights within CAS are safer than those outside CAS.

5.4 This would cause a reduction in the complexity of the region's airspace for the same amount of traffic, for both ATC and pilots. There would be less coordination and fewer tactical actions required, thus reducing the number of controller interactions. This would also result in a lower RT loading.

5.5 NATS' first priority is safety (and transparently demonstrating its commitment to safety). NATS will construct an appropriate safety case to show that an appropriate containment buffer for ATS Routes is applied to the proposed volumes of CAS.

Heathrow Offload Routes

5.6 The flows proposed would provide a more predictable method for the tactical balancing of flows by reducing the need for late tactical stack swaps. This would lead to a more modernised and partially systemised environment.

5.7 This would consequently reduce the operational complexity currently experienced within this region, and potential associated safety risks linked to this.

5.8 The proposed offload route and CAS could be used by pre-selected flights. This would increase the overall environmental efficiency.

5.9 A decrease in coordination and controller interactions would reduce ATC complexity. A reduction in late-notice stack-swaps would reduce cockpit workload.

5.10 NATS' first priority is safety (and transparently demonstrating its commitment to safety). NATS will construct an appropriate safety case in accordance with standard practice.

ATS routes and TRA 002

5.11 There is no particular safety consideration to be addressed by the implementation of new/revised high level ATS routes. However, some items are commonly used tactical-directs which would become formal ATS routes, logically these have better aeronautical data definitions (e.g. AIP publication, defined RNAV status etc).

5.12 There is no particular safety consideration to be addressed by the implementation of a revised TRA 002 boundary. The MoD are content that this would not cause a safety issue for their operation. NATS is similarly content, and appreciates the MoD's acceptance of this item.

6. Changes to the Full Options Appraisal

There have been changes in the environmental impacts of this Full options appraisal when compared to the Initial options appraisal (Ref 8). This is as a result of removing a number of the proposed ATS Routes following analysis conducted at the SAIP AD5 real time simulations in November and December 2018. Some proposed routes have been removed as they introduced an unacceptable level of complexity to the operation when compared to the benefits they would offer. Other proposed routes involved too many other sector groups, and therefore controllers, who would require additional training which could potentially cause the entire proposal to be unachievable within desired timescales.

A full list of all of the withdrawn ATS routes can be found below, including a brief description on the justification behind the withdrawal:

RETSI – ASRAX, P19
This route created unacceptable complexity for LAC Sector 5. This was specifically between traffic departing the EGCC TMA and traffic arriving into the EGCC TMA, within the UMOLO area.

POL – RETSI, P19
This route would require changes to LAC Lakes and PC Sectors which, to implement, would create additional training requirements. This would therefore contradict with Design Principle 2 *"minimise the resources needed to progress the proposal"*, as the introduction of this route would increase the training requirement.

SILVA – SSSSS – UGNUS
This route would require sectorisation changes between LTC Midlands and LTC Capital. The associated training requirement would increase the overall training burden/ timescales and therefore also contradict Design Principle 2, as above.

SOVAT – CPT – UGNUS, Q73
Although this route would only be available for traffic between SOVAT – CPT (FL360+), simulation analysis showed that, despite filing FL360, traffic is often transferred from Reims UAC below FL360. This would then penetrate LAC Sector 17 and could cause unknown future traffic conflictions.

MERLY – BABAX – MANIG
This route poses a potential route confliction against Danger Area EGD004 which would reduce the overall benefit. A training requirement would need to be added for LAC Sector 6 and 9, thus opposing Design Principle 2.

NORLA – ELRIP
The introduction of this route would pose the same issues as the above route, MERLY – BABAX – MANIG.

MERLY – INLAK
This route would require re-sectorisation between LAC Brecon and LAC Berryhead Sectors due to the placement of this proposed route. It was concluded that the required effort does not warrant the benefit gleaned, particularly with the current forecast traffic.

ASRAX – IDOVO – NITON, UT7 (to become T7)
This route was assessed against the availability for EGCC TMA arrivals, during the simulations. It was not considered feasible due to the resulting complexity from multiple sectors feeding LAC Sector 5 with EGCC TMA arrivals. This could potentially be progressed by using a night-time RAD relaxation, outside of this proposal and the CAP1616 process.

MERLY – NITON, UN21 extension (to become N21)
This route was also assessed against the availability for EGCC TMA arrivals, during the simulations. Again, it was not considered feasible due to the resulting complexity from multiple sectors feeding LAC Sector 5 with EGCC TMA arrivals.

7. Conclusion and Next Steps

7.1 The design options have been designed in order to reduce complexity in the West End sectors through streamlined procedures for optimal routing and flightplanning options.

7.2 The options have been developed with significant input from appropriate representatives of the GA community, MoD, airlines, Birmingham Airport and Heathrow Airport.
NATS thanks all of these stakeholders and looks forward to continuing the development of this proposal.

7.3 As summarised in Sections 3.9 to 3.12, the proposed changes will provide environmental and economic benefits for airline operators alongside increased operational flexibility. There is not expected to be an increase as a result of the proposed CAS and routes.

7.4 The options known as Design Options 1A, 1B, 2A and 2B have been appraised and are suitable for consulting on.

7.5 The next step is the Stage 3 Gateway Assessment planned for 25th January 2019.
Subject to CAA approval, this proposal would move on to Stage 3 Consult.

8. Appendix A: WebTAG Output for Design Options 1B (NATS' preferred option) and 2B

Based on the previously described Birmingham/ Heathrow route structures available evenings/overnights/mornings, 5 days a week, and H24 weekends:

Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NATS SAIP AD5-weekdays overnight + H24 weekends

Present Value Base Year 2010

Current Year 2018

Proposal Opening year: 2020

Project (Road/Rail or Road and Rail): road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£): £788,142

*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): -72,252
(between 'with scheme' and 'without scheme' scenarios)

Of which Traded -52093.79582

Change in carbon dioxide equivalent emissions in opening year (tonnes): -5,743
(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£): £1,137,365
(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	-12792.61187	-23789.88528
Non-traded sector	0	0	-4950.261734	-9205.79472

Qualitative Comments:

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £1,182,213

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £394,071

9. Appendix B: WebTAG Output for Design Options 1A and 2A

Based on the previously described Birmingham/ Heathrow route structures available evenings/overnights/mornings, 7 days a week:

Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NATS SAIP AD5- 7 days overnight

Present Value Base Year 2010

Current Year 2018

Proposal Opening year: 2020

Project (Road/Rail or Road and Rail): road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£): £760,627

*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): -69,742
(between 'with scheme' and 'without scheme' scenarios)

Of which Traded -50283.64601

Change in carbon dioxide equivalent emissions in opening year (tonnes): -5,508
(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£): £1,099,358
(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	-12288.42954	-22981.68033
Non-traded sector	0	0	-4755.162056	-8893.04967

Qualitative Comments:

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £1,140,940

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £380,313

End of document