

AMS Refresh – Co-Creation Workshops

Final notes

Workshop 1 – Integration

Attendees:

Lee Boulton - NATS

Ian Roy - Virgin

Kate Read – MOD

Pete Stratten - BGA

Andrew Lambourne – ACF

Richard Piper – Honourable Company of Air Pilots

Mark Roberts - Spaceport 1

Deborah Lovett - AEF

CAA Airspace Modernisation Team

Integration - general

The airspace integration vision for 2040 is one where we can operate in a single, integrated airspace and where we can share data to avoid segregation. Attendees were asked what integration looks like from their perspective. Some said that they are looking for the largest amount of unrestricted or uncontrolled airspace and that this seems only possible with improved Electronic Conspicuity (EC) rather than the traditional Automatic Dependent Surveillance–Broadcast (ADS-B). Minimising Controlled Airspace (CAS) outside controlling approaches to large airports is a step in the right direction. GA, especially air sport, can't always fly in straight lines, and so flexibility is required. However, this can only be achieved with the right technology, making sure that everyone is aware of everyone else's presence in the airspace.

It was echoed that all users should be able to fly where they want but with the minimal consequence and impact on others. This can be achieved with better understanding and planning of activity and greater opportunity to monitor intended vs activity actually being fulfilled. It was raised that this should be the vision for 2040. It was suggested that there is a lack of trust among different users and users are bound by restrictions/rules associated with certain classifications, leading to segregated activities that don't meet that ruleset. Ultimately, it should be about giving assurance to all (or as many as possible) users that they can fly where they want to fly by 2040 subject to having consideration for communities. We should break down barriers of what is stopping this happening while allowing others, e.g. Heathrow and the military to continue to function. We need the confidence and assurance that there is a safe system in place to integrate users into the airspace, but at the moment this doesn't exist.

Although it is in everyone's interest to have such a system in place, it could not be expected to implement a 'straight to' autonomous solution. Many recreational GA aircraft would not be able to technically implement such a system in the short-term, furthermore; the financial cost could be too great to implement an autonomous system straight away. However, the intention of the new Lower Airspace Service would be to enable steppingstones, taking into account user equipage etc, to get to that 2040 vision. A shared airspace maybe based on rebroadcast of position data to create a shared understanding of activity in the airspace. Many rule-based issues are blocking this at the moment.

Others echoed the need for an airspace with minimal restrictions and with the use of systems that create a known traffic environment, but that the key is more flexibility in terms of how much airspace

is required and the ability to turn it on and off rather than very rigid structures and timings, and cumbersome processes for managing that. It's about minimising the impact of those activities that still require segregation, such as firing weapons or high energy operations.

Noise

There were concerns raised that the phrase "managing noise" (in one of the AMS objectives) is meaningless without context. It was also noted that PBN technology which reduces lateral dispersion leads to concentration which can mean communities with more regular overflights than when dispersed. There was another point raised about climb rate – at present commercial FMS systems are tuned to minimise fuel consumption, all other things being equal. Overall, the noise objectives aren't giving people much comfort regarding environmental impacts. If noise levels reduce by 1db but flights increase by 50 a day, there is potentially a disbenefit. Therefore, how can industry contribute to better managing noise?

It was recognised by others that noise has to be a key focus and that the revision of the AMS provides an opportunity to address it. Working together much more closely as an industry was raised as a key enabler. All stakeholder groups have a view on how aircraft should operate, and industry should be able to work on an industry wide view on how best to mitigate impacts. There was a view that a barrier from delivering a better environmental performance is the difficulty in PBN deployment for more than one or two routes. There is a lack of clarity as to whether concentrated dispersion offers benefits. If that problem were resolved, it would open up opportunities to mitigate the impacts of noise.

In response to this, there was a discussion on the complexity of PBN and that its use depends on aircraft capability which varies across fleet. However, it provides the opportunity to systemise airspace and it would enable various operating techniques (continuous climb etc) to minimise noise. The concern was raised that there is ongoing investment in newer aircraft but restrictions around airports remain – there is a need to understand what newer techniques can be used to minimise noise. In summary, one main way of leveraging environmental benefit from PBN is if there is the possibility of having more than one route between a and b, but current FMS systems have limited storage capacity and more routes can increase the potential for human error.

There was a discussion around the pros and cons of an acceleration altitude at 1500ft or 3000ft in noise, engine wear and emissions terms. Concerns were raised that net zero doesn't consider noise impact. Questions were raised as to whether this will mean a focus on CO2 at the expense of noise? However, it was noted that the current government policy says that below 4000ft noise is key consideration.

When talking about managing noise, there were concerns that not much thought had been given so far to the fact that people are impacted by more than one airport. It was suggested that there is a need for an integrated approach to airspace modernisation that has to be looked at in greater depth, and there should be more information on how airports are going to cooperate to reduce noise impacts where there are multiple airports causing it – are airports going to come together and how will AMS facilitate airports cooperating so that noise can be better managed, and the impacts reduced.

It was suggested that concentration of flights isn't the ideal approach, but that also dispersion will inevitably increase overall population affected so there is not a clear-cut solution. There is a need to come together to understand how best to communicate this and what the best way forward may be.

UAS/GA integration

A question was raised as to what the ideal UAS interaction with GA may look like.

There was a general consensus that in order to contemplate integration of RPAS into non-segregated airspace, particularly Class G, that these platforms will require to be capable of achieving 'sense and avoid' at least as good as 'see and avoid' within the current ICAO Rules of the Air applicable to the airspace classification.

Business aviation

Concerns were raised around the needs for business aviation and that it doesn't necessarily get the protection of Controlled Airspace (CAS), and therefore has limitations on climb and descent. Integration of middle to upper airspace is important. Private owners can be very short notice demand, and fly off route sometimes, so it can be difficult to cater for them. Smoother management of a to b would help facilitate activities.

Because they are going into more class G, creating a 'known environment' would give them the ability to manage their own safety as well as having air traffic service. The more operators with support from systems and data being rebroadcast, the more can manage their own safety.

Spaceflight

There was a discussion about vertical and horizontal launch. They are new users, with a lot of political backing, but certain activities, not necessarily military, will always require segregated airspace. Assumption that this comes into the flexible use of airspace category. It was raised that if segregation is needed, it should be for absolute minimal time to allow that operation to happen, so there is minimal impact on/disruption to other airspace users.

In the context of CAS management, it was raised that although CAS is there all the time in certain areas, but that it is not always in use. When there is no traffic it is inefficient and affecting other airspace users. Ultimately, it is about ensuring safe operations, so if a vehicle is being launched into space and it needs a safety trace around it, that trace should only be in operation for the time needed – i.e. not just vertical and lateral confines but time as well. Sub orbital was raised as another variation around vertical and added to the complexity.

GA perspective on Flexible use of Airspace

It was discussed that making the Transition Altitude (TA) at 6000ft across the state would be a sensible approach. It would be helpful to have a method in place to let users know that certain airspace is available. At the moment, large chunks are not being used much by a particular airport, but it is not communicated effectively. A question around how you would turn the airspace off was raised. Some parts of Europe are already using radio calls to enable lower airspace users to access airspace not being used for a significant time block with rebroadcast. The challenge is that if airspace is needed again, then adequate time is needed to let users know. There was a comment about having airspace turned off completely, including danger areas and other types of restricted airspace – only turning it on when needed rather than turned on by default.

There was a view that in order to offer true flexibility in future arrangements we need to be capable of safely switching on and off volumes of Class A, C, and D airspace and temporarily reclassifying those volumes to Class G in order to deliver optimum flexibility of operations.

There are a lot of pinch points around class G and if we do optimise climbs for commercial flights, that CAS would be less needed. There are also peaks in demand at some airports and gaps at other times, so freeing it up gives efficiency for users, especially for GA generally if they want to participate.

Interoperability and compatibility

Some were mindful that making sure standard keeping in line with Europe can hold back what we are trying to do in the UK, but that there would be different viewpoints for different operators. However, having an eye very much on Europe shouldn't mean that it holds the UK industry back on innovation.

Others suggested that interoperability is not just when we operate in UK but also when visitors operate here. Differences cause confusion, so in a known environment with people participating in shared airspace, there is a need for people to be interoperable in airspace.

Interoperability is great in a new system, enabling exchange of info across different systems creating interfaces. However, interoperability's biggest issue would be if you have to change from what you're doing today as that will impact training, understanding of rules etc; So it should be in everyone's interest to keep rules the same, but from airspace users point of view we should be trying to come up with global rules.

PBN

Leaving EASA has created new opportunities, according to some. For example, we can rethink what is required and not be held to lines in the sand that may have been politically driven in the first place. There is an opportunity to relook at the PCP and not just apply it in the same way as CP1, but just look at what is required, and ask is it steering the UK in the right direction? Of course we want to make use of the technology but where EU gave an arbitrary deadline, there was the view that the UK shouldn't be held to it and have the desire to be more flexible in terms of timings and depending on airport's requirements, and seek opportunities that add value overall.

Comments sent by A4A (who couldn't be present at the meeting), summarising their key interests as fitting in with a jointly developed lower airspace strategy:

- Flexibly used airspace;
- A comprehensive lower airspace CAS review:
 - Based on UK agreed terminal airspace containment volumes (in particular CTRs – which currently vary widely in size... I can provide details);
- Develop an “airspace design toolkit” (revised procedures, regulation and policy – in light of BREXIT), to aid new design;
- Conduct a review of current volumes and re-align to a standardised structure (or agreed variance – based on actual use);
 - Periodic reviews of lower CAS volumes (annual), allowing adjustment (up and down) as demanded by actual use (similar to the process in Germany and France);
- Development of an EC roadmap;
 - Facilitate an on-call Flight Information Service (FIS) (this does not have to rely totally on ANSPs);
 - Facilitate traffic information in/around GA airfields/launch sites (to complement the wider FIS availability) – i.e. in the areas proven to be of most MAC risk.

Workshop 2 - Infrastructure

Attendees:

Lee Boulton - NATS

Ian Roy - Virgin

Kate Read - MOD

Pete Stratten - BGA

Deborah Lovett - AEF

Roger Hopkinson - GAA

Chris Cain - SASIG

Dan Wood - easyJet

Jennifer Sykes - HAL

John Turner – Honourable Company of Air Pilots

Phil Binks - Altitude Angel

Adrian Clarke - NATS (joined for last item only)

CAA Airspace Modernisation Team

Recap

CAA provided a summary of the first session.

There was a brief discussion about ICAO compliance and the opportunities the UK has now that it is no longer bound by EASA regulations. The aim is to standardise but sometimes there might be a need to file a difference.

Some feedback from the Review Panel was shared. It was suggested that in the future, there would not just be the traditional Lower Airspace Radar Service (LARS), but partly electronically. The Panel also said that the Transition altitude – getting 6000ft outside Controlled Airspace (CAS) was a good starting point.

Land-use planning

There was concern raised that nobody seemed to tackle the lack of coordination with land-use planning and that it was unclear who is responsible for this within Government. Conversations are ongoing with groups in DfT. CAA committed to inform them, but also stated that this is not part of AMS because it's not in CAA's remit, the same goes for capacity at an airport, which is a planning issue.

It was raised that airspace has to be able to cope with these issues as well as taking on other considerations around efficiency noise etc – airspace is invisible infrastructure, and you can't just put airspace to one side. It must be integral part of overall package to support aviation.

Intersections between routes

The Aviation Communities Forum (ACF) paper (*see attached to email*) on different climb rates and profiles was discussed, with the main question being how you solve the problem of route intersections in lower airspace given the wide variation of climb rates across fleets and on different days? In terms of performance of aircraft and airspace, can you do it in a way where routes don't interact?

Some expressed the need for industry to come together to try and understand vertical profiling as well as lateral. Concerns were raised about the inability to make a standardised profile since the climb rate is dependent on many factors, and hence even with a high-performance and a low-performance option, aircraft may not be climbing efficiently if they are targeting a small "letterbox". Can deconfliction be designed in?

There was support for the view that there is a real challenge in optimising airspace against objectives in AMS, because of the need for an industry-wide approach. There was a proposal to work on a playbook of procedures for a certain category of aircraft in certain conditions that would have a certain impact on fuel, carbon, noise etc – a rule book of what high-level consequences would be to inform initial designs. This could then be used to optimise each against AMS objectives. For example, impacted by different aircraft, engines, conditions on the day etc. instead of a ‘one size fits all’. Instead the outcome is set and develop the playbook so each airport can use design principles based on their traffic mix, locality and population mix below.

It was suggested that changing climb profiles is difficult, but you can have positive benefits for several users/factors, and it would be helpful to map out what is good/bad in different regions.

There was a discussion around 3Di which is still in use and looks at inefficiency, i.e. actual profile against the one that was filed. It was suggested that vertical/quick climb is in everyone’s benefit, but it’s about how you get that performance. Key strategic aim should be unlocking vertical performance and doing vertically what can do laterally.

Concentration

A question was raised as to whether you can technically reintroduce some of the natural dispersion that occurs today? Is there something to be done around automated dispersal?

It was agreed that PBN gives capability to disperse as well as concentrate noise – one route will concentrate, but to provide several routes with some degree of dispersal takes up more airspace, and interacts with accessibility, or with some routes being used for respite provision. So, a trade-off between noise, respite and access for other users (but see previous points about multiple routes).

Attendees questioned what is the ultimate objective we are trying to achieve? Is it less noise spread among greater number of people or reduce number of people exposed to highest levels of noise, or make sure those exposed to highest noise is only for limited period of time? In response to this it was mentioned that if airspace could be activated and deactivated more dynamically, then there wouldn’t necessarily be that conflict – similarly do we really need all airspace that our airports take up at the moment for single runway for arrivals from N S E W... by releasing some airspace we may actually release some to achieve vertical tube deconfliction. It doesn’t seem to make sense to constrain most aircraft, because planned profiles are against worst performing aircraft, and that is where flexibility of application will need supporting infrastructure, becoming the fundamental driver.

There was some concern that the way that ICAO describes some airspace constructs is out of date and not aligned with modern aircraft performance and are limiting airspace design.

It was concluded that most participants are in agreement, but that the difficulty is in the application, i.e. how do we achieve it? So many factors are important to consider when you want to change airspace e.g. weather changes, release of airspace, accessibility etc, and it is impossible to deliver them all. It was suggested that industry has to make compromises and had to be clear on that. Ideas have to result in meaningful plans with a roadmap of activity where we need ICAO’s support. Prioritisation is key.

ATM/UTM convergence

A discussion was held on how lower airspace is structured, and what is needed for a shared airspace.

NATS shared slides (*see attached to email*) showing NERL’s perspective on what sort of infrastructure was needed to support UTM integration.

Discussion on how to make progress to goal -Transponder Mandatory Zone (TMZ) – primary radar Dependent Surveillance Broadcast (DSB) and 5G potentially in mix. There is a mosaic of different

services so from uncrewed point of view can start off in mandatory TMZ – view that you start by saying uncrewed have to avoid crewed – small drones just can't be seen – but if all Cessna's are EC then capability to electronically avoid using detect and avoid or a separation service from UTM service provider.

There is also an opportunity to develop digital Flight Information Service (FIS) to replace voice FIS; Feedback from business jet community was that they wanted to see digital info on where all other aircraft are.

The feedback from GA is that ATC outside CAS is inconsistent, and that for uncrewed they will need to know which airspace is available to them through geo fencing – this also provides weather and traffic information, so if drones want same info as other users and GA and business aviation want more consistency, then there is scope for digitised broadcasting and a clear need for cockpit HDMI to receive this information. The question is how this could be started - perhaps by testing a small piece of airspace, at a small scale and then trial a bigger bit and, depending on success, expand it. Future flight phase 3 sounds like a good opportunity to test this and NATS are thinking of a project to do this.

The use of primary radar was mentioned as part of surveillance as it struggles to see small x-section crewed aircraft, let alone a drone, and focusing on 100pc EC. With Automatic Dependent Surveillance Broadcast (ADS-B) on two frequencies, primary radar for conventional, Germany is investigating the use of a 5G path, so expecting surveillance from variety of sources meaning for airborne vehicles either capable of receiving from multiple sources or have ground provider that collates and rebroadcast- one of issues we will face as an industry

On separation, studies have shown how difficult it is for the human eye to spot uncrewed, small aircraft so you can't use a see and avoid when small UAS are flying in the same airspace. The vision is that we have digital FIS, cockpit display of traffic information pointing out where other vehicles are. There was the view that it was the responsibility of the unmanned aircraft to avoid the other aircraft, as this would be easier to code up separation standard. If we do say that it's up to UAS to avoid crewed, then we will need to set a separation standard to enable the coding. This would also see the requirement for an EC mandate/more TMZs to facilitate this.

It was suggested that this should be tested with a trial in highly controlled conditions – revise tweak and expand to explore how well drones can avoid a human pilot.

An alternative to UTM was mentioned whereby you would ask the human pilot to come up with some sort of a Traffic Collision Avoidance System (TCAS) equivalent – could develop digital FIS equivalent – equating to human control service outside CAS. The reason for starting off with drones avoiding crewed aircraft is because this is an easiest first step but could progress to technological TCAS equivalent.

It was stated that UTM companies can take responsibility but that a lot of work comes down to better understanding the safety risks and challenges. UTM will have to take the responsibility of ensuring separation standards whatever those might be. This will only happen with small incremental steps.

It was echoed that getting single point of truth out to uncrewed or crewed aircraft is the key point, including rebroadcast, and in addition have the equipment that can advise pilots with situational awareness. There was a view that this is already possible with gliders, their kit gives them good situational awareness and helps to be aware of any risks of collision, so evolving this and equipage should be possible in the future.

Digital FIS was mentioned as giving a single point of truth, but there was the view that having a single frequency won't work. However, police helicopters can rebroadcast info to drone operator or if have real time telemetry can instruct drone to avoid manned aircraft, helping both drone and manned aircraft, because there is full situational awareness capability.

There was a question around aligning those UK ambitions with international developments, and there was confidence that the SESAR community would support this work and a logical sequence of actions was already going on, e.g. R and D moving to EASA and they turn into European regs – digitising of info is absolutely key to European masterplan, referring to work that is coming out of the US is also aligned so far. Once it starts getting into policy and regulation that will require usual consultation and alignment processes.

It was suggested that the CAA should have a role in ICAO or other global organisation that cover UTM – the outputs of this work could help the CAA convey the UK future view and help shape and guide the direction we take.

Infrastructure

There was a discussion on how to ensure everyone is connected to the LARS airspace management tool (SWIM enabled). Naturally there are cost attached to that, so the other question is about putting an investment profile together to realise those aims. If single point of truth everyone must be able to access it and today it doesn't.

It was suggested to consider infrastructure requirements at (smaller) airfields and different business models – something that looks to minimise changes in airport infrastructure is probably what they would want.

Workshop 3 – Changing context

Attendees:

Andrew Lambourne - ACF
Chris Foster - Altitude Angel
Deborah Lovett - AEF
Ian Roy - Virgin
Fiona Smith – AGS airports
Jennifer Sykes - HAL
John Turner - Honourable Company of Air Pilots
Pete Stratten - BGA
Kate Read - DAATM
Roger Hopkinson - GAA
Lee Boulton - NATS
Mark Roberts – Spaceport1
CAA airspace modernisation team

Space launch

SpacePort1 provided a summary presentation of how a launch for Space would occur. It was highlighted that a launch would consist of up to 4 significant event areas. Initially it would commence with the launch itself which would require a small area (approx. 3nm) of segregation. Throughout the climb, which took the form of a parabolic curve, various areas would be required for up to 3 booster separations events. The 1st, 2nd and if required 3rd areas would increase in size as the platform climbed. In the USA these separation areas are only notified and not segregated. The presentation focussed on remote areas of the Scottish islands which would see these areas over the Sea and areas of low air traffic. Additionally, these areas lay outside both the UK Sovereign Airspace and Flight Information Region.

Climb performance

Andrew Lambourne showed comparative slides on the departure climb spread Sep 2019 v 2020 to highlight that climb rates vary considerably even for a given aircraft type, typically achieving between 6,000 and 12,000ft after around 20km. There was a need expressed for studies to understand the performance in relation to influencing factors, noise impacts on the ground and the FMS development and how this can be used in the design factors. A question was raised as to how and what you optimise and what unimpeded / "ideal" looks like for climb performance. Currently the lowest performance design is used to design procedures, which could be very inefficient.

The Flight Management System (FMS) is highly optimised for fuel burn and engine wear and was tuned in around 2012 to reduce costs. Variability is caused by wind, temperature, air pressure, loading etc – some research worth doing, particularly bearing in mind that the objective is to minimise noise below 7000ft. Especially on the noise aspect, a request was made for a study on how climb rate correlates with noise at different distances, also significant flag that if you design a letter box in space some way down track from airport and expect all aircraft to fly into it, given the physical variables, the lowest common denominator tends to come to the fore.

Others supported the idea of a study – consistent with an earlier workshop conversation about a “playbook” which will help understand what the outcome we are trying to achieve in terms of

the trade-off between noise and other factors, the impacts of concentration vs respite etc, and what's important to people at different stages of flight.

Contextual changes

The discussion was brought back to the broader contextual issues which was the theme of the third workshop. Net zero legislation and decarbonisation was mentioned as a contextual change, and that the shift of focus on the environment is not only contextual issue such as different/new users in airspace. Whilst the AMS doesn't own contextual change, it will have to react to and reflect it.

It was mentioned that climate change may change the pattern of where people travel to and therefore airlines might change its directional priorities and airports they fly from – organising strands of routes is challenging and how would that be accommodated.

Others said that this underlines that the key contextual change is flexibility. If operators are changing their routes, it is fundamental for the future to have that new technology that enables switching airspace on and off.

A question was raised as to how CAA and industry would respond in case the Government priority shift to carbon.

In response it was said that the main goal is to make airspace as efficient as possible, and aircraft as protected as possible. AMS must describe as we have it today and adapt over time. We have to agree on our priorities, but environment and ability to offer service always be key aspect of strategy; it will be the key driver.

Airspace change process

The view was expressed that legacy issues are difficult to change and that the governance process needs to be reviewed to enable change.

Some expressed the view that the process of airspace design takes too long and that it should be designed around flexibility, rather than seen as fixed structures using modern performance and technology. The AMS needs to be adaptable – airspace design needs to be one that can react rapidly to changing demands - that would accommodate the changes in route network by an airline moving airport, or military changed operations.

Attendees were reminded that the CAP1616 process is up for review this year and that will determine whether we will make any substantive changes to it.

The question was raised whether the strategy can articulate a flexible approach to help sponsors through the change process. Potential Gov't policy change might delay airspace change. Southend was mentioned as an example of how to remove airspace. The formal process to change other areas is draconian/onerous. But it can be done when needed by NOTAM as per Southend.

It was reiterated that switching airspace on and off is the way forward, but a question was raised how we ensure that the right information is given to the right person at the right time. R&D needed to articulate the concept of operations and methodologies of how to achieve airspace management.

Concerns were raised around CAA's duty, and whether the mandate of CAA is inappropriate for what it is trying to do. CAA is being forced to be seen to be fair in process and procedure rather than trying to make best decision.

Community representatives were asked if they would accept a shorter process? The public have difficulty understanding complex proposals, but they do want to know the impact on them better or worse. Is it different to today, there are no tools available to sponsors to help with demonstrating impacts. A long process is not in anyone's interest, public lose interest after a few months.

Others said that collaboration is the key to airspace design, not adversarial engagement. The need was raised for an industry wide, cross disciplinary, group that can address designs for sponsors and remove some of the adversarial approach.

While it was noted that CAP1616 addresses the problems identified with the previous CAP725 process, further support was given for the view that the CAP1616 is onerous, but that more advice to aid communities is needed. The current CAP1616 requirements for communities to respond from a basis of knowledge is difficult and independent advice would be welcomed to understand the impact on the ground. Transparency is welcomed but people get lost in the detail and can't keep pace with the changes. It was suggested that ICCAN should have a role in facilitating the presentation of understandable noise impacts to communities, and that industry-wide tools may help translate low-level designs into noise heat maps.

Some expressed support for the CAP1616 process as such and said it was a big improvement from how it was done before, however also recognised the value of group engagement to speed it up rather than to undermine the process.

UAS/UAM (Uncrewed Aircraft Systems/Uncrewed Aircraft Management)

Support was given to emerging technologies and need for the AMS to reflect this. Reference was made to a Future flight/Innovate UK presentation that showed their 2024 vision including commercial operations and airspace integration: [IUK-050821-4293 Innovate Future Transport A4Portrait.pdf \(publishing.service.gov.uk\)](#)

They are expecting significant impact to have happened with commercial operations underway, fundamental changes to airspace, both challenge, and consortium doesn't feel there is a road map to getting there – fear will come towards the end of projects and not actually be able to implement it. It was suggested that we need an AMS initiative on how actually get there – governance, collaborative framework, pull working groups together so not conflicting, how get sectors of industry to work together.

A question was raised regarding what would happen if carbon was given more priority. Reference made to CAA review of NADP 1 and NADP2 which concluded that the carbon difference was minimal whereas the noise difference is worth being aware of. It was noted that the first 7,000ft of flight create a small percentage of overall carbon but a major percentage of overall noise perceived on the ground. And although Zero Emissions Flight might be achievable in carbon terms, it will be very unlikely in noise terms – noise also being an emission.