London Airspace Modernisation Project
ATS Route Network

LAMP2 Network
Gateway documentation:
Stage 1 Define

Step 1B Design Principles

NATS

Roles

Action	Role	Date
Produced	**Airspace Change Specialist** NATS Future Airspace and ATM	26/7/18
Reviewed Approved	**Head of Airspace Systemisation & Airport** NATS Future Airspace and ATM	26/7/18
Reviewed Approved	**Manager Operational Concepts** NATS Future Airspace and ATM	26/7/18
Reviewed Approved	**LAMP Project Manager L5251** Operations & Airspace Programme Delivery	26/7/18
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Issue	Month/Year	Changes this issue
Draft 1	May 2018	Document written, considering feedback from first round of engagement Draft sent to CAA for CAP1616 discussion
Draft 2	Jun 2018	Document updated. Draft sent to stakeholders for second round of engagement
Draft 3	Jul 2018	Document updated. Draft sent to CAA for comment
Issue 4	Jul 2018	Submitted to CAA for publication

Contents

Introduction

This document forms part of the document requirements for CAP1616 airspace change process:
Stage 1 Define Gateway, Step 1B Design Principles.

In April 2018, NATS published a list of example design principles in a slide pack, along with some context as to what design principles mean, and why. We emailed them to a wide variety of industry contacts, in order to engage and stimulate aviation stakeholders.

We made it clear that these were proposed examples for discussion, and that each stakeholder should discuss them internally, provide feedback, add their own examples, and consider any relative priorities.

We received feedback from a range of aviation industry stakeholders. In May 2018, NATS analysed that feedback and updated the design principles. We also discussed the CAP1616 Stage 1 process with the CAA.

In late May 2018, NATS sent the revised design principle document out for a further round of engagement, receiving additional feedback. Again we analysed that feedback and made further, final, updates.

This document describes how your feedback has influenced our design principles – thank you for your participation and your feedback.

We will now submit this design principles document to the CAA, to complete the Stage 1 Define Gateway under the UK's airspace change process known as "CAP1616". Subject to approval of Stage 1, we will formally adopt them for the London Airspace Modernisation Project.

Engagement on specific design concepts will happen later, in Stage 2, and formal consultation in Stage 3, but the design concepts will be evaluated against the final Stage 1 design principles.

How this document is laid out

The Executive Summary lists the Design Principles (DPs), amended due to your feedback.

The next sections discuss each DP:

We asked   The original discussion text of a potential DP (we sent this out, you provided feedback)

You said   A summary of how your feedback has influenced the DP

We did   An amended DP (sometimes more than one), possibly different from the original discussion text

This is repeated for each DP.
The priority levels are now described as A B C where A is the highest priority.

Section 11 summarises feedback about additional DPs

Section 13 summarises the engagement events, number of responses and key stakeholders who responded to the request for feedback.

Sections 14 and 15 Feedback Annexes provide direct quotes from, or a summary of, each stakeholder's response. Each annexe reflects each round of engagement.

These comments have been considered in the context of the original text of the original draft DP and, where appropriate, influenced the text of the DP itself, or resulted in changes to the associated narrative.
Each comment is attributed to a stakeholder reference number followed by a brief description of that stakeholder, for example "080 Gatwick Airport".

Executive Summary – List of Design Principles (DP) and relative priority (A to C)

The following list of ten principles summarises the results of two rounds of engagement.
Each of these principles evolved from the original DP and engagement feedback.
The evolution is described in detail in the next sections of the document.

DP0 Safety
Is always the highest priority   (A)

DP1 Operational
The airspace will enable increased operational resilience   (B)

DP2 Economic
Optimise network fuel performance   (C)

DP3 Environmental
Optimise CO_2 emissions per flight   (C)

DP4 Environmental
Minimising of noise impacts due to LAMP influence will take place in accordance with local needs   (C)

DP5 Technical
The volume of controlled airspace required for LAMP should be the minimum necessary to deliver an efficient
airspace design, taking into account the needs of UK airspace users   (C)

DP6 Technical
The impacts on GA and other civilian airspace users due to LAMP will be minimised   (C)

DP7 Technical
The impacts on MoD users due to LAMP will be minimised   (C)

DP8 Operational
Systemisation will deliver the optimal capacity and efficiency benefits   (B)

DP9 Technical
The main route network linking Airport procedures with the En Route phase of flight will be spaced to yield
maximum safety and efficiency benefits by using an appropriate standard of PBN   (B)

0. DP0 Safety

0.1 Original discussion text and priority

Safety is always the highest priority

Golden – nothing can be higher

0.2 How has feedback influenced this DP?

The original wording of the DP was deliberately general.

Safety of all – airspace users, and those on the ground – is implicit in this DP.

We also received feedback that airspace design should reduce the likelihood of infringements where possible. Cyber security and the resilience of information systems were both mentioned - these factors are outside the CAP1616 scope of airspace design, but have been fed back to the relevant hardware and software teams.

Resilience as an airspace concept (in this case the ability of an airspace design to recover from any disruption) was captured as an additional DP.

0.3 Proposed text and priority – two DPs

Safety is always the highest priority

Priority A

Operational – The airspace will enable increased operational resilience

Priority B

1. DP1 Engagement

1.1 Original discussion text and priority

Engagement – Air Navigation Service Providers (ANSPs)

High priority

1.2 How has feedback influenced this DP?

This was less a Design Principle and more an exploration of stakeholder engagement strategy. The airspace change process CAP1616 defines the engagement requirements, which NATS will follow as per the appropriate guidance, using the feedback supplied by stakeholders.

Throughout the design process, multiple option concepts will be developed with stakeholders and assessed in a data-driven manner.

During the second round of DP engagement, the importance of inclusive stakeholder engagement was emphasised, especially by (and between) NATS and the adjacent ANSPs.

A key element of the design process will be regular interfaces between NATS, Airports, adjacent ANSPs and aircraft operators (AO).

DP removed, remaining DPs to be renumbered.

2. DP2 Engagement

2.1 Original discussion text and priority

Engagement – Industry

High priority

2.2 How has feedback influenced this DP?

As DP1 – this was more an exploration of stakeholder engagement. DP removed.

3. DP3 Environment

3.1 Original discussion text and priority

Environmental – Minimise fuel disbenefit

Medium priority

3.2 How has feedback influenced this DP?

As per the LAMP Statement of Need (SoN), network capacity should not be a significant constraint on airport capacity and environmental impacts should be minimised.

If the proposed concept causes a fuel disbenefit to certain routes, other elements of the region's network could be modified, thus optimising the network fuel performance. It may not be possible to fully balance impacts on all route distance combinations. This should be an acceptable trade-off for the long-term capacity benefits. Efficient, continuous climbs and descents, and minimised holding, are all highly desirable.

This DP was not clearly environmental nor clearly economic, even though the consumption of fuel and the reduction in delay due to capacity are directly related to both. This airspace change proposal is primarily to increase efficiency leading to greater capacity in the region. Increases in capacity mean increases in the overall number of flights, each of which consumes fuel and emits greenhouse gases such as carbon dioxide (CO_2). A principle to consider emissions per flight would give a better indication of environmental performance than a total system emissions comparison at this stage, because the overall number of flights could not increase to the same degree if the region's capacity was not increased.

The two different aspects of fuel use were captured as separate DPs. During the second round of engagement, the priority of these two DPs was questioned – should they be one level lower than DP1 Resilience, DP8 Capacity and DP9 PBN? NATS agreed with this reprioritisation. Additionally, the use of "optimising CO_2 / fuel per flight" is preferable to "minimise fuel/CO_2 for all flights" or "optimise for all flights". The former allows for a trade-off of individual routes for the benefit of the system, the latter two would conflict with the optimisation of the system and would not allow trade-offs in the same way – if all flights are optimised, it could result in a lower overall network benefit.

3.3 Proposed text and priority – two DPs

Economic – Optimise network fuel performance

Priority B – After second round of engagement, this was revised to priority C

Environmental – Minimise CO_2 emissions per flight

Priority B

After second round of engagement, this was revised to "Optimise CO_2 emissions per flight", priority C

4. DP4 Environment

4.1 Original discussion text and priority

Environmental – No change to flightpaths below 7,000ft due to LAMP2.

Medium priority

4.2 How has feedback influenced this DP?

This was less a Design Principle and more an exploration of scope and stakeholder engagement strategy. Feedback from stakeholders can be summarised as concerns about the potential impacts of enforcing a rigid 7,000ft boundary, which NATS accepts. The LAMP scope remains primarily for changes at and above 7,000ft. Originally this was intended to more clearly demark the priorities between

noise and flight efficiency, with NATS responsible for the latter and Airports the former[1]. Changes to routes or tracks below 7,000ft would remain the responsibility of the airport, however NATS acknowledges that we will need to influence the interface where some Airport procedures link with the Network – we expect appropriate scaling of the airspace change process to take account of the degree of influence NATS exerts. NATS will therefore be a stakeholder in changes below 7,000ft and will feed our Network requirements to Airports, to be considered alongside other stakeholder requirements – each airport knows its own requirements and those of its local communities.

Ultimately NATS accepts the potential that our Network requirements may involve some elements of Airspace Change Level 1 [footnote 1 on page 8], where minimising noise impacts due to overflight below 7,000ft is a priority.

The extent of NATS' influence will not become clearer until Stage 2 where design concepts (based on the local needs of each Airport's interface information) can be explored and evaluated against this DP.

We have also, separately, described how we envisage the way Airspace Change Level 1 elements would be managed – please see Section 11 on page 12 for these additional considerations.

We have reworded the DP to be more consistent with the LAMP SoN, i.e. minimised environmental impacts, but this time in the context of noise impacts due to overflight below 7,000ft.

During the second round of engagement, the priority of this DP was questioned – should it be one level lower than DP1 Resilience, DP8 Capacity and DP9 PBN? NATS agreed with this reprioritisation.

4.3   Proposed text and priority

Environmental – Minimising of noise impacts due to LAMP influence will take place in accordance with local needs

Priority B – After second round of engagement, this was revised to priority C

5.   DP5 Airspace

5.1   Original discussion text and priority

Airspace: No increase to overall volume of controlled airspace (CAS) at and above 7,000ft

Medium priority

5.2   How has feedback influenced this DP?

Feedback to this DP was polarised.

The GA community said that a reduction of CAS (compared with today) was necessary, especially at altitudes below 7,000ft, due to potential improvements in airspace efficiency and closer spacing of routes. Airport and airline stakeholders said, in summary, that a DP limiting the expansion of CAS at and above 7,000ft would be an unnecessary constraint and could compromise the goals of this project. They said more CAS could be introduced, providing the volumes required to contain future-proofed efficient structures maximising capacity and resilience, except where there would be significant impacts on other airspace users at these higher altitudes.

We have considered these opposing points of view and have rewritten the text to take account of both.

During the second round of engagement, the GA community emphasised that the design should be able to use less overall airspace, and that impacts of lower-altitude CAS on their activities were greater than that of higher CAS, along with the airspace classification. This has been recorded and acknowledged. Lower-altitude CAS and its classification will be considered in the vicinity of the FASI-S airports under their own DPs once their ACP processes launch, with NATS LAMP interfacing at the upper limits of that airspace, thus the intent of the GA's emphasis is included within the DP as written.

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[1] References to 7,000ft, Level 1 and Level 2 are based on definitions within the CAA's airspace change guidance document known as CAP1616. Level 1 changes are those with the greatest impact, with new flightpaths below 7,000ft altitude, such as in the vicinity of an airport where noise is a major factor. Level 2 changes are those where noise is less of a priority and flight efficiency (fuel consumption) becomes more important, defined from 7,000ft and above.

5.3   Proposed text and priority

Technical – The volume of controlled airspace (CAS) required for LAMP should be the minimum necessary to deliver an efficient airspace design, taking into account the needs of UK airspace users

Priority C

6.   DP6 Airspace

6.1   Original discussion text and priority

Airspace – The needs of GA users will be considered, in the airspace at and above 7,000ft

Medium priority

6.2   How has feedback influenced this DP?

The original text was less a Design Principle and more an exploration of stakeholder engagement.

Its original intent was to consider the impacts of revised airspace arrangements on civilian airspace users inside and outside CAS which are *not* classed as commercial air traffic. Feedback highlighted the use of 'GA' in this context as too narrow, excluding other users such as remotely piloted aerial system (drone) operations for example – these will become more prevalent in future, incurring a demand on airspace resources hitherto not seen. Airspace classification and the minimum navigation standards to be used were also points of note in this DP's context. The priority 'medium' was also noted, with some stakeholders questioning why the equivalent military MoD DP7 had a priority of 'high'.

Feedback on DP9 is also relevant here. The wording of DP9 was interpreted by some stakeholders to mean that only highly equipped aircraft under the command of commercially trained aircrew could enter the new airspace, effectively ruling out most GA aircraft types and their pilots. We clarify here that ATS routes are contained within controlled airspace volumes. The climb/descent routes planned for the LAMP2 Network would require compliance with modern, high performance navigation standards – at least RNAV1 and, potentially, a higher standard, see DP9.

The controlled airspace volumes *within which those routes sit* (such as a revised LTMA) would take on an appropriate airspace classification, the specifics of which would be discussed in due course via design concept development and stakeholder engagement.

Other routes may be deemed to be required, for example to transit CAS volumes under certain conditions. Those transit routes may not need to be RNAV1.

Modifying the DP as per the text in the next paragraph encompasses more civilian airspace users, and also allows the principle to be qualitatively evaluated against future design options. In the second round of engagement, the GA community stated it was satisfied that the DP allows development of discussions on the subject of GA impacts.

6.3   Proposed text and priority

Technical – The impacts on GA and other civilian airspace users due to LAMP will be minimised.

Priority C.

7.   DP7 Airspace

7.1   Original discussion text and priority

Airspace: The needs of MoD users will be considered, in the airspace at and above 7,000ft

High priority

7.2   How has feedback influenced this DP?

As per DP6 above, the original text was less a Design Principle and more an exploration of stakeholder engagement. Its original intent was to consider the impacts of revised airspace arrangements on military airspace users inside and outside CAS.

Feedback from the MoD was primarily about navigation specifications and is discussed further under DP9.

Feedback from other stakeholders was more concerned that there should be a better management of airspace where the MoD typically has primacy, allowing its use by civilian air traffic in a more dynamic way, while acknowledging that recent improvements in this area have already been made.

Feedback from some stakeholders also queried the priority of military users as 'high'. This feedback can be associated with a separate Flexible Use of Airspace (FUA) State Project under the overall UK FAS.

Modifying the DP as per the text below allows the principle to be qualitatively evaluated against future design options. During the second round of engagement, this DP was supported as written.

7.3 Proposed text and priority

Technical – The impacts on MoD users due to LAMP will be minimised.
Priority C.

8. DP8 Modernisation

8.1 Original discussion text and priority

Modernisation – No constraints to the efforts made to systemise the network, for capacity
High priority

8.2 How has feedback influenced this DP?

Feedback on systemisation – minimising controller and pilot workload as far as possible, via maximum reduction of controller tactical intervention – was generally positive.

Some stakeholders believed we should be even more ambitious about future capabilities, others cautioned that excessive systemisation might make it difficult for controllers to react to a suddenly-emerging unusual situation.

The intent of this principle is to segregate as far as possible, by design, the traffic flows in this region. Currently they regularly intersect and must be manually managed by controllers. Today's CAS boundaries, air traffic service (ATS) routes, Standard Terminal Arrival Routes (STARs) and other airspace structures should not constrain any future airspace design concept. Potential exceptions could be where existing investments in airspace design below 7,000ft are retained by the Airport as part of their own design principles or design concepts, and the LAMP Network would interface appropriately.

Changing the text allows the DP to be qualitatively evaluated against future design options.

During the second round of engagement, the link between capacity and efficiency was articulated, leading to the modification of the text of the DP (remaining priority B).

8.3 Proposed text and priority

After the first round of engagement, this was revised to
Operational – The greatest capacity benefits from systemisation will be realised   (Priority B)

After the second round of engagement, this was further revised to
Systemisation will deliver the optimal capacity and efficiency benefits   (Priority B)

9. DP9 Modernisation

9.1 Original discussion text and priority

Modernisation – RNAV1 would be the minimum navigation standard

9.2 How has feedback influenced this DP?

The CAA's existing Future Airspace Strategy[2] makes it clear that the future of UK airspace is Performance Based Navigation (PBN), progressing towards reduced lateral spacing between routes, with on-board navigation performance monitoring the step after that.

The intent of this principle was to use modern navigation standards to maximise the efficiency of the network. RNAV1 meets the FAS' reduced lateral spacing requirement, and RNP1 meets the on-board performance monitoring requirement.

Feedback from some airports and airlines requested the consideration of Required Navigation Performance 1 (RNP1) or other advanced PBN standard, but airport feedback also urged considering the equipage of smaller airlines.

Feedback from the GA community regarding navigation-specification restricting entry to the airspace volumes was considered under DP6 (see above), hence the rewording of this DP to better suit its intended purpose.

During the second round of engagement, this DP was supported as written.

9.3 Proposed text and priority

Technical – The main route network linking Airport procedures with the En Route phase of flight will be spaced to yield maximum safety and efficiency benefits by using an appropriate standard of PBN.

Priority B.

10. Summary list of Design Principles, renumbered, with relative priorities (A to C)

10.0 Safety is always the highest priority   (A)

10.1 Operational – The airspace will enable increased operational resilience   (B)

10.2 Economic – Optimise network fuel performance   (C)

10.3 Environmental – Optimise CO_2 emissions per flight   (C)

10.4 Environmental – Minimising of noise impacts due to LAMP influence will take place in accordance with local needs   (C)

10.5 Technical – The volume of controlled airspace required for LAMP should be the minimum necessary to deliver an efficient airspace design, taking into account the needs of UK airspace users   (C)

10.6 Technical – The impacts on GA and other civilian airspace users due to LAMP will be minimised (C)

10.7 Technical – The impacts on MoD users due to LAMP will be minimised   (C)

10.8 Operational – Systemisation will deliver the optimal capacity and efficiency benefits   (B)

10.9 Technical – The main route network linking Airport procedures with the En Route phase of flight will be spaced to yield maximum safety and efficiency benefits by using an appropriate standard of PBN. (B)

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[2] Published by the CAA in June 2011

11. Airspace Change Level 1 considerations

This section is associated with DP4, please see Section 4 on page 7 and also paragraph 12.3 below for additional details.

Feedback from our Airport colleagues was clear – they expect to manage their valued local community relationships by engaging in the way they see fit.

What is not yet clear is the extent of LAMP influence – if any – on Airport interfaces. However, it is prudent to provide for that eventuality.

If NATS' preferred design concept means one or more Airport/s is/are required to make changes to their lower level design concept (below 7,000ft), NATS would provide appropriate support for each affected Airport's Level 1 engagement.

The extent of the support NATS provides to each Airport would be proportionate to the extent of that influence – the greater NATS' need to influence the Airport interface, the greater the support NATS would provide to the Airport as part of their Level 1 engagement activities.

The specifics of that support would be agreed between NATS and the Airport/s once the need, and the extent, has been agreed. This is compatible with the wording and intent, of DP4 which reads *"Minimising of noise impacts due to LAMP influence will take place in accordance with local needs"*, where "local needs" is the Airport's engagement and management of their stakeholders.

12. Suggested additional DPs

The following draft design principles were either suggested by stakeholders, or NATS inferred them from stakeholder responses.

They have all influenced the revised DPs listed above and are not being progressed as additional standalone DPs.

12.1   003 ARPAS The needs of commercial drone operators will be considered, in the airspace at and above 7,000ft

The intent of this suggested DP has been incorporated into the scope of revised DP6.

12.2   015 BHA Non-pressurised helicopters and GA should be considered, e.g. a network of PBN routes 7-10,000ft to allow network integration.

This suggestion is a potential design solution rather than a design principle. However, the intent of this suggested DP has been incorporated into the scope of revised DP6 and DP9.

12.3   070 Heathrow Airport, 073 Luton Airport, 078 Birmingham Airport, 080 Gatwick Airport
Noise and impact on community should be considered, at least as a partner with the relevant Airport e.g. at consultative committees or other appropriate forum

This is relevant to DP1 and DP4. The intent of this suggested principle is now within the scope of revised DP4 and is discussed in Section 11 above.
DP1 has been removed but this feedback has been taken on board and will be considered in our stakeholder engagement strategy.

12.4   074 Southend Airport, 078 Birmingham Airport: Recognition and consideration of airspace change investments by FASI-S partners, or where there is no desire to make significant changes from today's flightpaths

The intent of this suggested DP has been incorporated into the revised scope of DP8.

12.5   080 Gatwick Airport – A design that is suitable and meets the needs of all users.

Gatwick writes, this could be extended to recognise that access to airspace should be proportionate to the volume of traffic under management, with due recognition to the nature of the activities being undertaken. It will be important that a future airspace design supports all aspects of UK strategic ambition and does so in a fair and proportionate way; design solutions should not favour one operator,

military or civil, or one airport, to the detriment of others. The overall design must deliver benefits in excess of user investments.

NATS writes, this DP would be difficult to qualify / quantify when evaluating multiple design options under Stage 2 of the CAP1616 process. However the intent of this suggested DP has been incorporated into the scope of revised DP6, DP7 and DP8.

During the second round of engagement, 080 Gatwick Airport wrote:

We disagree with your assertion at (11.5) that it would be difficult to qualify and quantify suitability and proportionality (when evaluating) multiple design options under Stage 2. We do not think that (new) DPs 6, 7 or 8 sufficiently recognise that the proportionality of different types of traffic under management is an important factor that should be considered in the design of airspace. We believe that the overall design will be more acceptable if it is both suitable and proportionate. We would wish to see a DP included that explicitly recognises a fundamental need for NERL airspace design proposals to be 'suitable and proportionate, for future traffic under management'; this should attract a priority B rating.

NATS continues to believe that neither the proposed DP as originally written, nor the revised text in quotes above, could be qualified/quantified in a way to evaluate future design concepts. NATS contends that DP6, DP7 and DP8 are all fit for that purpose and cover the spirit of this discussion point.

12.6   727 British Airways – Modernisation: Maximise Airspace Capacity, Efficiency and Resilience

The intent of this suggested DP has been incorporated into the scope of revised DP1, DP5 and DP8.

13.   Engagement Evidence

13.1   Relevant extract from minutes of NATS Operational Partnership Agreement meeting of 20th March 2018

Attendees:
Aer Lingus, BA, BACF, easyJet, Flybe, GAMA, IAG, Jet2, KLM, TUI, United Airlines, NATS (various senior staff, several units), Heathrow Resilience Lead, Met Office

Extract from minutes:
LAMP2 Future Airspace Strategy Implementation – South (FASI-S)
Senior NATS staff provided an update on LAMP2. This was firstly a request for feedback on the Design Principles and Priorities in accordance with the new CAA airspace change process (CAP1616), which had been published on the NATS Customer website as well as sent out in the advance slidepack for OPA – feedback was requested to be sent to (NATS email address). Customers requested that these also be emailed to them. An update on progress will be provided at future OPAs.

Airlines requested that the LAMP2 Design principles and Priorities be emailed to them

13.2   Relevant extract from minutes of NATS Flight Efficiency Partnership meeting of 21st March 2018

Attendees:
Aer Lingus, BA, BACF, easyJet, Flybe, IAG, Jeppesen, Jet2, KLM, Rocket Route, Ryanair, TUI, United Airlines, Virgin, Wizz Air, NATS (various senior staff, several units)

Extract from minutes:
Senior NATS staff briefed the changes to the CAA Airspace Change Process that had been implemented in January 2018 as a new CAP1616. Some airlines were unaware that the CAA had consulted on this and that they had had the opportunity to comment. The changes meant that NATS as a sponsor would have to engage earlier with airlines and provide more evidence than previously at each stage of the process. NATS therefore requested airlines to be aware that they would have to make continual requests for help from the airlines in order to achieve this. Airlines questioned whether they had the agreement at higher levels to make decisions on the impact of airspace changes and whether this should be done at the Service Investment Plan (SIP) level. However, NATS pointed out that plans for airspace change had been consulted with airlines for RP2 and for RP3 the airlines had made clear that airspace modernisation was top of their priority list.

NATS to contact all airlines for each airspace change and request which airlines wish to be engaged
NATS to look at using NATS Customer website for publishing airspace change detail and requests for feedback

13.3 Relevant extract from minutes of Future Airspace Strategy Industry Implementation Group (FASIIG) meeting of 22nd March 2018

Attendees:
Senior CAA staff, senior MoD staff (DAATM), FASVIG staff, senior NATS staff (various units/roles), PPLIR, Virgin, GATCO, Luton Airport, ACL-UK, BA CityFlyer, IAG, United Airlines, TSC, Gatwick Airport, Jet2, FASIIG consultant, Heathrow Airport, Osprey, head of airspace strategy for DfT, ComRes Global Consultancy.

Extract from minutes:
NATS advised the group that the Design Principles for LAMP are available on the customer website and agreed to distribute the link. The overarching principle is that NERL airspace should not be a constraint on the growth of capacity at the airports.

13.4 Example design principles for discussion – slide pack

Supplied separately, this slide pack described the background behind design principles, and provides the original list to provoke discussion. It urges recipients to consider the content, to agree or disagree on the text or priorities, and to encourage provision of feedback to NATS.

13.5 Use of websites

NATS' Customer Gateway website was updated, to include a downloadable slide pack. It was also updated giving general information on forthcoming airspace change proposals.
(No URL is provided here – a customer login ID is required for access).

NATS' public website was updated, to include a downloadable slide pack. That website has since been updated, but retains a link to the original slide pack.

https://www.nats.aero/environment/consultations/future-airspace-strategy-implementation-south-ats-route-network-managed-nerl-london-airspace-management-programme-2-lamp-2-fasis-network/

The CAA website will show progress to date through the airspace change process, including this document.

http://www.caa.co.uk/Commercial-industry/Airspace/Airspace-change/Decisions-from-2018/London-Airspace-Management-Programme-Phase-2---ATS-Network/

(URLs correct at time of writing)

13.6 Emails to relevant aviation industry interested parties

First round

Emails were sent to **232** email addresses, based on National Air Traffic Management Advisory Committee (NATMAC) contacts, FASI-S airport contacts, UK and non-UK airlines, and other contacts suggested by the head of NATS Customer Affairs.

172 did not respond (**70+** read receipts were received but no response was forthcoming)

33 responded in some form

11 provided no specific comment, or lent their general support for the principles without detail

22 provided comments useable to influence the design principles – included in this document

Supplied separately, an Excel sheet of engagement records (with names and contact details redacted).

Second round

The same **232** email addresses were used in the first round.

Additionally, **11** email addresses of adjacent ANSP senior personnel – Amsterdam LVNL, Maastricht MUAC, Irish Aviation Authority Shannon and Dublin Centres, Belgocontrol, DSNA Central Ops, Paris ACC, Brest ACC and Reims ACC, and Ports of Jersey.

14 responded in some form

4 provided no specific comment, or lent their general support for the principles without detail

2 provided comments on the importance of continued appropriate engagement but without commenting on the principles in detail

2 provided general comments on LAMP scope, and the wider governance of FASI-S (including LAMP)

4 provided substantive comments with the potential to influence the design principles – summary included in this document.

13.7   Key stakeholders

The following stakeholders responded, and are broadly categorised into key areas of the industry.

The three-digit prefix is our reference number.

First round of engagement

Airline customers

612 Airlines for America, A4A (representing nine US airlines and one Canadian: Alaska Airlines; American Airlines; Atlas Air; Federal Express; Hawaiian Airlines; JetBlue; Southwest Airlines; Continental; UPS; Air Canada as an associate).

032 American Airlines and 068 United Airlines also responded individually.

034 BA CityFlyer

727 British Airways

697 Cathay Pacific

043 Emirates

054 KLM

066 TUI

617 Heathrow AOC, representing 89 airlines operating at Heathrow Airport (some supplied individual responses as per this list)

728 Virgin Atlantic

Wider aviation industry

094 Honeywell, 103 Rockwell Collins representing FMS manufacturers

095 Jeppesen representing a navigation database provider ("data house")

049 Gama Aviation – business aviation charter

017 GATCO, representing the interests of UK air traffic controllers.

003 Association of Remotely Piloted Aircraft Systems (ARPAS) UK responded on behalf of the UK's commercial drone operators.

015 British Helicopter Association (BHA) representing the helicopter industry.

MoD

084 MoD Defence Airspace and Air Traffic Management (DAATM) – one response. NATS has a long standing relationship with the MoD DAATM, which is the point of contact for all UK airspace related conversations with the British military.

Non-commercial

016 General Aviation Alliance (GAA) responded on behalf of seven GA organisations: 008 British Balloon and Airship Club, 010 British Gliding Association, 011 British Hang Gliding and Paragliding Association, 012 British Microlight Aircraft Association, 014 British Parachute Association, 018 Helicopter Club of Great Britain, and 021 Light Aviation Association.

020 HCAP representing the professional and safety interests of UK pilots.

024 PPL/IR is part of the GAA but provided a separate response.

085 FASVIG wishes to clarify that it does not speak for its stakeholder organisations (which would supply their own feedback), more that they are available to facilitate strategic discussions between the parties.

UK Airports via airport authorities

071 Bristol Airport Ltd	076 London Stansted Airport
073 London Luton Airport Operations Ltd	078 Birmingham Airport
074 London Southend Airport	080 London Gatwick Airport
075 TAG Farnborough Airport	083 Southampton Airport

Second round of engagement

Airline customers

695 Heathrow Airline Operators' Committee and London Heathrow Airline Consultative Committee (a different contact with wider remit than 617 Heathrow AOC), representing 86 Heathrow airlines

043 Emirates

655 Etihad

697 Cathay Pacific

727 British Airways

Wider aviation industry and non-commercial airspace users

016 General Aviation Alliance (GAA)

020 Honourable Company of Air Pilots

UK Airports via airport authorities

073 London Luton Airport Operations Ltd

080 London Gatwick Airport

082 Cardiff Airport

MoD

084 MoD via DAATM

Air Navigation Service Providers

902 LVNL ANSP

903 MUAC ANSP

906 Belgocontrol ANSP

13.8 The UK Civil Aviation Authority

The CAA is our Regulator and not a stakeholder *per se*.

They did, however, provide process guidance on CAP1616 Stage 1 and how it applies to this proposal.

13.9 Conclusion

In this two-way engagement exercise, we supplied the aviation industry with some example draft design principles, to provoke discussion.

We received feedback on those example principles and amended some of them, added others, and provided an explanation why.

We then repeated the engagement / feedback exercise.

This two-way engagement and evolution resulted in an amended list of design principles and relative priorities, finalised for this project.

14. Annex A Feedback Summary – First round of engagement

The following paragraphs are extracts or summaries from the feedback received during the initial stakeholder engagement exercise. DP numbers refer to those in the original slide pack, for industry discussion.

14.0 DP0 Safety is always the highest priority.

016 General Aviation Alliance (representing 8 GA organisations) and 024 PPL/IR Europe (organisation promoting the interests of private flight with instrument ratings)

Safety priority must extend to all airspace users (including those outside controlled airspace (CAS) under this proposal).

080 Gatwick Airport

Safety should include cyber security and system resilience, with Government support on national infrastructure security.

727 British Airways

Consideration should also be given to how airspace design can help reduce infringements of controlled airspace, which currently account for a third of all losses of separation. It is acknowledged that this would largely be achieved by raising the required standards of general aviation pilots and compelling all airspace users to use available technology to achieve required levels of conspicuity for all aircraft.

Maximising airspace capacity, efficiency and resilience to cope with anticipated growth in UK air traffic should be a stand-alone design principle, second only to DP0.

14.1 DP1 Engagement – ANSP

016 GAA and 024 PPL/IR Europe

It is important that NATS works effectively with ANSPs responsible for lower airspace, such that the most efficient airspace structures can be implemented. We find the assignment of this DP as 'high' to be at odds with the implication of the statement on page 2 of the presentation, that NATS expects airports to be responsible for lower airspace. Where appropriate, NATS should consider airspace changes that bridge the 7,000ft demarcation, working closely with lower airspace stakeholders to achieve this.

017 Guild of Air Traffic Control Officers GATCO

This should include ANSPs outside UK Flight Information Region FIR, should be pushed by CAA at European level, including controllers not just development teams/management.

020 Honourable Company of Air Pilots

The proposal will lead to altered airspace requirements for the underlying airports to link with departure and arrival gateways. Therefore, it is important to identify those changes in parallel with further development of LAMP2 rather than implement LAMP2 in isolation so that en-route simplification does not have the opposite effect on procedures closer to the airports.

073 Luton Airport

Consider amending this principle to say "The network must be suitable for all therefore ANSPs must work together"

074 Southend Airport and 078 Birmingham Airport

These airports want to either consider recent airspace change investments, or where there is no desire to make significant changes from today's flightpaths at lower levels.

083 Southampton Airport

The airport authority should be included as a key stakeholder

066 TUI

Whilst NATS will propose and incorporate changes above 7,000 feet if the airports redesigns for airspace below 7,000 feet are not approved does that mean that the changes proposed by NATS above 7,000 feet may not work. Guess my question is, are the NATS changes applicable and workable independent of the

airspace design below 7,000 feet, or are they fundamentally interlinked, i.e. if airports cannot push through changes below 7,000 feet how or will this affect LAMP2 for NATS.

617 Heathrow Airline Operations Committee AOC

Fully support the design principles.   Re consultation, in addition to the airline customers etc, suggest add airline organisations eg. International Air Transport Association IATA and the AOC of course. As you know we would work with the airlines to develop the principles and achieve common aims and objectives. This is all true for Heathrow of course but other key airports such as Gatwick, Stansted and Luton may well have their own local AOCs who may want to be involved. IATA of course would aim to cover all airline users.

727 British Airways

BA agrees with this design principle but feel it could be stronger to ensure both ANSPs and airports work together to support a dovetailed network solution and ensure no disconnect of fragmented airspace. Of course, airports are not ANSPs, so we are concerned that there is no mention of distinct engagement with airports in this or any other design principles. Airport engagement should be included in DP1, or as a stand-alone design principle.

NATS states that it expects airports to set the requirements for lower-level airspace under their parts of the FASI-S programme because they understand their own needs and those of their local communities. We do not accept that this is placed purely on the shoulders of the airport as we will see a lack of coordination and ultimately sub-optimal designs. NATS may not have the lead with changes below 7,000ft but must be heavily involved regardless of its role as a tower service provider or not. (This para is also relevant to DP4)

The FASI-S programme will require an unprecedented amount of coordination. Different airports will have the same demands over the same airspace and will impact the same communities with their airspace change proposals. The different sponsors of neighbouring airspace changes also need to ensure that their proposals fit with the NATS re-design of upper route airspace and all will need to ensure their proposals are submitted to the CAA in a coordinated way.

The Government's Department for Transport (DfT), CAA and NATS must ensure that future demands on airspace are fully understood and develop a new approach to airspace modernisation governance to oversee implementation. As airspace design changes cannot be properly affected without the close engagement of all ANSPs and airports, we believe the Government's new Aviation Strategy should consider new powers of enforcement to ensure mechanisms are in place to facilitate coordinated design and make sure all stakeholders collaborate and take forward important airspace changes. (This para is also relevant to DP2)

14.2   DP2 Engagement – Industry

016 GAA and 024 PPL/IR Europe

It is important that NATS is engaged with other airspace stakeholders and that as proposals develop, this engagement deepens. We would welcome a real commitment to continual refinement through consultation and partnership, with a recognition that this may result in significant changes to proposals if the needs of other airspace stakeholders are not being met. This approach will increase the chances of achieving a solution that is optimised for as greater range of airspace users as possible. In the past, despite conducting a public consultation process, many Airspace Change Proposal (ACP) sponsors have demonstrated a reluctance to significantly modify the proposals they are supposedly consulting on, or comprise in response to objections or alternatives. This must be avoided.

017 GATCO

This is important but with the caveat that if design benefits the network as a whole, then some parts of the industry might be disadvantaged, for example, some longer routes to enable more capacity.

727 British Airways

Progress on the programmes and projects identified to deliver transformation has been slow. We have worked collaboratively with NATS and Heathrow Airport to enhance airport resilience through recent programmes such as Time-Based-Separation (2015) and future programmes such as Independent Parallel Approaches (2022). However, unless the surrounding airspace is modernised to support this, there is significant danger that all such programmes will not fulfil their true potential.

With BA's main hub at Heathrow dependent on well-structured airspace, we view the delays to date, and further anticipated delay in delivering the strategy and the LAMP2 programme, with considerable frustration. The current milestones and delivery timeline for LAMP2 for the upcoming NATS Regulatory Period 3 (2020-2024) are already too late and leave no room for further delay. Clearly, a date must be set to complete LAMP2 well before any Heathrow expansion. That said, the evidence is clear that airspace change is needed now and so, irrespective of the need to prioritise airport expansion; Heathrow should not be used as an excuse to hold back airspace modernisation in London and the South East that can be achieved in the interim.

Delays to date have injected significant uncertainty in the FAS programme and this will only result in delays experienced by passengers today increasing and continuing for even longer. It is not acceptable for the programme to be left with no fixed plan for delivery while consumers pay the penalty. A clear FAS deployment plan is needed to allow NATS and airlines to make the case for investment in equipment and systems to fully exploit new airspace capacity. We stand ready to play our part in reinvigorating the FAS programme and the Lead Operator and Carrier Panel (to look at the technical standards for airspace design and ensuring fly-ability of designs).

14.3 DP3 Environmental – Minimise fuel disbenefit

003 Association of Remotely Piloted Aircraft Systems (ARPAS) UK

Consider changing to prioritise use by systems with reduced environmental impact; there should be a penalty for operating environmentally unfriendly systems.

017 GATCO

An important consideration and should be viewed as a cumulative effect. Some longer routings might enable fuel savings elsewhere. Within the LAMP project the idea was to enable the majority of routes to be as efficient as possible with other routes being penalised. There should be an overall net gain otherwise there is little point. It is interesting to see the wording change from CO_2 savings to fuel disbenefit.

034 CityFlyer (part of British Airways)

The introduction of LAMP1 saw a significant increase in the track mileage for our aircraft operating into our home base of London City Airport (LCY), which is the heart of our operation. This resulted in a significant increase in our fuel burn and thus cost, despite the suggested offset of a somewhat more expeditious climb out of LCY. I would ask that the LAMP2 design considers a more efficient arrival routing into LCY and offsets some of the increased fuel burn we have seen as a result of the LAMP1 implementation.

054 KLM Royal Dutch Airlines

Impact on route charges and time schedules is not specifically included, where longer routes would cause negative impacts. Earlier aircraft operator (AO) involvement may help in identifying solutions not obvious from an ANSP point of view.

080 Gatwick Airport

The focus of this principle on city pairs seems unnecessarily narrow: would it not be better simply to seek to minimise fuel usage, and associated emissions? This would allow NERL (NATS En Route) to prioritise climbs over descents, to seek to shorten track miles flown where possible and appropriate, and possibly to keep aircraft at higher altitudes for longer.
It would also be helpful if, as a principle, all climbs and descents to and from free route airspace should be continuous and ideally follow consistent profiles, commensurate with aircraft design and performance.
Where route adjustments are necessary, they should not create a restriction, or burden, on other routes or airports. Where there are unavoidable dis-benefits, they should be absorbed by those who receive related benefits.
There should also be an aim to reduce, and ultimately remove, stack holding. Approach design should lead to time based arrival separations becoming the normal mode of operation when technically feasible.

083 Southampton Airport

Any change should maximise the fuel benefit for all users. LAMP1 caused more track miles on some routes into Southampton.

727 British Airways

BA agrees with the concept of fuel trade-offs for long-term capacity benefits to a point but fuel disbenefit being balanced across the network may unduly penalise a particular airport or carrier and could cause a fuel disbenefit to those routes/city pairs that are modified to seek a balance. We cannot envisage trade-offs that impact on 'primary' airfields or flows to achieve a nominal balance being acceptable.

To optimise capacity, fuel burn and resilience we believe an element of optioneering is needed with different weightings for different airports based on the relative benefits to the network. Principally, we believe Heathrow should be prioritised with the highest weighting. If Heathrow fails the network fails, and so Heathrow should be the starting point for design before building out from there.

BA would like to see airline operators consulted and brought in from an early stage in the development of options and scenarios. Longer routings will have an impact on costs and schedules and so these will have to be considered as part of consultations. Options must fully address the interface with changes below 7,000ft and cost-benefit analysis should be conducted to address both flight efficiency and capacity per option to facilitate informed decision making. The consultation process should conclude with documented justification for preferred options.

14.4 DP4 Environmental – No change to flightpaths below 7,000ft due to LAMP2.

016 GAA and 024 PPL/IR Europe - do not support as written.

We are concerned the use of 7,000ft as a rigid border to the scope of this exercise will hamper the overall efficiency of future airspace structures. The best upper airspace system is of little use in isolation if the system below it remains archaic and vice versa. In order to maximise efficiency, it will likely be necessary to modify the interface between airspace above and below 7,000ft. While this will inevitably make the process of design and consultation more complex, it is important that lower airspace is modified as required to gain the maximum benefits envisaged by Future Airspace Strategy (FAS). The difficulties associated with working closely with other ANSPs (that may have different priorities or local considerations) and/or the need for greater public consultation must not stand in the way of realising the full system benefits of this 'once in a generation change'.

070 Heathrow Airport

We believe this could be strengthened to give greater clarity as it could be taken out of context and interpreted to mean that there will be no changes below 7,000ft. It also belies the fact that the LAMP2 network requirements will have an impact on the number/positioning of gateways – which is something our knowledgeable stakeholders will pick up on. Suggested wording: "LAMP2 design scope is for routes/flight paths 7,000ft and above (ie level 2 ACP). The design of routes/flight paths below 7,000ft remain the responsibility of the airport . LAMP2 will be a stakeholder in changes below 7,000ft and will feed in network requirements to airports to be considered alongside other stakeholder requirements as per the CAP1616 process."

078 Birmingham Airport

DP4 is set as a medium priority. Birmingham Airport accepts that there will be occasions where it is not possible to replicate existing procedures whilst also delivering the benefits of Airspace Modernisation. Birmingham Airport would however request that every effort is made to present Airports with this option as our experience suggests that in many cases it would be preferred by local stakeholders.

Birmingham Airport agrees that consultation below 7,000 feet should be sponsored by the Airport as it is the Airports that have the local knowledge in order to enable the most effective engagement. We do however request that NATS makes literature relating to the wider project, including the reasons for the redesign and why routes must end at set locations publicly available. This will help Airport sponsors engage openly and transparently in an evidence based manner with local stakeholders.

080 Gatwick Airport

NERL's approach to require airports, through their own ACPs, to determine the locations of gates at or immediately above 7,000' will have two immediate consequences. Firstly, NERL may have to adjust the timing and approach to stages 2 and 3 of the LAMP2 ACP. Secondly, airports are likely to need to bring forward the ACPs for its procedure design below 7,000'. Urgent coordination of ACP schedules will be

required to meet submission milestones, which NERL will need to lead and coordinate. If the deadline of Q1 2022 for the submission of all FASI-S proposals to the Secretary of State for consideration is met, airports will need to develop gate location options (as part of Stage 2 of the ACP), so NERL can develop its airspace design options. We will therefore need NERL to provide feedback as part of our Stage 1 engagement regarding any constraints on gate locations that we will need to take account of as part of Stage 2. Noise remains an emotive factor above 7,000'. It is therefore a factor that also needs some consideration in route design and we would not wish airspace design above 7,000' to undermine efforts to tackle the impact of noise experienced by communities at lower altitudes.

085 Future Airspace Strategy Visual Flight Rules Implementation Group FASVIG

Commented re 7,000ft interface and airport procedure replications. Possible miscommunication re LAMP2 and FASI-S, clarified under revised DP8.

727 British Airways

BA agrees with this principle to a point. Wherever possible we should avoid compromising trajectories and entry/exit points for upper airspace to accommodate issues below 7,000ft. As mentioned for DP1, we feel that this would require full collaboration and coordination between NATS and the sponsors of adjoining airspace changes to ensure harmonisation with designs above 7,000ft, especially where synchronised changes are required. Airport engagement here is essential for avoiding sub-optimal designs and NATS must be heavily involved wherever airspace changes below 7,000ft are proposed.

We see a potential gap in ownership between 4,000ft and 7,000ft that may need addressing here.

In the main, BA is comfortable with a community led approach on design principles below 7,000ft, provided they are balanced with delivering an improved system for consumers in terms of minimising delays and maximising safety, runway throughput and resilience on a sustainable basis. In the interests of efficient operations, with the commercial and wider environmental benefits that brings, the transition from lower to upper airspace should not result in unreasonably long flight tracks or steep turns and climb gradients, especially as this often has detrimental consequences in terms of noise and emissions below 7,000ft. We are otherwise prepared to operate airspace as it is designed, providing it does not limit or constrain throughput and is within the technological capability of aircraft and is safety compliant, e.g. Flight Management Systems have limits on the quantity of different Performance-Based Navigation (PBN) flight paths that can be stored and so these must be manageable to avoid excessive complexity and associated safety risks.

14.5 DP5 Airspace: No increase to overall volume of controlled airspace (CAS) above 7,000ft

016 GAA and 024 PPLIR

While the GA Alliance clearly supports the aim of no overall increase in controlled airspace volumes, we are disappointed that this principle only goes this far. It should be a design principle and aim of LAMP 2 to 'make space' for the release of CAS below 7,000 ft and reduce above that level where possible. It is important that as use of airspace is made more efficient, the minimum necessary airspace volumes are applied. For the VFR GA community, we hope that the implementation of FAS will allow reductions of controlled airspace, particularly the raising of existing lower limits. This also relates to our concerns on DP4 – in order to see reductions in CAS below 7,000 ft, it will likely be necessary to modify the interface with upper airspace. Once upper airspace is set, it becomes the parameters around which lower airspace has to be configured. A failure to integrate lower airspace more effectively will likely lead to volumes being larger than they need to be, which is a serious concern for the GA community.

017 GATCO

We understand why there should be an effort to try not to increase the overall volume of CAS, however, if it is necessary and the airspace is not regularly used by other users, then why limit design to this principle. There should be no constraint real bottleneck here for the airspace designers. The LAMP project looked at areas where airspace could be given back to enable new airspace.

020 Honourable Company of Air Pilots

Do not support any increases in controlled airspace where this has a negative impact on GA access and GA safety through enforced funnelling of GA into ever smaller choke points; ATCO manning should increase to support continued GA access if there is any increase. (We note that FASVIG is identified as a stakeholder and support the concepts of flexible use of airspace they are developing.)

054 KLM

Prefers expansion of CAS, for safety and efficiency. Goal should be to minimise this impact instead of preserving the exact same airspace volume. Otherwise, increase as much as possible until other users (Military) are impacted, requiring additional consultation.

071 Bristol Airport

The South West is a very constrained sector from a capacity perspective, which already experiences restrictions through flow or inability to conduct continuous climbs. If no increase in overall volume of airspace is provided by this modernisation process, how will this sector, especially eastbound routes, become more effective to provide the enhanced flow efficiencies, increased capacity and operational performance that form a requisite part of future airport growth.

080 Gatwick Airport

We endorse this principle, but would not wish redesign to be constrained by existing lateral CAS boundaries, as it may be possible to make better use of airspace over the sea and airspace adjacent to the existing route structure. For example, this could, be used for holding more aircraft at height during peak periods and/or during incident management. The LAMP2 2024 design should be capable of supporting anticipated traffic volumes in c2050. The airspace design should be fitted with 'tubes' that can be switched on/off as need arises. We would also hope that a more effective design should allow the declassification of some airspace and thereby allow access to a wider group of airspace users.

727 British Airways

It feels unrealistic to achieve capacity benefits within the current volume of airspace and consequently BA disagrees with DP5 which would appear to contradict DP8... We believe that more airspace above 7,000ft is likely to be required to deliver safe, efficient and resilient design without impacting other users and so options to deliver this should not be discounted.

This design principle should acknowledge the need to,
(i)   future proof for airport developments which are designated to be of national significance,
(ii)   consider the phasing and alignment of airspace capacity developments in line with airport National Policy Statements and relevant airport Master Plans and
(iii)   develop detailed and integrated upper/lower airspace plans with gateways/milestones agreed with the industry to ensure delivery in line with national policy commitments.

As stated in our suggested new DP (see section 0), we disagree with this design principle. We believe it is unrealistic to achieve capacity benefits within the current volume of airspace and that more airspace above 7,000ft is likely to be required and should be encouraged to deliver safe, efficient and resilient design without impacting other users. Options to deliver this should not be discounted.

The principle here should be that an increase in CAS is possible unless other users are impacted, in which case, further consultation could allow airspace trade-offs to achieve common goals whereby any handback is matched by gains.

14.6   DP6 Airspace – The needs of GA users will be considered, in the airspace at and above 7,000ft.

016 GAA

While the GA Alliance clearly supports a design principle that takes into account the needs of GA, we are disappointed that the DP has only been assigned 'medium' priority (whereas the MoD appear to have been assigned 'high'). It is also unclear what the DP will mean in practice and what actions will be taken to account for the needs of GA in this context.

For GA VFR airspace users, the needs generally amount to:
Reduction of existing CAS volumes;
Improved access to those airspace volumes that remain; and
No negative impact on safety from implementing new airspace designs.
For example, there is no mention of airspace classification in the context of the needs of GA – the extensive use of class A for enroute and higher terminal airspace effectively means large areas of the UK are off limits to VFR traffic. Use of classes B-E would represent a more reasonable balance between the needs of different airspace stakeholders, particularly for the GA community. We note some states manage their entire network with class C being the highest classification, thereby enabling VFR access.
For GA IFR users, the need is to ensure that aircraft of lower performance profiles than jet transport (and

with typical cruising levels between FL100 and FL250) are still able to operate without impediment. We also seek clarification regarding RNAV1, which is addressed at DP9.

024 PPLIR

While PPL/IR Europe clearly supports a design principle that takes into account the needs of GA, we are disappointed that the DP has only been assigned 'medium' priority (whereas the Ministry of Defence MoD appear to have been assigned 'high'). For GA Instrument Flight Rules (IFR) users, the need is to ensure that aircraft of lower performance profiles than jet transport (and with typical cruising levels between FL100 and FL250) are still able to operate without impediment using the range of airports practical for GA traffic in the current London Terminal Manoeuvring Area LTMA. We also seek clarification regarding Area Navigation Standard Specification 1 (RNAV1), which is addressed at DP9. Our members frequently use airports in the LTMA area and operate under IFR in the associated airspace. This generally involves operating both:
At airfields located outside of controlled airspace, into and out of the airways system; and
At airports such as Biggin Hill or Cambridge, which often share arrival procedures with larger airports in the LTMA. Use of the LTMA in this fashion, as well as transits at lower level, is often not straightforward, particularly from a flight planning point of view. We would welcome discussion (as we have had in the past) as to how the mix of IFR operations we conduct might be more effectively facilitated.

080 Gatwick Airport

We hope that a redesigned airspace above 7,000' offers more opportunities to GA communities and those that use airspace for leisure pursuits. We also hope that the redesign offers improved segregation of user activities to reduce infringements and improve safety (also incorporated in revised DP5 wording).

085 FASVIG

Commented re GA organisations and individual organisational representation. The intent of mentioning FASVIG was to promulgate the DPs, it was not expected that FASVIG would respond on behalf of all the GA organisations. FASVIG can be used to assist in identifying areas of potential conflict.

727 British Airways

This aligns with FAS principles and so BA is comfortable with this principle, as long as designs are ultimately optimised for all airspace users with the primary goal of maximising airspace capacity, efficiency and resilience as per our suggested DP (see section 0).

14.7   DP7 Airspace: The needs of MoD users will be considered, in the airspace at and above 7,000ft

015 British Helicopter Association BHA

The requirement for military to retain airspace should be looked at. With their decrease in activity there should be a review of their needs, and/or the possibility of sharing it with other users, activation by Notice to Airmen (NOTAM) when it is required, overall size of requirement.

016 GAA and 024 PPLIR

Why is MoD high priority and GA only medium.

080 Gatwick Airport

This needs to be based on a balanced and realistic assessment of the airspace requirements for military training. Airspace requirements should be proportional to user needs and considered against their cost and dis-benefits. Ultimately, we recognise that it is often necessary to segregate airspace for military training and operations, but improved mechanisms are needed to provide more dynamic information on the availability of airspace for civil users.

083 Southampton Airport

Better use of Flexible Use of Airspace (FUA).

084 MoD

MOD has no specific comments on your proposed design principles but we would wish to see military airspace and equipment requirements, including navigation equipment of Military aircraft be taken into account, noting that older aircraft without appropriate equipment are not yet out of service.

727 British Airways

BA is comfortable with this principle, so long as it is matched with a reciprocal arrangement to consider the impacts of revised military airspace arrangements on the network and commercial air traffic. Impacts should be minimised, and existing standard airspace structures used where possible.

We would particularly want to see better future management of airspace to utilise Flexible Use Airspace (FUA) principles. The MOD has been notoriously poor at handing back unrequired airspace and providing civil aircraft users with sufficient opportunities or time to plan more effective routings. Whilst it is recognised that the MOD has made improvements to this process and are willing to work with airlines, greater traction is required. BA welcomes the MOD's commitment to working with NATS to make real improvement setting targets in this regard.

14.8   DP8 Modernisation – No constraints to the efforts made to systemise the network, for capacity

016 GAA and 024 PPLIR

Clearly this is a key deliverable of the FAS, but would emphasise the comments made earlier about the rigid demarcation of 7,000 ft.

017 GATCO

In principle, GATCO agree with this; systemisation in busy traffic levels, with flexibility to use more direct routings and removing vertical constraints when traffic levels are lower. However, in highly congested busy airspace, full systemisation isn't currently possible, there is too much traffic that requires intervention to increase spacing and ensure safety. Consideration should also be given for aircraft being unable to fly the systemised route due to weather, equipment failure, emergencies and other unusual events. This can quickly lead to overloaded controllers and unsafe situations. Additionally, the assumption that controller/pilot workload can be minimised by reducing controller tactical intervention is a rather simplistic one and, potentially, a wrong one. The controller will still be involved in the management of the airspace and in some of the tactical controlling. Removing the controller from the decision-making process and leaving them to monitor the system can increase controller workload at times where their input is required after a period of monitoring, just because the controller has not been directly involved and their situational awareness might not be complete. Again, that argument is included in CAP1377. We have seen how "reducing the workload" of the driver in driverless cars, by removing them from the decision making process, has had catastrophic consequences when the driver was required to make a decision at short notice because the automation encountered a situation it could not deal with.

NATS response: The GATCO respondent is correct that, within the current airspace structure, full systemisation is not possible. Our current structure requires extensive Controller intervention at all stages of flight. However, utilising aircraft capabilities and future ATM design concepts, safety and capacity can be improved while significantly reducing the need for Controller intervention. This will require future tool capabilities, consideration of the ATCO role and extensive input from Safety and Human Factors in order to provide a robust and efficient airspace model for the UK. As part of this evolution, Controller's tasks will change dramatically, and their decision-making task is expected to transition from short term tactical intervention to longer term profile optimisation. This is in line with the intent of the revised DP.

070 Heathrow Airport

Supports RNAV1 minimum, but seek clarity on the position of NATS with respect to non-compliant operators, and whether these will be accommodated at all, or with a penalty and the NATS position on the "best equipped best served" issue. In addition it is crucial to understand if a higher navigational specification will be required to enable aircraft to stay within each tube, if so this should be articulated as soon as possible, additionally there should be some form of consideration towards the future and the designs being capable of accommodating future advancements. Add a capacity reference date, such as network capacity to the year 2040.

076 Stansted Airport

Design of routes above FL70[3] will not result in flow restrictions to aircraft in vicinity of airports or cause extended routes (ATC intervention) The design of the routes above FL70 should not cause the re-

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[3] Altimetry - FL70 refers to Flight Level 70, a vertical reference of 7,000ft above a standard pressure datum of 1013HPa.
Not identical to 7,000ft altitude but sometimes used interchangeably or for brevity in some circumstances.

alignment of airport departure routes (in particular there should not be the need for airports to re-design or re-plan Noise Preferential Routes NPRs) Design should be designed under "Systemised airspace" principles. Arrival routes designed to minimising holding in the vicinity of airports (including the ability to lose or gain time). Ability for the design to support sharing of predictable data to support AMAN/DMAN[4] principles. Airspace should not be a constraint to growth of airports

080 Gatwick Airport

It is important that aircraft operating in an enhanced airspace network should be able to make full use of these new network capabilities. The required benefits of enhanced airspace capacity will not be achieved unless operators are able to use it efficiently. We expect NERL to work closely with regulators and airlines to ensure that existing aircraft capabilities and operating constraints are fully understood and addressed, ideally before 2024. It is important that a future design can accommodate new network capabilities, system tools and changes to route design if the network is to be as efficient and effective as possible. It should take account of anticipated developments in airspace design and aircraft operations, and enable easy adoption of new capabilities. Clearly, NERL will need to establish the network system capabilities that it expects to be available at the time of initial implementation and share this with airports, airlines, ANSPs and others in the near future.

We are an advocate of measures that progressively systemise the network, to create capacity, reduce pilot and controller workload and automate performance monitoring. We also wish to see dramatic reductions in the tactical interventions by controllers, especially during the latter stages of descent and before commencing a final approach. We therefore want to see how the network will be better systemised beyond 2024, so that designs below 7,000' can exploit these capability enhancements.

In addition, highly efficient airspace design should not be compromised by ineffective interfaces with neighbouring FIRs or is regularly subject to down route flow restrictions. As a principle we would expect that a future airspace design is capable of adopting air traffic management enhancements stemming from Single European Sky Air Traffic Management Research (SESAR) and other initiatives.

727 British Airways

BA strongly agrees with the principles in DP8 not to constrain efforts to systemise the network for capacity, but systemisation is not a principle in itself; it is a means of achieving capacity increases and so we believe DP8 should be rolled into a new design principle and carry a 'very high' priority weighting.

As stated in our suggested new DP (see paragraph 12.6), BA strongly agrees with this principle which is the only one to mention modernisation and systemising the network to maximise capacity. We believe that maximising capacity, efficiency and resilience to cope with anticipated growth in UK air traffic should be a stand-alone design principle, second only to DP0 safety principles in priority terms.

As already mentioned it feels unrealistic to achieve capacity benefits within the current volume of airspace and consequently BA disagrees with DP5 which would appear to contradict DP8 and our suggested DP. We believe that more airspace above 7,000ft is likely to be required to deliver safe, efficient and resilient design without impacting other users and so options to deliver this should not be discounted.

NATS note: LAMP2 is the Network part of FASI-S, under NATS En Route stewardship. This airspace change proposal (ACP) is specifically relevant to the air route network at higher levels 7,000ft+.

Each Airport will contribute to FASI-S, with their own ACPs, their own airspace design principles and concepts, at levels below 7,000ft. These would be coordinated in a cooperative manner.

LAMP2 Network's design aim is to cope with the number of planned runways in the southern UK. It is not being designed for a specific capacity or year. It does not seek to constrain traffic on routes below 7,000ft.   Should runway capacity change over the longer term, it would be reasonable to expect future airspace changes at lower and/or higher levels.

14.9   DP9 Modernisation – RNAV1 would be the minimum navigation standard

016 GAA

We have no objection to the use of RNAV1 as a design criterion for new routes and procedures. However, we do not support mandatory RNAV1 approval for entry into the relevant airspace for all IFR

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[4] Arrival Manager/Departure Manager, air traffic control tools assisting in determining or setting the time of arrival or departure of a particular flight.

flights. It should be possible to accommodate a low volume of IFR traffic, that is not RNAV approved. This is particularly relevant for GA IFR aircraft operating in and out of secondary airports or GA airfields in the south east of the UK. While presumably an important aim of LAMP 2 is to reduce ATC intervention in aircraft flight paths, the option of tactical vectoring, to facilitate a low volume of non-RNAV1 approved aircraft, should be retained. Many IFR GA aircraft flying in the relevant airspace will be RNAV1 equipped by the likely time of implementation of LAMP 2, so we emphasise that it is not anticipated that large numbers of non-RNAV1 approved GA aircraft will wish to use the relevant airspace. However, we would not wish to see non-RNAV1 approved aircraft unnecessarily disadvantaged. If it is the intention of NATS to seek an RNAV1 airspace mandate, we would suggest this is made clear, along with the precise areas of airspace it would apply to. Should this be the case, we recommend further discussion on the subject. We would also be interested to know to what extent the use of RNAV1 design criteria might allow lower route and procedure containment margins within controlled airspace than is currently the case.

017 GATCO

Agree, assuming all aircraft are equipped with RNAV1 and there is consideration given to an occurrence of an aircrafts equipment failing or emergency or weather deviations occurring.

024 PPLIR

We support the use of RNAV1 as a design criterion for new routes and procedures. However, we do not support mandatory RNAV1 approval for entry into the relevant airspace for all IFR flights. It should be possible to accommodate a low volume of IFR traffic, that is not RNAV1 approved. This is particularly relevant for GA IFR aircraft operating in and out of secondary airports or GA airfields in the south east of the UK. While presumably an important aim of LAMP 2 is to reduce ATC intervention in aircraft flight paths, the option of tactical vectoring, to facilitate a low volume of non-RNAV1 approved aircraft, should be retained. Many IFR GA aircraft flying in the relevant airspace will be RNAV1 equipped by the likely time of implementation of LAMP 2, so we emphasise that it is not anticipated that large numbers of non-RNAV1 approved GA aircraft will wish to use the relevant airspace. However, we would not wish to see non-RNAV1 approved aircraft unnecessarily excluded. If it is the intention of NATS to seek an RNAV1 airspace mandate, we would suggest this is made clear, along with the precise areas of airspace it would apply to. Should this be the case, we recommend further discussion on the subject. In response to the consultation on LAMP1, PPL/IR Europe made a detailed argument about why the proposal at the time for an RNAV1 airspace mandate was unnecessary. This is included for reference as an annex. If NATS thinks the issues have fundamentally changed since then, we would urge further discussion.

032 American Airlines AAL

Supports the efforts of LAMP2 with the intent of improving efficiency and capacity. With the modern navigational capability that exists in our aircraft there are operational gains that are not being well served by today's airspace structure in the UK. We have found that full usage of current avionics technology coupled with the associated airspace enhancements there is a definite reduction in time flown and engine emissions which contribute to enhancements to the flying public and aviation industry.

070 Heathrow Airport

See DP8 above.

073 Luton Airport, 076 Stansted Airport, 080 Gatwick Airport and 727 British Airways suggest pushing for a higher minimum standard, no reliance on ground based navigation aids, as RNAV1 itself is relatively old technology and higher levels of PBN are required.

080 Gatwick Airport

The vast majority of aircraft operating within the LTMA are already equipped to the RNAV1 standard. Setting this as the minimum standard is highly unlikely to secure the best capacity and systemisation from the network. We would ask NERL to consider the additional benefits to LAMP2 and wider FASI-S programme of adopting higher standards, such as Required Navigation Performance (RNP).

We would also wish to understand how Flight Management Systems (FMS) capability upgrades in aircraft and airline fleets are being encouraged. Future airspace design should offer enhanced benefits to those that have invested in aircraft and ATM capabilities that can maximise the systemisation NERL and airports can offer. Airspace design should not be based on aircraft with the least capability.

083 Southampton Airport

Consideration should be taken regarding the aircraft equipage of the smaller airline

084 Ministry of Defence MoD

In response to this first stage consultation, the MOD has no specific comments on your proposed design principles but we would wish to see military airspace and equipment requirements, including navigation equipment of Military aircraft be taken into account, noting that older aircraft without appropriate equipment are not yet out of service. To facilitate this, the MOD is willing to engage throughout to ensure our respective requirements are safely met. The MOD would also be interested in assessing any potential opportunities for improving current operations that might be realised from this undertaking.

103 Rockwell Collins Avionics

As related to Flight Management Systems for our commercial Business Jets and Canadian Regional Jets, Rockwell Collins endorses the concept of using RNAV1 because of our commercial aircraft are capable of RNAV1.   To require RNP1 would be problematical because our TSO-C129a systems are not capable of RNP1. Only aircraft that have updated their FMS for localizer performance with vertical guidance (LPV) (since 2008) also have RNP1 capability.

727 British Airways

The lack of progress in modernising UK airspace over the last 20 years is particularly disappointing when put in a global context. BA devotes significant resource to the tactical and strategic management of air traffic control, airport and airspace related issues to optimise its performance in current and future airspace. However, aircraft that BA operates in the UK have not been able to fully utilise their advanced navigational capabilities despite being able to use them in the rest of the world, e.g. the benefits of PBN standards are already being demonstrated in Frankfurt, Hong Kong and Atlanta and other overseas airports. BA equipped its Boeing 777 fleet with on-board navigation systems to enable area navigation routings (RNAV), but these aircraft will start to be retired before this technology has had the chance to benefit consumers and communities in the UK by flying more efficiently and precisely. Likewise, newer aircraft BA now operates, such as the Airbus A380, are forced to use traditional beacon navigation infrastructure despite their advanced on-board technology.

Virtually all modern aircraft can take advantage of satellite-based navigation to fly more precise routes. However, consideration must be given to the timelines associated with fleet equipage projections and the phasing out of older navigational technologies. There are marginal gains to be had by equipping legacy aircraft with specific levels of PBN capability such as RNP AR but this does come at significant cost and is not possible on some aircraft fleets, notably the Boeing 747.

BA believes that there is a case to review the NATS licence policy of "first come, first served" for managing aircraft in UK airspace. With the delay to the London airspace programme and increasing demand resulting in furthers delays and congestion, it may be more appropriate to move to a "best equipped, best served" policy that incentivises airlines and aircraft operators to invest in and deploy newer aircraft navigational technology. Whilst this would represent a departure from accepted practice worldwide, London and South-East airspace is the busiest and most congested airspace in the world and so this approach does merit careful review.

15.   Annex B Feedback Summary – Second round of engagement

The following paragraphs are copies of, extracts from, or summaries of the feedback received during the second stakeholder engagement exercise. DP numbers refer to the same numbers in this document, not the original slide pack.

695 Heathrow Airline Operators' Committee and London Heathrow Airline Consultative Committee (HAOC and LACC)

NATS LAMP2 Stage 1B Updated Design Principles and priorities

On behalf of the London (Heathrow) Airline Consultative Committee (LACC), the Airline Operators Committee (AOC) and collectively representing the 86 airlines currently operating at Heathrow Airport, we remain of the strong conviction that airspace must be modernized as quickly as possible. This will secure the necessary capacity, resilience and safety outcomes aligned, particularly, with the Government's decision to expand Heathrow as the national hub and consequently realise the wider economic benefits for the UK.

Updated response on priorities

The Heathrow airline community acknowledges the earlier work done by NATS on the design principles and that airline comments have been included in the latest version issued on the first June. We remain broadly supportive of all the amendments and would like to highlight two key aspects regarding the prioritisation and governance of the Design Principles:

Design Principles

In the light of the airline submission to the DfT regarding the Airport National Policy Statement… that DP1 OPERATIONAL (B) must clearly acknowledge that both airspace capacity and operational resilience will increase. A hub airport will only work effectively if the demand for airspace is matched by NATS's ability to deliver the supporting infrastructure in a timely manner. Furthermore the design linkages between the network level – where NATS has accountability - and the lower airspace (below 7000ft where the airport has accountability) must be clear and considered as a single design and programme continuum. Whilst DP 8 at priority C acknowledges how capacity benefits from systemisation will be realised, our view is that the most critical node in the network, from a UK and International perspective, must be considered as a priority B in the revised DP1 OPERATIONAL principle

NATS note: Due to an editorial typo, DP8 (re: capacity) in the summary page was listed as priority C but the body text, and overall intent, was priority B supporting the view of HAOC/LACC. Following this discussion point on DP8, HAOC/LACC provided useful information and discussion on the governance arrangements for FASI-S stakeholders, outwith the remit of this paper. That text has been recorded elsewhere for further consideration.

727 British Airways

BA generally agreed with, and supported, the wording of the DPs, with views on their relative priorities – most should be a lower priority than increasing capacity/resilience, the opinions below are to maintain an appropriate differential:

DP0 Safety remains A

DP1 Operational (resilience) remains B

DP2 Economic change from B to priority C – fuel trade-offs are acceptable for improvements in capacity/resilience

DP3 Environmental (CO_2) change from B to priority C – fuel trade-offs are acceptable for improvements in capacity/resilience, reword to "optimise" instead of "minimise"

DP4 Environmental (noise) change from B to priority C – LAMP is primarily higher level and should work with airport sponsors to avoid compromising higher level interfaces

DP5 Technical (CAS) keep priority C as it is appropriately one rung below capacity/resilience, and trade-offs can be found where CAS volumes impact other users above 7,000ft.

DP6 Technical (GA impact) change from C to priority D – due to proposed priority reductions for DP2 DP3 DP4, this should be reduced to maintain that distinction.

DP7 Technical (MoD) remains C

DP8 Operational (capacity) – there is a discrepancy between summary C and body text B, BA believes this should be B.

DP9 Technical (PBN) remains B

NATS note: We understand the reasons, and generally agree with, BA's changes in priority in order to make the distinctions clearer between them. We have made those priority changes in the body of this document, except to DP6 which we retain at its original priority C, one rung higher than BA's opinion. DP8 should always have been specified as priority B and we are happy to confirm & correct the text.

082 Cardiff Airport

Cardiff Airport understands and supports the need to focus on capacity constraints on airspace over the south east of England. While the airspace surrounding Cardiff Airport is not capacity constrained at the moment, the planning undertaken for the successful hosting of the UEFA Champions League Final in 2017 would indicate that capacity is likely to become an issue during the RP3 period, therefore we believe that consideration of the Severn Airspace as part of the airspace modernisation project is necessary to meet the growth aspirations of airports in the region.

We believe considering the Severn Airspace as part of the modernisation project could improve the presentation of traffic to the adjacent en route sectors, increasing the efficiency of the airspace as a whole.

NATS note: Cardiff Airport is part of FASI-S and their point of view on the Severn region will be part of that collaboration, outwith this DP paper.

016 GA Alliance

This stakeholder response was generally supportive that NATS had taken on board the feedback from the first round of engagement and the clarification/wording of the DP's supporting text. The GA Alliance emphasised that the design should be able to use less overall airspace, and that impacts of lower-level CAS on their activities were greater than that of higher-level CAS, along with the airspace classification. This has been recorded and acknowledged. Lower-level CAS and its classification will be considered in the vicinity of the FASI-S airports under their own DPs once their ACP processes launch, with NATS LAMP interfacing at the upper limits of that airspace, thus the intent of the GA's emphasis is included within DP5. Regarding DP6, the stakeholder was satisfied for now that it allows for the development of discussions on GA impacts.

020 HCAP

We note and welcome the policy (10.6 and 10.7) to afford MOD and GA airspace users equal priority when assessing the impact of change but were less comfortable that both have much less priority than the NATS network fuel performance. We hope improvements in aviation's overall environmental footprint will drive the design. You give safety the highest priority in your design principles (10.0) but you still have not stated explicitly that your highest priority is the safety of all airspace users and those who are over-flown. This would allow you to export NATS network aviation risk to the GA community and to those they over-fly. We think this is a serious flaw, especially as the noise impact of those under your network (10.4) has priority over any impact on GA or MOD. It is extremely difficult to satisfy all conflicts in airspace design but that makes it even more important that the principles balance the needs of all involved parties on the ground and in the air.

NATS note: We believe the scope of DP0 Safety is inclusive, clear and broad. We have also changed the priority of DP2 DP3 and DP4 to C, equalising them with DP5 DP6 DP7, aligning with HCAP's views.

Responses from the following stakeholders can be summarised as "generally support and agree with the DPs, no specific comments":

043 Emirates, 073 London Luton Airport Operations Ltd, 655 Etihad, 697 Cathay Pacific, 902 LVNL ANSP

084 MoD had no further comments.

080 Gatwick Airport

Summary extracts from their response:

(3.2) In support of DP3 we consider continuous climbs and descents, and minimised holding, to be essential requirements of a new design, rather than just 'desirable', to help secure long term, efficiency based, fuel and environmental benefits.

NATS note: The use of "essential" practically mandates this as part of the solution, however NATS agrees that these items are perhaps more than just "desirable". Wording changed to "highly desirable". This does not change the DP text itself but refines the supporting text and how it influenced the DP.

(3.2) You state that the primary goal is increased capacity, through improved efficiency of design and go on to declare that this additional capacity will be used to accommodate additional aircraft. This may well be the case, but there are other benefits from a more efficient design which will be accrued immediately. We feel your proposed text (3.3) 'Optimise network fuel performance' to replace the former DP3 is ambiguous and would benefit from being simpler, for example, the new DP2 could be framed as

'minimise fuel usage/flight'; this would also be in accordance with the proposed 'Minimise CO2 emissions/flight'.

NATS note: The use of "optimising CO_2 / fuel per flight" is preferable to "minimise fuel/CO_2 for all flights" or "optimise for all flights". The former allows for a trade-off of individual routes for the benefit of the system, the latter two would conflict with the optimisation of the system and would not allow trade-offs in the same way – if all flights are optimised, it could result in a lower overall network benefit.

(4.3) We would advocate that the proposed amendment of DP4 includes the caveat that the impact of noise (above 7000') will be minimised, 'where possible'. In addition, in relative terms, we feel the priority of this DP should be reduced to a 'C' to reflect government policy on the consideration of noise (above 7000').

NATS note: We believe the wording of DP4 is appropriate as written, however a change in priority is also appropriate, to priority C, for reasons given earlier in this paper.

(8.3) To reflect the fact that modernisation will be primarily delivered through more efficient and effective design, which in turn enables agility through systemisation, DP 8 should include 'efficiency benefits' as well as 'capacity benefits'. Moreover, as systemisation is key to unlocking capacity and enabling efficient operations, it could be raised to priority B.

NATS note: We acknowledge the link between capacity and efficiency as articulated here, leading to the modification of the text of the DP. It remains priority B, but as previously noted elsewhere in this document there was an editorial typo leading to the body text correctly presented as B but the summary page incorrectly presented as priority C.

Gatwick Airport also disagreed with para 12.5, a rejected DP, please see that para for NATS' response.

End of document