Thinks Insight & Strategy

UK Research and Innovation

sciencewise

Framework for Future Flight in the UK: Principles from a deliberative Public Dialogue

July 2024

Executive summary

Introduction

The Future Flight Challenge (FFC)[1], delivered by Innovate UK and the Economic and Social Research Council (ESRC), is a £300 million four-year challenge funded by UK Research & Innovation (UKRI), aiming to position the UK as a world leader in the third aviation revolution.

Alongside a wider programme of social science research funded by the Challenge, UKRI/Innovate UK commissioned this dialogue, which was led by the Future Flight Challenge Social Science Research Director and team based at the University of Birmingham[2]. The dialogue was supported by UKRI's Sciencewise programme[3] and delivered by Thinks Insight & Strategy.

Approach

This dialogue aimed to understand public views on the potential future operation of three Future Flight technologies with the UK. These were:

- Non-passenger-carrying drones
- Electric Vertical Take-Off and Landing vehicles (eVTOLs)
- Electric/hydrogen Regional Air Mobility (RAM).

It aimed to understand the publics' hopes and fears around Future Flight technologies, systems and services as well as their expectations for regulation and decision-making.

The dialogue engaged 43 participants from across the UK over a series of 7 workshops, selected to be reflective of the diversity of the UK. Participants initially discussed existing transport and delivery services, moving on to the three Future Flight technologies and their potential uses. They then heard from specialists on the topics they were most interested in, before finally developing and refining principles they wanted to underpin the deployment of Future Flight.

Starting points: views on current transport services

When discussing current transport and delivery services, participants spoke about congestion, cost and negative impacts on the environment. They felt that existing services were not available equally across the country, and were especially lacking in rural areas. This underpinned their

[1] https://www.ukri.org/what-we-do/browse-our-areas-of-investment-and-support/future-flight/
[2] https://futureflightsocial.ac.uk
[3] https://sciencewise.org.uk. Sciencewise is a UK Research and Innovation (UKRI) programme which enables policy makers to develop socially informed research and policy with a particular emphasis on science and technology.

hopes that Future Flight services could fill gaps in existing transport and improve on user experience and sustainability. They felt that current delivery services were plentiful and convenient, but contribute to road congestion. This led to a parallel concern about Future Flight delivery services leading to overly congested skies.

An ideal future: participant visions of a successful and unsuccessful deployment

In the best-case scenario, participants hoped Future Flight services would deliver social, environmental and economic opportunities for all. They supported the opportunity for better connectivity across the UK, through affordable and more sustainable journeys. In addition, they saw Future Flight as an opportunity for more accessible travel, including those with disabilities, health conditions and those experiencing other barriers to access current public transport.

Conversely, in a worst-case scenario, participants worried that roll-out would be badly managed while diverting investment away from other modes of public transport. Concerns surrounded whether Future Flight services would be affordable to the public and safe to use, as well as risks to wildlife and jobs, and the potential for increasing noise and visual congestion. There was also scepticism around the sustainability and ethics of the manufacture and powering of Future Flight vehicles.

Principles for development and roll-out

Participants developed fourteen principles they wanted to see underpin the roll-out of Future Flight technologies, services and systems. Seven principles were overarching and seven were specific to topics that were most important to them:

i. Future Flight technologies must be used for public good – they should only be rolled out if there are more positive impacts than negative ones for society as a whole

Participants felt strongly that Future Flight technologies and services should benefit the whole UK population. They wanted use cases that protect human life and improve connectivity for rural, remote and hard-to-reach places to be prioritised. They felt Future Flight technologies should only be deployed if they are more sustainable than existing transport when the whole journey and production lifecycle is accounted for.

ii. Research and testing must be carried out to make sure that policy and regulation for Future Flight technologies aligns with these principles

Participants wanted policy and regulation to be established before roll-out and to be updated as the technology, and our understanding of its impact, evolves over time. This included policy on safety, sustainability and protecting wildlife, noise and visual pollution, privacy, social inclusion, and accessibility for those with disabilities, health conditions and wider access barriers.

iii. The development of Future Flight technology and services must involve collaboration with specialists and the public

Participants wanted well considered channels in place for the public, specialists and other stakeholders to feed into decision-making. These were particularly relevant for deciding flight paths, and in the design process in terms of factoring in impacts on wildlife and those living with disabilities, health conditions and other access barriers to public transport.

iv. Future Flight developers and operators must be held to account by independent bodies

Participants wanted independent bodies to be monitoring and holding the industry and service providers accountable across safety, sustainability and the impact on wildlife, the use of drones for surveillance, and social inclusion and accaccessibility. They felt these bodies must be funded independently to avoid bias.

v. Future Flight technology and development must be transparent

Participants wanted decision-makers and the public to know about the ethics of production and overall sustainability of the technologies. More broadly, they felt the public should be aware of the roll-out of Future Flight technologies, systems, infrastructure and services, how they are funded, and what Future Flight vehicles around them are being used for.

vi. The roll-out of Future Flight technologies must be properly resourced

Participants wanted enough resources in place to ensure human accountability at all times in terms of safety and managing airspace, particularly in cases of autonomous flight and where future flight

operates at scale. They felt training needs should be considered early to ensure there are enough people with the right skills to do Future Flight jobs.

vii. The UK as a whole must benefit from leading in Future Flight technologies, behaving ethically through international cooperation

Participants felt strongly that economic gains for the UK from the development and deployment of these technologies should be distributed across society, rather than limiting benefits to profit-making companies. They also wanted the UK to avoid unethically extracting resources or labour from other countries in a bid to be world-leaders in Future Flight.

viii. Future Flight technologies must be managed safely and held to the same level of, or higher, safety standards as existing technology

Participants wanted certainty and reassurance around safety, for both passengers and non-passengers, including considerations of fuel and batteries. Safety measures included robust training and licensing to fly Future Flight vehicles, with safety standards applied across all operators and monitoring by an independent body. They wanted significant consequences for those who contravene safety rules or threaten national security, with human accountability for safety and security even if vehicles are pilotless.

ix. Flight paths must limit the negative impact of noise pollution and visual congestion on people

Participants felt flight paths and transport hub placement should be designed with the potential benefits and negative impacts of noise pollution and visual congestion in mind, balancing the two along with public input. They wanted regulation on maximum noise levels, and for consideration to be given to people and places that could be differentially impacted.

x. Future Flight vehicles and operations must be designed with accessibility in mind from the start

Participants saw a significant opportunity for Future Flight services to improve the accessibility and social inclusion of public transport and wanted the end-to-end journey to be designed with access needs in mind, including the needs of those with non-visible disabilities and neurodivergence. They felt people with expertise

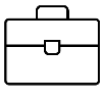
and lived experience should be involved in decisions, and that manufacturers and operators should absorb the additional costs.

xi. Future Flight services must be affordable to the public

Participants felt strongly that Future Flight services should not only be available for the wealthiest in society, when there are negative consequences for the rest of the public and Future Flight services and systems are funded or supported, at least partly, by taxpayer money. They felt that if Future Flight services begin by being available only to the wealthiest in the beginning, they should eventually be affordable to the public (within 10 years).

xii. Limiting negative impacts of Future Flight on wildlife must be a priority, avoiding tick-box exercises

Participants wanted independent research and experts to feed into decision-making about Future Flight technology, services and infrastructure so that avoiding negative impacts on wildlife is prioritised. This was meant in a broad sense, not just limited to potential collisions.



xiii. Future Flight job opportunities must be available in a fair and accessible way

Participants wanted training and job opportunities to be open to all, including those displaced from jobs due to the roll-out of Future Flight technologies and services, balancing the need to recruit the best talent with providing opportunities for social mobility.

xiv. The use of drones for surveillance must be proportionate to the level of the potential threat, with clear guidelines

Participants had differing views on how drones should be used for police surveillance but felt that decisions should be made with specialist input on the potential impact on vulnerable and targeted groups. They wanted case-by-case decisions on use to be made, with regulation and oversight carried out, by an independent organisation.

Responsibilities

When it came to responsibilities for rolling out and governing Future Flight, participants had differing expectations across stakeholder groups. They felt the government should be overseeing the development, roll-out and regulation of Future Flight systems and services, ensuring the principle of public good is prioritised and achieved. With government

oversight, they felt industry should be developing the technologies and services to meet safety and other standards, and to support training into Future Flight jobs and careers. They wanted independent bodies to be involved in setting regulation, e.g. for safety and noise levels, then enforcing it while ensuring transparency. They felt a range of interest groups, including publics, should feed into the development of Future Flight technologies and services and be able to hold government (by which participants meant both elected representatives and the organisations that deliver policy on their behalf) and others accountable. This included ensuring the application of principles on public good, social inclusion and accessibility, jobs, noise pollution and visual congestion, wildlife and the use of drones for surveillance of people. Alongside a range of specialist input, they wanted independent research to also feed into the development of Future Flight technologies and services, particularly to ensure the safety of the technologies, adherence to the principle of public good, and to avoid negative impacts on wildlife.

Conclusions

While participants initially worried about the negative impacts of Future Flight roll-out, they began to see more valuable opportunities as conversations went on. Some use cases had direct benefits, through developing connectivity, more sustainable transport, or for emergency services. Even where they were more sceptical about a particular use case, as with passenger services reaching a limited audience, they could see how conditions could be put in place to ensure some benefits accrue. However, they had low trust in government and industry to deliver the roll-out in the right way, ensuring that these opportunities outweigh the drawbacks and deliver the public good that participants hoped for.

Given this lack of confidence, participants advocated strongly for the role of independent bodies, involving specialists, interest groups and publics, in making careful decisions and overseeing the roll-out. This was critical to ensure that the resource, manpower and investment spent on Future Flight is the right use of resources for the UK, compared with other transport options. They wanted Future Flight systems to only be invested in *if* they offered something better than existing systems, particularly when it came to sustainability, accessibility and affordability. They set a high bar for government, technology developers and service operators to meet in delivering a future flight system that genuinely serves the public good. And even with a roll-out that respects all of participants' red lines

there are still concerns that a tipping point could be reached where the scale of future flight is overwhelming.

By the end of the dialogue, participants still had doubts about the feasibility of the ambition of the Future Flight Challenge, and reiterated their calls for involvement of members of the public and potentially impacted groups in decision making. Continued engagement, transparency and oversight were critical to building trust in the future flight roll-out.

Contents

Introduction

The Future Flight Challenge[4] (FFC), delivered by Innovate UK and the Economic and Social Research Council (ESRC), is a £300 million four-year challenge funded by UK Research & Innovation (UKRI). This challenge aims to position the UK as a world-leader in the third aviation revolution, by creating the aviation system and ensuring the safe integration of Future Flight technologies with existing aviation infrastructure.

As part of the social science research funded by the Challenge, the Future Flight Challenge team identified a role for a public dialogue to complement other research. This sought to develop understanding of public interests, concerns, and perspectives on Future Flight technologies, as well as offer publics the opportunity to feed into regulation, policy-making and technological development. This work was commissioned by Innovate UK through the UK Research and Innovation (UKRI) Future Flight Challenge, delivered by Innovate UK and the Economic and Social Research Council (ESRC), and co-funded by Innovate UK and Sciencewise[5]. The work was led by the UKRI Future Flight Challenge Social Science Research Director and team based at the University of Birmingham, and supported by UKRI's Sciencewise programme.

A team of experienced public engagement practitioners from Thinks Insight & Strategy were commissioned to undertake the public dialogue.

The Future Flight Challenge, and this public dialogue, focussed on three key technologies and potential civilian and commercial use:

- Non-passenger-carrying drones.
- Advanced air mobility – passenger-carrying electric Vertical Take-Off and Landing vehicles (eVTOLs).
- Regional Air Mobility – electric/hydrogen conventional take off vehicles (RAM).

The dialogue built on a previous mini-dialogue about the Future Flight Challenge, delivered by IPSOS in 2022[6]. Learnings from this mini-dialogue informed the design of this dialogue, and findings from the mini-dialogue were shared with participants throughout early workshops for them to reflect on as part of their own deliberations.

Alongside the dialogue, the FFC Social Science Research team have carried out research with impacted and marginalised groups. In addition,

[4] https://www.ukri.org/what-we-do/browse-our-areas-of-investment-and-support/future-flight/
[5] https://sciencewise.org.uk
[6] https://www.ukri.org/wp-content/uploads/2022/07/UKRI-120722-FutureFlightChallengeMiniPublicDialogueReport.pdf

two surveys were run by the FFC team with YouGov, with the second undertaken while this dialogue was ongoing. Findings from the first survey were presented to participants and their questions were included and prioritised when designing the next iteration of the survey. These findings were again made available to the dialogue participants at the end of the dialogue to inform their discussions. The survey findings are published alongside this report.

Why dialogue: aims and objectives

This dialogue aimed to engage a diverse and inclusive group of publics to deliberate on the social, economic, and environmental implications of future commercial aviation technologies and related infrastructure within the UK. Public dialogue was chosen as a methodology because Future Flight technologies, their proposed uses and the potential timelines for their future operation are not widely known about by UK publics. The dialogue allowed members of the public to be provided with, and reflect on, information before reaching any conclusions, giving a more detailed and informed view than would have been possible with quantitative research methods used in isolation.

The dialogue aimed to provide evidence to decision-makers about how the public want to see Future Flight technology deployed, managed and used.

Within this overarching aim, the objectives of this dialogue were:

- To explore the public's hopes, fears, and expectations around Future Flight technologies.
- To understand the public's views on the potential social, economic, and environmental impact of Future Flight technologies in the UK, including benefits and harms for different groups.
- To explore views on the social desirability and undesirability of new aviation technologies.
- To explore how people view the current physical, socio-political, commercial, and legal infrastructure around flight technologies, as well as understand expectations of regulation and policy to enable Future Flight technologies.
- To identify priorities for future research and further groups that should be engaged on key issues.

Who took part: the dialogue participants

The dialogue engaged 43 participants from across the UK over 7 workshops. This group was recruited to be reflective of the diversity of the UK public and were selected through free-find methods by a specialist recruitment agency. A full breakdown of the characteristics/demographics of the target sample, the initial 50 participants recruited and the final group of 43 can be found in Appendix A.

In the first two workshops, participants were organised into breakout groups bringing together those with characteristics that may lead to them being disproportionately or differentially impacted by Future Flight technologies, services and infrastructure. This enabled them to have a shared space to explore issues that mattered most to them, without their contribution being drowned out by the overall direction of the group. For all subsequent workshops participants were mixed, ensuring participants were exposed to different perspectives throughout the process and for disproportionately or differentially impacted groups to feed into the wider discussion. These groupings were those with less socio-economic status, those with disabilities and long-term health conditions, and those who lived in rural and remote areas. More detail on these groups can be found in Appendix A.

What we did: the dialogue approach

The overall format of the dialogue comprised six 3-hour evening workshops hosted online, followed by an in-person 6-hour summit to conclude the process. This format gave the participants a total of 24 hours of structured deliberation time.

Alongside these workshops, all participants were able to engage with each other in an optional online community. This online platform allowed participants to review past materials and presentations, supplementary materials, and take part in discussion boards related to the workshops.

Phase 1 introduced the dialogue and the topic, discussed the three technologies and their use cases, and explored the actors who could, or should, be involved in the deployment of Future Flight technologies and services. The dialogue was participant-led, which meant that at this point, participants chose topics they found most interesting and wanted to see covered in the following workshops. In Phase 2, participants heard from specialists across a range of topics that were identified as a priority by participants, and discussed how they wanted Future Flight technologies

and services to be rolled out. Finally, in Phase 3, participants came together for a full-day summit to refine principles for the deployment of Future Flight, stress-testing them through the lenses of different people, places and use cases. They then discussed who they felt should be responsible for delivering against these principles.

Full details of the dialogue approach can be found in Appendix B, and a full list of specialist contributors can be found in Appendix D. The full set of materials, including discussions guides, stimuli and presentation content can be found in an accompanying document: Appendix of dialogue materials.

Design

The dialogue materials were designed collaboratively, between the Thinks Insight & Strategy team who delivered the dialogue, the FFC Social

Science Research team based at the University of Birmingham and Sciencewise. An oversight group were invited to comment on the approach and materials throughout the design process. A list of the oversight group members can be found in Appendix C.

The design process was split into three separate stages: workshops 1-3, workshops 4-6 and the summit. This allowed for the approach to be shaped by participants, with initial analysis of emergent findings conducted by the team between each stage to inform design.

Analysis

Throughout the process, participants were allocated to facilitated breakout groups for discussion, where data was captured through facilitator note-taking and audio recordings. Ongoing analysis of emergent findings was conducted through facilitator debrief sessions following each workshop, which the research team utilised to inform ongoing design. The emergent findings from each workshop were played back to participants at the beginning of the following workshop. This aimed to ensure deliberation accounted for views across the group that individuals had not heard within their breakout groups, and to provide them with the opportunity to discuss and challenge these findings.

The reporting process involved using audio recordings of the discussions, which were plotted transcript-style into 'grids' that enabled the team to analyse across groups for each section of the workshops. Analysis and reporting were conducted thematically using a predetermined report structure, with a collaborative process among a small team who challenged and ratified each other's thinking.

Evaluation

Design sessions, workshops, facilitator briefings and management meetings were observed by independent evaluators Graphic Science and Navigator Consulting. The evaluation team also gathered direct feedback from participants after each workshop.

While reading this report: methodological considerations

Public dialogue is a qualitative method which is particularly useful to understand emerging public opinion on topics, like the Future Flight Challenge, which are complex and upstream. It allows participants to be provided with balanced and varied information on the topic, hear from others with different perspectives, and formulate a more considered view. This in turn allows for exploration into the underlying principles behind

views and attitudes; and to gain a better understanding of underlying drivers, views, values and depth of insight. Where, as in this case, dialogue is commissioned by a public body, it can also be an effective way of bringing publics into policy and decision making, with the outputs of the dialogue being presented to and considered by decision-makers.

Dialogue involves bringing together a small number of people from a wide range of backgrounds, to explore their own and each other's views. It generates rich and detailed discussions within a group in response to information provided about a topic. A dialogue provides a complementary approach to the other pieces of work carried out by the Future Flight Challenge social science team, and gives an indication of how wider publics might respond once further information on the technologies becomes available to them.

To provide the reader with a sense of strength of opinion during discussions, we have articulated where there was greater or lesser consensus, and where views were divergent or not widely supported. This should not be interpreted as a strictly quantitative assessment of public opinion.

Participants were given information designed to be accessible and useful for a high-level discussion across a range of topics. Through this process, participants were enabled over a period of months to fully examine and explore the complexity of the Future Flight technologies and related infrastructure. This allowed them to make informed decisions about what their hopes and expectations would be for future roll out of these technologies, systems, infrastructure and services.

Future Flight technology is upstream in terms of systems, policies, regulation, commercialisation and operation. Little is known about its implications, and neither citizens nor experts have a full picture, therefore many questions posed by participants could not be answered at this stage. However, the information we were able to provide, along with the extended deliberation period, meant that participants were able to give clear insights and steer across a range of topics, covering what is important to the public in the development and deployment of Future Flight technologies and services. The participant-led approach meant that participants were able to discuss all topics that were important to them. In lieu of the depth that can sometimes be gleaned through dialogue on more developed policy areas, this enabled significant breadth in the topics discussed, and formed a holistic view of Future Flight technologies through many lenses.

Findings part 1: Reactions to Future Flight

The following introductory chapter begins by outlining participants' baseline views on transport and delivery services, which helped to frame later discussions about Future Flight technologies. It then provides insight into participants' initial reactions to the three Future Flight technologies, before outlining two imagined futures that reflect participants' best and worst-case scenarios for a future with these technologies. This provides context for the rest of the report, which explores the principles that participants felt should underpin the development and deployment of Future Flight technologies, services, systems and infrastructure.

Baseline views on transport and delivery services

While much of the current activity in the development of Future Flight is focused on technology, it will provide new transport services once implemented. It was important that the dialogue enabled participants to think about this future, in which new services could be available to them and others, and not just abstract technology. Therefore, we started the first workshop by asking participants to think about how they and people they know use and experience current transport and related services. Responses highlighted challenges with existing transport systems and frustrations as well as benefits from increased access to delivery services. This informed their subsequent priorities for Future Flight services.

Passenger transport

Participants described current public transport services in the UK as inconvenient and inaccessible due to infrequent service provision, indirect journeys, and an unpleasant user experience. Public transport was often contrasted with driving, which was felt to be more convenient and accessible, particularly in rural areas. Participants still had frustrations about driving, especially around traffic and worries about environmental impacts. Flying was described as fast and convenient for longer journeys, though with the downsides of negative environmental impacts. They expressed frustrations about the increase in prices of fuel and public transport, particularly for train tickets. Planes were found to sometimes be cheaper than trains, though less sustainable. Participants described finding it hard to weigh up the options to make the right decision.

These criticisms of public transport meant that participants were interested in how Future Flight services could improve user experience and address deficits in current public transport. The criteria of convenience, affordability and accessibility remained throughout the

dialogue as means of assessing potential Future Flight services, particularly in rural areas. Their concerns about needing to sacrifice sustainability to access cheaper travel also underpinned discussions about Future Flight technologies; they wanted any sustainability gains claimed for Future Flight services compared to current transport to be genuine and substantiated.

Delivery services

Participants often described positive experiences of delivery services in their area. Though poorer experiences did feature in discussion, with issues such as deliveries being left in unusual places e.g. rubbish bins or hedges. There was also general resignation that rural areas would inevitably have poorer service provision than urban areas.

The pandemic was mentioned frequently as a time during which delivery services improved significantly. Participants felt that, as people got into the habit of using delivery services more in the pandemic, this has led to them being used more frequently since.

While this increase in delivery service provision was generally viewed as positive, participants also said that it had led to a significant increase in congestion on roads. This was felt to lead to an increase in emissions, with negative environmental impacts and increased noise pollution. Participants felt the public had become more reliant on having more, and faster deliveries. They felt that convenience was a huge benefit but questioned whether our society should be based around convenience, which they associated with increased consumerism at the expense of the environment.

On the one hand, participants' positivity and wide use of delivery services underpinned their interest in drone delivery services. However, their concerns about the increasing number of deliveries causing noise pollution and negative environmental impacts led to concerns that Future Flight delivery services at-scale would have similar negative effects. Conversely, their ambivalence about increased convenience underpinned questions about whether use cases for Future Flight technologies that solely deliver convenience should be a priority.

> *"We've become a following day society. Before we waited a few days for deliveries. But now we expect them to come next day. Think of all those delivery vehicles creating congestion and pollution." – Workshop 1*

Initial reactions: the feasibility of Future Flight

In workshops 1 and 2, participants were introduced to the three main technologies included in the Future Flight Challenge: non-passenger-carrying drones, eVTOLs (electric Vertical Take-off and Landing vehicles) and electric/hydrogen RAM (regional air mobility), alongside use cases illustrating how they may be used. The full set of materials shared with participants can be found in the accompanying Appendix document.

- There are different types of drone, which vary in size and what they can do. These will be different to what's available now. Some do shorter or longer distance journeys. They will also vary in how much weight they can carry, and how noisy they are.
- In the UK, drones currently need to be flown by an operator on the ground. Regulation says that this operator needs to have a direct line of sight (to be able to always visually see the drone) to operate the drone.

Flying longer distances

Industry are hoping to be able to use drones that run 'beyond visual line of sight' so they can be used for longer distances.

Longer flying times

Most drones currently run on batteries and electricity and are much smaller than the ones we may see in future, which means that flight time is limited to 20-40 minutes. Industry is working on enabling them to fly for longer using more powerful battery systems.

Drones are currently used, for example, by estate agents to show properties, but in future could be used, for example, to routinely monitor off-shore windfarms without needing to have an operator within visual direct line of sight.

Carrying heavier cargos

Some companies are also working on drones that can carry heavier cargos and fly further with them e.g. drones can currently carry small cameras but drones carrying heavy sacks of post are being tested

Examples of stimulus shown to participants in workshops 1 and 2 exploring the three technologies and use cases.

A variety of concerns and considerations arose in response to the Future Flight technologies, alongside some recognition of the benefits that they could bring. Participants tended to identify potential harms first, which is common in discussions of new technology, where risks can seem more tangible and benefits seem less specific.

Participants raised concerns around the feasibility of the pace and scale of the ambition outlined by the Future Flight Challenge roadmap[7]. They struggled to picture these technologies being introduced to the UK and embedded in society in the near future. These concerns centred around:

- **Technological advancements**: participants felt developments in batteries and hydrogen may not be sufficient to realise the vision of Future Flight technology in coming years. They questioned how realistic autonomous flight is in the medium term.
- **Infrastructure**: the infrastructure needed to support these new technologies was also a concern. Participants anticipated that new transport hubs, drone depots, vertiports and redeveloped airfields will take significant time and resources to put in place.
- **Operational**: there were also concerns about the feasibility of Future Flight operations in changeable weather, in the context of the UK's climate and climate change.

At this stage, participants questioned whether it was worth moving forward with Future Flight technologies now, considering the amount of development, research and testing they felt would be needed.

An ideal future: what participants wanted a world with Future Flight to look like

As discussion progressed, participants became more open to the opportunities that Future Flight technologies present and focused on articulating what they do and don't want a future with Future Flight technologies to look like.

Throughout the seven workshops, participants discussed many aspects of Future Flight technologies and services in detail, particularly participants' prioritised topics of: safety, affordability, sustainability, wildlife, noise and air pollution, privacy and surveillance, impact on jobs and accessibility.

There were common threads across these wide-ranging discussions that, taken together, describe two visions: one for a socially desirable, and one

[7] https://www.ukri.org/wp-content/uploads/2021/08/UKRI-130821-FutureFlightVisionRoadmap.pdf

for a socially undesirable deployment of Future Flight technologies. This section of the report describes those two visions.

The following chapters describe the principles that participants felt would lead to success, and who should be responsible for delivering on them.

Participants' vision of successful deployment

Through their discussions in the dialogue, participants described a world in which Future Flight technologies and uses would provide useful services. They saw these as useful in ways that deliver social, environmental and economic benefits throughout the whole lifecycle of the technologies.

As they outlined in the summit, transport and delivery services would be better connected across the UK. This would be the case particularly for rural and remote areas, and areas that are currently difficult to reach on public transport. The routes taken by Future Flight vehicles would be direct, efficient, and fast. Accessing services would be convenient and accessible to all – throughout the whole customer journey, from booking to arriving at final destination – and safer than current modes of transportation. Journeys would be affordable to all. Use cases that protect human life would be implemented, including emergency triage, delivery and rescue, and surveying equipment/infrastructure or large conservation areas.

Future Flight vehicles would be quieter than current transport and delivery vehicles, and decisions on flight paths and the number of vehicles allowed to be in the air would balance the benefits with the drawbacks of visual congestion. The roll-out of Future Flight technologies, systems and services would lead to a significantly more sustainable transport system in the UK, with fewer cars on the road and reduced emissions overall. Wildlife would benefit from quieter transport and delivery services, with infrastructure and flight paths mindfully developed to avoid negative impacts.

The investment in Future Flight technologies, systems and services would improve the UK economy and this wealth would be distributed across society to ensure everyone benefits. Jobs would be created, balancing social mobility with recruiting the best talent available. Those who experience job loss because of Future Flight operations would be supported to re-train in Future Flight technology and service-related roles. The supply chain would be monitored, with human rights violations and exploitation of other countries' resources avoided. Misuse of drones would also be avoided, both in terms of crime/hacking, and police surveillance.

Restrictions would ensure that nobody feels, or is, overwhelmed, observed or intruded upon by Future Flight technologies and uses.

All necessary infrastructure, resourcing and regulation would be in place ahead of national roll-out. Policy and regulation would be designed to deliver the benefits described above and would be developed and monitored collaboratively by those with diverse perspectives and interests. Decisions would be made based on these collaborative efforts and independent research, with the government leading the way and holding public interest at heart. Independent bodies would be used strategically to ensure government and industry are held to account.

Participants' vision of an unsuccessful deployment

In contrast, a poor roll-out of Future Flight technologies and services would not deliver social, environmental and economic benefits for society, and would lead to a poorer transport system overall. The roll-out would be incoherent and disjointed, with little leadership, regulation, national policy or strategy to guide its deployment. This would lead to problems across multiple areas.

Investment in public transport overall wouldn't increase and money would be diverted from current public transport to Future Flight technologies, systems and services. Due to overall underinvestment, Future Flight passenger-carrying services and current public transport would be unreliable, expensive and provide a poor user experience. Some large-scale passenger-carrying services would fail, ultimately wasting the public money invested in them. Only small-scale services would remain, leading to the benefits of increased mobility being limited to the wealthy elite.

While routes taken by passenger-carrying Future Flight services would be direct, efficient and fast, they would also be very expensive. This means that most of the public, public services and businesses would be priced out of services, including uses that protect human life. For those who can afford to use these services, there would be significant access barriers for those living with disabilities and other health conditions.

Future Flight vehicles would be noisier than current public transport, with flight paths that enable vehicles to fly over both urban and rural areas at all hours, except for affluent areas. Those on the ground would experience negative impacts on their wellbeing due to the additional noise and visual pollution. Wildlife would experience similar negative impacts, along with loss of habitats to make way for necessary – and in some instances wasted, if demand was lacking – infrastructure.

The introduction of Future Flight services would not lead to any significant reduction in the use of cars, with some people choosing to use their cars more as public transport worsens overall. In practice, accounting for the whole user journey and life cycle of production, Future Flight technologies would also be less sustainable than current modes of public transport. The combination of the above would ultimately add more journeys and emissions overall.

Drone delivery services would scale more successfully. However, with limited regulation and profit-driven businesses leading the way, increased convenience would come with a lot of vehicles in the sky. This would lead to significant negative impacts for both people and wildlife in terms of noise and visual pollution and the subsequent impact on wellbeing. Accounting for the whole life cycle of production as well as operation, drones would also turn out to be less sustainable than current delivery services. As the scaled operation of delivery drones becomes autonomous, there would be mass job losses and no compensation or support for those affected.

Lack of regulation would mean Future Flight technologies are less safe than current modes of transport and delivery, leading to accidents and malicious use. It would also lead to an unmonitored supply chain, with the UK enabling human rights violations and exploitation of other countries' resources. Finally, due to a lack of oversight and clear external constraints, drones would be overused by the police, ultimately leading to a police state that targets ethnic minorities and deprived areas.

How to get there: principles for Future Flight

Participants in the dialogue understood that achieving the socially desirable and environmentally beneficial future they wanted would not be easy. The remainder of this report discusses the principles they felt Future Flight technology, system and service development and deployment needs to be aligned with, and the processes by which Future Flight operations should be governed. These principles set a high bar for government, industry, and other actors, to deliver the benefits that participants felt Future Flight technologies and services could achieve if implemented well.

Findings part 2: Cross-cutting principles

As described in *Findings part 1*, this dialogue explored the public's hopes and fears around Future Flight technologies and services. In this section, we explore how participants wanted the roll-out of Future Flight services and technologies to be managed to achieve the positive future they envisioned.

Developing the principles

The following principles were developed based on participants' discussions in workshops 4-6. After discussing initial reflections on presentations from experts, participants were encouraged to suggest principles in breakout groups for the use of Future Flight technologies. They developed these by discussing what outcomes they wanted, and what they felt should be in place to make that happen.

The dialogue team synthesised the principles suggested by participants in the breakout groups, informed by analysis of the discussions to date. This synthesis resulted in 14 principles, which were then brought to participants at the summit where they were discussed, amended and developed further. The following sections explore these principles, highlighting the opportunities, issues and conditions expressed by participants.

Some of the principles developed during the dialogue apply to all three technologies, many different use-cases and multiple areas of concerns or opportunity for participants. They focus on what needs to be in place for benefits to be realised and disbenefits avoided. These cross-cutting principles are:

- Future Flight technologies must be used for public good – they should only be rolled out if there are more positive impacts than negative ones for society as a whole
- Research and testing must be carried out to make sure that policy and regulation for Future Flight technologies aligns with these principles
- The development of Future Flight technology and services must involve collaboration with specialists and the public
- Future Flight developers and operators must be held to account by independent bodies
- Future Flight technology and development must be transparent
- The roll-out of Future Flight technologies must be properly resourced

- The UK as a whole must benefit from leading in Future Flight technologies, behaving ethically through international co-operation.

Other principles are specific to topics that participants felt strongly about, such as safety, noise or impacts on wildlife. These are covered in detail in Findings part 3.

i. Public good: Future Flight technologies must be used for public good – they should only be rolled out if there are more positive impacts than negative ones for society as a whole

There was a high level of consensus that:

- Future Flight technology should only be rolled out if it is more sustainable than existing modes of transport. This includes the whole journey and the whole lifecycle of Future Flight technologies.
- Decision-makers should consider the impact of Future Flight technologies compared to other modes of transport in terms of wildlife, noise levels and congestion, and safety – avoiding unnecessary harm for the sake of profit.
- Future Flight services should focus on improving emergency response and connectivity for areas that need it.
- Future Flight services should be independently monitored throughout roll-out to ensure that they are benefiting the public.

This principle underpinned many discussions throughout the dialogue, with public good becoming a test participants applied to different technologies or services. However, defining exactly what public good meant was challenging, and the rest of this section explores the different factors participants discussed. In some cases, benefits were clear – where Future Flight services could save human lives or bring social and economic benefits to those currently left behind. However, they also felt that other uses cases could deliver public good, under the right circumstances. For social and economic benefits, the key was for them to be widespread, serving more than just a few individuals, and for environmental benefits they should be genuine, not overstated, or ignoring impacts further afield.

Public money for public benefits

Beyond the Future Flight Challenge funding, participants anticipated that an entire system would be needed to support these technologies, including regulation and infrastructure. They assumed that this would at least partly involve taxpayer money even if no other aspects end up being publicly subsidised. Overall, participants felt that Future Flight services should be for the public given they will be, partially, publicly funded or enabled by public funding. This meant they wanted to see use cases with overall public benefits prioritised and realised, and for Future Flight technologies and services to benefit the UK public as a whole, not just investors and affluent users of niche services.

However, there were concerns about the extent to which this public good would happen. Participants felt that Future Flight technologies would be rolled out to make profits for industry, and to boost the UK's status and the reputation of politicians, as opposed to focusing on benefits for the public.

> *"I'd go ahead and say Future Flight technology should be nationalised. We want them to be used for social good but we're really sceptical about the implementation of that, when this gets implemented it's not going to be used for social good." – Summit*

From the outset, participants were concerned about the potential cost to the taxpayer to develop and roll out Future Flight technologies. They worried that the public would not see the return for this expense, with the technologies not offering any real benefits to the wider population, only benefiting the elite or getting scrapped halfway through roll-out. Participants cited issues around infrastructure projects such as HS2, which they felt showed a track record of similar failures to deliver predicted benefits.

> *"It feels a bit like HS2… it was government funded for infrastructure but private companies use them to provide services. People debated whether that was good or not, but this is another level. At least HS2 would have been accessible to most people, but these aren't. So you're subsidising something that only the elite will be able to use." - Workshop 2*

When prompted, participants recognised the potential for Future Flight technologies and services to bring economic benefits to the UK through increasing national GDP overall, though they were sceptical about how well these benefits would be distributed across the population. *There is*

more detail on this within principle vii focused on international co-operation.

Monitoring

There were questions around how public good could be defined, monitored and quantified. Participants themselves struggled to come up with a singular definition, instead describing different aspects like reducing environmental impacts of transport or delivering widespread social benefits. Participants saw defining the public good in any given situation, e.g. for a specific service, as an active process that should involve different voices, not something that could be specified fully in advance. Participants wanted this challenge to be kept in mind while the technology is rolled out, to ensure that the public benefits are tangible and measurable, and therefore demonstrable. This would allow for scrutiny on whether Future Flight systems and services are contributing to public good overall, and where amendments to services, technologies and policies need to be made.

> *"…it should only be rolled out if there's more positive than negative… how do you manage what's the good and the bad, how do you count that?... Let's say we invented a tech half the population can't afford, does that mean it's more bad than good?" – Summit*

Enabling public good

Despite their wishes, participants generally felt Future Flight technologies and services will not be rolled out expressly for public good, and that a focus on profit and prestige would increase the likelihood of negative impacts for society. There was interest in ensuring the ability to pause and backtrack on the planned roll-out, if the negative impacts outweigh the positives. They felt this would help to avoid vast amounts of public money being lost. Participants mentioned HS2 as an example not to follow, as huge investments were believed to have been lost.

Participants wanted government (by which they meant both elected representatives and the bodies that deliver policy) to have oversight of Future Flight operations to encourage a focus on public good, but questioned how well this would be done. This led to a general feeling that independent bodies and research organisations should be involved in scrutinising the uses and implications of Future Flight technologies, systems, infrastructure and services to enable the government to better deliver on this challenging overarching principle.

Public benefits

There were several public benefits that participants felt aligned with the idea of public good that Future Flight technologies, systems and services could deliver, and wanted to see maximised.

Improved sustainability

Throughout the workshops, participants were frustrated about the lack of clarity on the environmental impact of Future Flight technologies. They wanted to know whether these technologies were genuinely more sustainable than other transport and wanted to see more research into this.

From the outset, there were concerns around the true environmental impact of using batteries and hydrogen to fuel these technologies, and whether this would be holistically more sustainable than other transport. Participants cited news stories around the true sustainability of electric cars once the whole supply and manufacturing process is accounted for.

> *"There is also a lot of stuff that I was already familiar with about how stubborn these batteries are with recycling because as she [the specialist] said the designs all differ so you need something to break them all down. My overall concern with the green aspect of this would be is it just a front facing clean energy but behind the scenes, like the Wizard of Oz when you pull the curtain back and it's just smog." – Workshop 5*

Participants also continuously questioned whether Future Flight services would replace or add to journeys being made in existing transport, and the implications for environmental impacts. Future Flight technologies and services were not seen to have a positive environmental impact if they were not replacing more polluting and less sustainable journeys being made e.g. by plane, helicopter or car.

Consequently, participants wanted Future Flight technologies to be prioritised over other modes of transport *only* if there was a proven positive environmental impact. They felt this should consider the full picture, including the supply chain, transport of materials, and fuel, as well as the operation of the technologies. In turn, this meant that if Future Flight technologies turn out to be, overall, more sustainable than other modes of public transport then they should replace rather than supplement what is currently in place.

"It should reduce cars and buses on the roads and also probably the use of helicopters and fossil fuel flights. It should be replacing, there's no point adding to the congestion." – Summit

Powering Future Flight technologies was of particular interest to participants throughout the workshops. They wanted to know how electricity and hydrogen would compare to fossil fuels. Specifically, they wanted to know that batteries would be sustainably manufactured, use renewable energy, and be fully recyclable to ensure there are no hidden negative environmental impacts. They also wanted transparency around hydrogen; how it would be produced, stored and used, to ensure that it is fully sustainable. *There is more detail on this within principle v focused on transparency.*

"The drain on earth's resources has got to be of a lesser degree than what we are doing with fossil fuels…We should find ways of doing this with the resources we have and looking at quite frankly 100% recyclability." – Workshop 5

Improved public transport

From the outset, participants saw Future Flight services as a positive in the cases where travel time would be significantly reduced at an affordable price for the public. More specifically, they felt that Future Flight services should aim to improve connectivity for remote, rural areas and hard-to-reach places, rather than focusing on areas with high demand and profitability prospects. As such, they wanted to see the roll-out of transport and delivery services prioritise areas with lower connectivity, rather than areas that already have good transport links e.g. London, ensuring services provide public good, not just profits. Though, they felt this should be in balance with avoiding overly congested skies for the sake of convenience.

Participants did not want to see Future Flight technologies replacing other modes of transport (trains and buses in particular) if they don't offer any additional benefits or address any specific needs. In particular, they felt Future Flight technologies and infrastructure should reduce negative impacts on wildlife, and be quieter, safer and more convenient than existing modes of transport. *There is more detail on this within principle xii focused on wildlife, ix focused on noise and viii focused on safety.*

As the workshops went on, participants felt more and more supportive of the opportunity Future Flight technologies present in terms of social inclusion and accessibility. They wanted Future Flight vehicles, infrastructure and services to improve on current public transport,

ensuring they are accessible to all without barriers for people living with disabilities and mobility issues. *There is more detail on this within principle x focused on accessibility.*

> *"A big thing for me is that it needs to be inclusive of disabled people… You can't even get on a train now sometimes, it's very hit or miss, if you're in a wheelchair there might not be a place for you, there might not be a ramp or someone. If we're going forward with these new types of travel and they're excluding people, then it's not progress really." – Workshop 6*

Use cases: defining public good

Certain use cases were highlighted as directly beneficial, and participants felt that defining their value to the public was relatively straightforward.

Protecting human life

The use of drones for inspecting remote infrastructure was seen to be a positive use of Future Flight technology. Participants felt that overall, this would make jobs safer and more efficient, and would be a good use of taxpayer money. eVTOLs for emergency response were felt to have the potential to improve public services, by being more manoeuvrable as well as quieter and more sustainable than alternatives. However, a less widely held view was that they wouldn't be more effective than existing emergency helicopters but could be significantly more expensive given they are a new technology, which tends to be expensive at least to begin with. When participants first learnt about eVTOLs and this use case, they generally did not focus on the safety and environmental benefits of eVTOLs compared to helicopters but did focus on the automation and potential costs of eVTOLs, which may also have shaped this less dominant view.

> *"I mean, if it ain't broke, why try to fix it. You know, helicopters work and there are small areas that they land on. I mean, the idea of having some robot drive one of these wouldn't be my idea of fun. Because I just wouldn't trust it. It is hackable and attackable and is easily led astray" – Workshop 2*

A less widely held view was that drones used for surveillance could enhance policing, with the aim of keeping people safe. Though there were divergent views on this, given concerns about misuse and targeting minority communities. *There is more on this within principle xiv focused on surveillance.*

Connectivity

Participants felt that using drones to deliver post or parcels would help improve connectivity for less connected areas. However, questions arose around whether more deliveries would be a public good overall. Participants worried that there would be more drawbacks than benefits, with concerns around the negative impacts of congestion and noise.

The use of RAM for UK wide connectivity was seen as a positive way to allow greater connectivity, if affordable to the public and more efficient than current public transport. But participants worried time savings would not be realised due to the practicalities and logistics at airports and remote airfields, and they would only connect areas with higher demand, and where existing airfields are situated e.g. in the Southeast of England. They worried that therefore areas with the highest need wouldn't experience the benefits. There was also a feeling that this isn't needed in a country the size and geography of the UK, and that other modes of transport would be able to better support connectivity.

Within cities, eVTOLs were not seen to provide any improvements for transport, and participants felt that existing transport systems could address most needs without the downsides of noise, congestion and infrastructure changes e.g. installing vertiports. While they were seen as exciting and futuristic, allowing for fast, seamless travel, participants did not envisage this would be needed, affordable or offer value for investment. The use of eVTOLs within cities and for airport transfer was seen as servicing the elite, while the remainder of the population would experience the downsides.

Participants were more divided when it came to eVTOLs for UK wide connectivity. The downsides of noise and congestion remained, but participants felt eVTOLs could improve connectivity for remote, rural and poorly connected places which could be valuable.

Another potential benefit would be reducing the carbon footprint of elite frequent domestic flyers, to have an overall positive impact on the environment. However, this was generally mentioned as an aside, as participants still expressed discomfort toward the government funding transport used only by the wealthiest, even if it would have a smaller environmental impact.

ii. Research and testing: Research and testing must be carried out to make sure that policy and regulation for Future Flight technologies aligns with these principles

There was a high level of consensus that:

- Policy and regulation should be established before roll-out and needs to be updated as the technology and our understanding of impact evolves over time.
- This should include:
  - Safety regulation, including airspace and flight paths
  - Sustainability
  - Noise and visual pollution
  - Protecting wildlife
  - Privacy and data management (particularly for drones)
  - Accessibility of vehicles and infrastructure for those living with disabilities or mobility issues
  - Resourcing e.g. staff

Research-led decisions

There was consensus that policy and regulations should be established before the roll-out of Future Flight technologies, and that these should be based on research. Given Future Flight technologies, services and infrastructure will have significant impacts on people and wildlife, participants felt there should be investment in research about the technologies and their impacts and that the knowledge generated should be applied to decision-making. This application should happen early in the process, to ensure that the technologies are rolled out in the right way, e.g. tailoring to different environments, from the start.

Participants felt the research should be transparent and funded by bodies without a vested interest, to avoid profit-driven incentives that could bias the research process. They wanted to ensure the industry had no sway over this research, and there were suggestions that research should be funded by taxpayer's money to remain more neutral.

> *"Research is absolutely vital. Just making sure that they are not biased in any way, and they are completely independent, it doesn't really matter to them if it goes ahead or not, and that there are no ties to them and the industry itself." – Summit*

Research to ensure public good

There was a strong sense that research should be focused on understanding the impact of Future Flight technologies and services before roll-out and over time. This would allow for according policy adjustments to mitigate negative impacts and maximise positive ones, factoring ongoing learning into policy and regulation. Key areas of interest were:

- The sustainability of Future Flight technologies, compared to existing transport e.g. trains and cars, and accounting for the whole lifecycle of technology/transport development and the whole customer journey. *There is more detail on this within principle i on public good.*
- The impact on wildlife, including impacts wider than just collisions and immediate habitats e.g. migration patterns and biodiversity, with consideration to different types of wildlife e.g. insects, farm animals, birds. *There is more detail on this within principle xii on wildlife.*
- The impact on job creation and displacement, generating a better understanding of the types of jobs and the geographical areas affected. *There is more detail on this within principle xiii on jobs.*
- The impact of noise pollution on human and animal life. *There is more detail on this within principle ix on noise pollution.*

There was a strong sense that participants wanted Future Flight technologies and services, and related policies, to improve quality of life for those in the UK. This included prioritising flight paths and infrastructure in less connected areas and increasing wildlife protections in rural areas and areas of outstanding natural beauty. There was also unanimous support across the group for effectively managing air traffic control to ensure safety. There were less widely held views that regulation should encourage innovation or that careful implementation should start with drones rather than roll out all three technologies at once. These views were generally not supported by the wider group.

iii. Collaboration and consultation: The development of Future Flight technology and services must involve collaboration with specialists and the public

There was a high level of consensus that:

- Flight paths should be designed in a way that considers the needs of wildlife and hobbyists.
- The public should have their say, and that should be factored into decision-making e.g. flight paths.
- Decision-making processes should invite all those with a stake and include NGOs, especially when it comes to factoring in impacts on wildlife and those living with disabilities or health conditions.
- There should be clear leadership on the way forward that brings stakeholders together.

Mixed views remained over:

- How voices should be weighted to ensure that a fairly balanced range of views are taken into account.

Diverse specialist input

Overall, it was important to participants that specialists with expertise in a range of fields inform the case for the need of Future Flight technologies and services, and that these address the right issues. When moving ahead with the technologies and different use cases, they wanted to ensure that specialists and the public were able to feed in and highlight key benefits or concerns.

While these specialists were often undefined, participants placed value on their independence and expertise on topics such as wildlife, noise or impacts on jobs. This contrasted with industry and government, who were seen as biased and pushing their own interests of profit and political gain.

There was clear consensus that the development of Future Flight technologies, services, infrastructure and systems should include a range of voices across different sectors. Throughout development, participants felt it was important that this process be inclusive and avoid political bias. To that end, participants wanted to see a selection process similar to jury processes used in criminal court cases. This way, the public could feed into policies deemed most important, such as the use of drones for surveillance. This would allow for a wide range of 'normal' people, who

have no bias or personal interests, to provide their views to decision-makers who can design sensible policy using a range of views.

> *"What the other participants said got me thinking about policy making, I wasn't really thinking about the bigger picture in terms of how we can make the whole process more inclusive, particularly by employing and consulting people - wheelchair users and the elderly that might benefit." – Summit*

Getting the balance right

Participants wanted to know that specialists would be involved when it came to different aspects of the roll-out. They specified that:

- Designing Future Flight vehicles with safety in mind should involve experts and specialists throughout, as this was important to get right. Participants felt it was important to involve independent specialists here but felt that industry specialists would also have a role as they imagined they would be closer to the design and manufacture of the vehicles. *There is more detail on this within principle viii on safety.*
- Decisions around flight paths should involve the public at the local level as this will affect them personally. The development of infrastructure should involve specialists to ensure that vertiports and airfields are placed in the right areas to ensure efficiency for economic growth and minimise negative impacts such as noise on the public. While participants did not land on either aspect of this trade-off in the dialogue, they felt this should be put to the public to discuss further. Participants also felt that the public should have a voice, but maybe not the final say, to avoid NIMBYism ('Not In My Backyard'). *There is more detail on this within principle ix on noise pollution.*
- Designing Future Flight technologies, services and infrastructure should involve a range of people living with disabilities, health conditions and people who are neurodivergent, as well as disability organisations and accessibility experts. These groups and individuals should feed into the decision-making process to ensure Future Flight technologies and infrastructure are truly accessible. *There is more detail on this within principle x on accessibility.*
- Stakeholders beyond the police should be involved in devising the rules for use of drones in surveillance. Participants wanted to see human rights groups and independent bodies involved in shaping

and providing oversight for this use case. *There is more detail on this within principle xiv on surveillance.*

- Wildlife should be considered when designing and rolling out Future Flight technologies and infrastructure. The interests of wildlife and nature should be represented by non-governmental organisations to ensure they are balanced with the interests of humans. *There is more detail on this within principle xii on wildlife.*

By the final stage of the dialogue process, participants began to think more critically about the implications of everyone having a say in the roll-out of Future Flight technologies and services. They worried that including many opinions could mean that nothing gets agreed and achieved. Broadly speaking, participants felt the ideal weighting of voices depended on the aspect of Future Flight technologies, systems and services being considered. Participants thought technical aspects such as safety need predominantly specialist knowledge whereas aspects that will affect the everyday lives of the public, for example noise and flight paths, should weigh the opinions of the public more heavily. While participants felt unable to provide definitive guidelines, they wanted to see consideration given to how different voices would be included and weighted to ensure decisions would be made with all stakeholders, including wildlife, in mind.

iv. Accountability: Future Flight developers and operators must be held to account by independent bodies

There was a high level of consensus that:

- Independent bodies should be monitoring and holding the industry accountable across:
  - Safety regulation, including airspace management and flight paths.
  - The impact of Future Flight technologies on wildlife and sustainability.
  - The use of drones for surveillance, avoiding 'mission creep'.
  - Accessibility of Future Flight transport for those with access barriers.
- These bodies must be funded independently, through a tax on industry, so they are not biased.

The value of independence

There was strong consensus across the group that regulation should be monitored independently. Participants felt that the government should have some oversight, but there was a low level of trust in how competently and quickly they would act in the event of a problem. There was also a more general concern that regulation would not keep up with the pace of the evolving technology, which would lead to negative impacts on the safety and misuse of Future Flight technologies.

> *"The technology will move fast and everything else has to follow in terms of safety, regulations, impact on the environment. It's like mobile phones… they didn't have a clue… chasing well behind everyone else." – Summit*

Participants felt that independent bodies need to be truly independent, ensuring no involvement from parties with vested interests such as profit or political gain. They felt these independent bodies should include stakeholders from a range of backgrounds and organisations to ensure a balance of views, with differing knowledge and including newer as well as established experts.

Participants wanted these bodies to hold the industry to account. This meant monitoring the activity of the Future Flight industry and limiting negative impacts through enforcement. This also meant these bodies need to have powers to determine who's in the wrong and carry out enforcement.

Priorities for independent bodies

Participants were initially reassured that the CAA would be able to play this role alongside their work regulating existing aviation. However, upon reflection, participants felt this would not be sufficient at roll-out as they pictured a large influx of new vehicles in lower and currently unregulated airspace. They felt other bodies should be involved to ensure monitoring and accountability across the country for users of Future Flight services as well as non-users.

Participants felt it was particularly important for independent bodies to be involved in regulating Future Flight development in relation to:

- **Noise**: to monitor and evaluate the level of noise from Future Flight technologies, and to shape regulation around acceptable noise levels in different areas and at different times. Participants felt the CAA could be involved here. *There is more detail on this within principle ix on noise pollution.*

- **Wildlife**: to ensure the protection of wildlife is genuinely prioritised, with mechanisms for regulation and accountability for industry. *There is more detail on this within principle xii on wildlife.*
- **Surveillance**: to protect privacy and public interest. Participants felt having an independent ombudsman or body was essential to protect privacy. Low levels of trust in the police meant low trust in how this would be managed or regulated properly without independent oversight. *There is more detail on this within principle xiv on surveillance.*

Funding

There was initially some disagreement on how these bodies should be funded – either by taxpayer money, by payments directly from industry, or from a combination of the two. There was a strong sense that independent bodies should not be funded by the government, because this would be an extra financial burden on taxpayers. Conversely, participants worried that direct funding from industry would lead to pro-industry bias and give industry too much power over these bodies. After deliberation, a tax on the industry was felt to be the most suitable approach to alleviate the financial burdens and ensure independence.

v. Transparency: Future Flight technology and development must be transparent

There was a high level of consensus that:

- Decision-makers and the public should know about:
  - The sustainability of these technologies.
  - The ethics of sourcing materials and producing the technologies.
  - How the industry is and will be funded.
- The public should be aware of the roll-out of Future Flight technologies, systems, infrastructure and services, and what Future Flight vehicles around them (particularly drones) are being used for.

Transparency enabling accountability

To enable accountability, there was consensus around the need for transparency about the roll-out of Future Flight technologies, systems, infrastructure and services, and how this would be funded. Participants

also felt there should be transparency around responsibilities across the Future Flight ecosystem, particularly around who has the power to initiate the roll-out. *There is more detail on this in the fourth findings chapter on responsibilities.*

> *"Any sweeping decisions that involve people should be completely transparent because it allows people to make choices about what they want to do with it or support it if they know exactly what's going on." – Summit*

In later workshops, as participants learnt more about different aspects of the technologies through specialists, they voiced that information should be shared transparently about Future Flight vehicles and their production:

- They wanted to see transparency around the quality and safety of materials used in manufacture, to ensure safety of the vehicles. *There is more detail on this within principle viii on safety.*
- They wanted to see transparency around the sustainability and environmental impact of Future Flight vehicles. This links to the previously noted need to understand and ensure the sustainability of Future Flight technologies and services.
- They wanted to see transparency around the safety of workers in the supply chain, around human rights e.g. mitigating involvement with modern slavery, and around the sustainability of supply chains. *There is more detail on this within principle vii on international co-operation and principle i on public good.*

Raising public awareness

Participants wanted to see greater public awareness of Future Flight technologies. They felt this needed to be balanced and honest, not just selling the positive aspects. Participants suggested multiple ways that the technologies could be communicated to the public to build greater awareness of proposed uses, timelines and modes of operation, ahead of and during roll-out. A key suggestion was to provide public databases and flight tracker websites for the public to identify drones overhead, clarifying their ownership and use. This was particularly important to participants as they felt there could be many drones in use in the future, some of which may be recording personal data. This links strongly to the use of drones for policing, as this would include being able to identify police drones when in use. To a lesser extent, participants saw value in raising awareness through showcasing models of Future Flight technologies and simulating the noise levels and sounds of Future Flight technologies to members of the public, for example in airports.

vi. Resourcing: The roll-out of Future Flight technologies must be properly resourced

There was a high level of consensus that:

- There must be people involved in monitoring safety and managing the airspace, with human accountability at all times (as opposed to this being automated).
- Training needs should be considered early to ensure there are enough people with the training to do Future Flight jobs.
- Pilots/operators and other staff should be properly trained and licensed.

Mixed views remained over:

- Whether the industry should address resourcing by hiring locally, or internationally.

When discussions began at the summit, participants felt this was a less pressing issue than some of the other principles. This challenge was felt to be more distant, and perhaps easier to overcome, than some of the more immediate considerations. However, on reflection, participants felt it was also important to get resourcing right ahead of roll-out.

Gearing up to regulate

The group expected the CAA to have oversight of the regulation of Future Flight operations, but there was concern around the CAA's capacity to regulate in the context of new technology. This was based on concerns that the CAA may be overwhelmed given the scale of the ambition and that new (i.e. lower) airspace would need to be regulated, which would take time to put in place. Participants wondered whether this could hold up the roll-out or regulation of Future Flight technologies. There was agreement that the CAA should collaborate with manufacturers ahead of time, to anticipate what would be needed to regulate Future Flight technologies and operations.

> *"I think the CAA have a role to play in the roll-out of resources and tradespeople to ensure safety in the skies… there's going to be an awful lot more happening in the sky, so they need to be involved. They need to be trained up on the fact that there's going to be quadruple the amount of vehicles in the air."*
> *– Summit*

Resourcing rural and remote services

Resourcing for the use of Future Flight technologies and services in rural and remote areas was seen as potentially challenging. Participants felt that bringing in RAM and eVTOLs to connect these areas up would require more resourcing effort to put staff in place to run these operations compared to urban areas where there are more people. After learning more about airspace management, participants had concerns about whether there would be sufficient resources to ensure the use of Future Flight technologies would be monitored, and regulation enforced, in rural and remote areas. This was underpinned by there being fewer people to draw on than in urban areas, and led to a feeling that rural areas would be harder to police than urban areas. At the summit, participants spoke about balancing the benefits of local employment for Future Flight services and manufacture in rural areas with the need to attract high quality talent. These concerns about resourcing specifically in rural areas were eventually overshadowed by concerns around resourcing across the industry overall.

Developing a Future Flight workforce

It was important to participants that there be sufficient staffing to ensure the safe and efficient running of Future Flight services. They felt this had significant implications for resourcing, requiring extensive and thorough standardised (while also tailored to local areas as needed e.g. weather, local geography) training around operating aircraft, maintaining vehicles and regulating the use of Future Flight technologies and services. Participants wanted collaboration between trainers and industry to ensure those teaching have up-to-date knowledge and direct experience. They felt this would help to manage ongoing technological and systems developments in a fast-moving space. *There is more detail on this within principle xiii on jobs.*

Participants wanted assurance that human beings would have ultimate accountability when operating an autonomous vehicle, which would mean adequate resourcing. There was consensus across the group that people should be involved throughout and held responsible if things went wrong, and concern that, without being mandated, companies may replace rather than supplement human oversight.

> *"This is related to drones and planes that are unmanned. Are they all going to be controlled by a central hub? If so, what is the security to do this? Right now, you can't hack a train or plane due to people driving. if these are going to be autonomous then*

we need to understand how to protect these servers."
– Workshop 3

Participants assumed that addressing resourcing challenges would mean recruiting a large number of staff. They wondered how this would be done, thinking about resourcing challenges in other industries. There was also little consensus on where Future Flight industry should be recruiting from. While it was seen to be important that the Future Flight industry offers job opportunities for local areas and communities, getting the best of the best to do the job was also felt to be important. Participants recognised that this may require going further afield, both within the UK and internationally. While consensus wasn't reached, participants felt it was important to weigh the benefits of both approaches and strike an appropriate balance.

vii. International cooperation: The UK as a whole must benefit from leading in Future Flight technologies, behaving ethically through international cooperation.

There was a high level of consensus that:

- Rolling out Future Flight technologies should create jobs and improve the UK economy, rather than limit benefits to profit-making companies – especially if taxpayer money will be funding this.
- Decision-makers and industry should be transparent and realistic to avoid wasting taxpayer money.
- Safeguards should be in place to avoid monopolies/international technology companies taking over.
- Supply chains should be ethical i.e. we should not unethically extract resources or labour from other countries.
- We should share learning internationally, to build on successes and learn from mistakes.
- The UK should contribute knowledge and expertise to Future Flight technological developments.

Mixed views remained over:

- Whether the UK should be leading on Future Flight technologies.

Benefiting the UK overall

Throughout the workshops, participants often struggled to see how Future Flight technologies or services would significantly impact the economy. While they recognised potential benefits in terms of efficiency for businesses, there was scepticism around projected GDP figures.

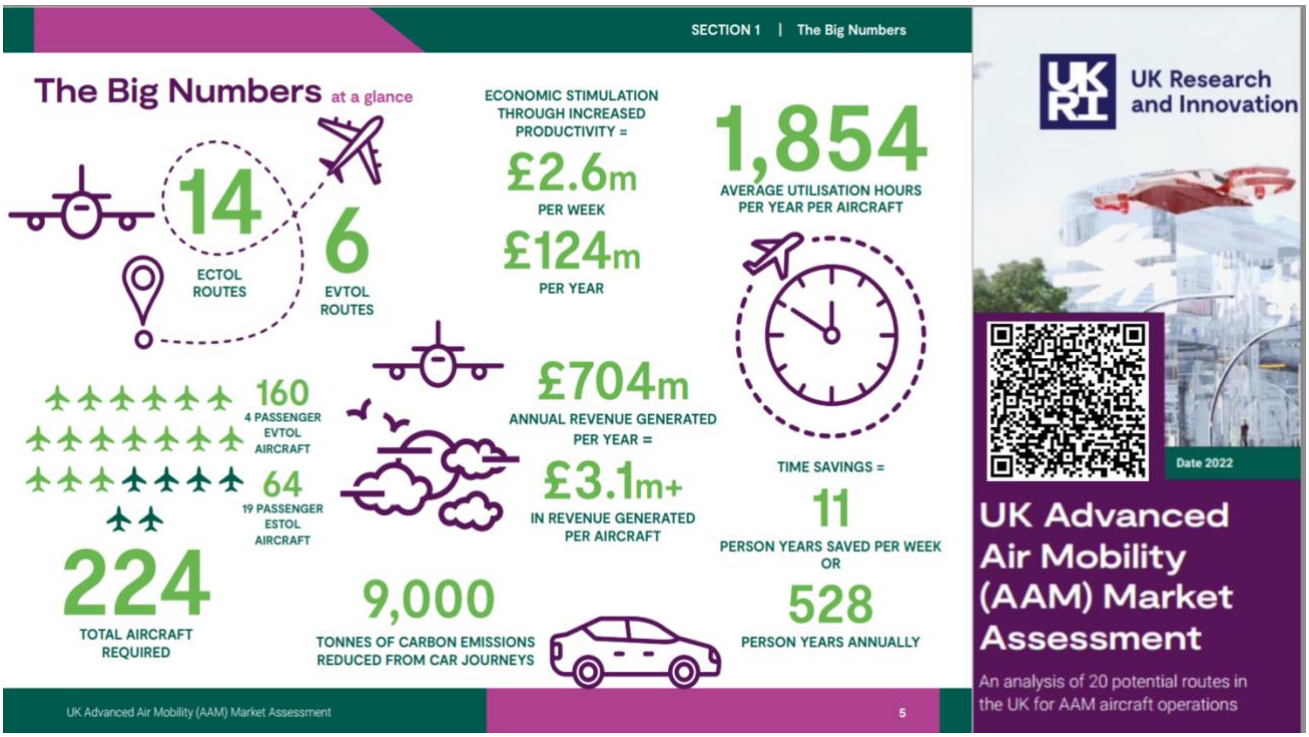
> *"If we're talking about transporting people… why would the economy be boosted because 10 people have landed in your village?" – Workshop 2*

There was also a high level of concern around who would benefit from Future Flight technologies. Participants assumed the industry would benefit rich investors and business owners, as opposed to the majority of people in the UK. They worried that the roll-out of Future Flight technologies and services might increase wealth inequalities, rather than benefit the country as a whole.

> *"I'm sure it's going to make businesses more efficient and productive and profits bigger - that's probably why it's being pushed through. Sorry I'm a cynic." – Workshop 1*

To some extent, participants could envision that if Future Flight technologies and services positively impacted the overall UK economy, it would have positive knock-on impacts for average people, rather than those who benefit directly from share prices. However, they did not see this fitting the industry's interests, and had a lack of trust in the government's ability, and interest, to ensure that profits made would be distributed across society.

However, as the dialogue progressed, hopes emerged that the technologies would create jobs and be an asset to the UK economy, rather than a drain on the taxpayer. Participants did see potential for Future Flight technologies to provide benefits if development and manufacture was to happen in the UK. But in practice, many worried this would be outsourced to other countries, so job opportunities would not benefit those in the UK.



Slide from specialist presentation on affordability and feasibility in workshop 4.

Participants also worried that Future Flight technologies and services would be dominated by an international corporation (e.g. Amazon), with shareholders benefiting from the UK's investment and the British public seeing few returns.

> *"I'm just concerned that the government is going to pump a lot of money into this... and then it'll be bought up by a foreign company" – Summit*

UK leadership

Participants worried about the UK government's motivations to roll out Future Flight technologies and services. Due to high levels of scepticism around the economic benefits of Future Flight technologies and services, they worried that the government was pushing to become a leader in this industry for prestige; to improve their reputation with voters and on the international stage through innovation and distraction, rather than dealing with current problems and trying to bring benefits to the UK public as a whole.

Beyond this, there were concerns and questions around whether the UK could and should become a leader in this space. Participants suggested that other nations would be better placed to lead on the development of Future Flight technologies and services. They thought of countries with more natural resources (i.e. heavy metals), more money, or a greater

need for Future Flight technology e.g. due to being a bigger geographic area or issues with existing transport links. China, the US and Australia were named as examples.

They also felt that the UK should be working towards a more collaborative approach with other countries. One area where participants saw a role for the UK was in research and development of the technologies. Even those most sceptical about the UK leading in Future Flight technologies wanted the UK to contribute their knowledge and expertise to technological developments in this space. Overall, it was important to participants that learnings and successes on the development of Future Flight technologies, systems and services be shared, especially when it comes to key issues such as safety.

Ethical supply chains

In addition, participants were concerned about the UK taking advantage of other countries in the race to become a leader, particularly when it came to manufacturing. As the dialogue continued, participants became increasingly concerned about the potential for human rights violations against those working in the supply chain of materials outside of the UK, particularly around lithium mining for the manufacture of batteries. There was a strong feeling that the supply chain should not at any point contravene human rights and labour laws. It was paramount to participants that the supply chain should be ethical throughout, and participants worried that some of the countries where manufacturing happens would use child labour.

> *"The source of the cobalt and lithium that was just mentioned briefly, I think they [the specialist] said the Congo or somewhere. I don't know what that country is like for human rights but bad I would think. So that's a concern, an ethical concern about how the workers are treated." – Workshop 5*

Findings part 3: Topic-specific principles

Where the previous chapter focused on overarching principles, the following chapter focuses on topic-specific principles. These principles focus on the areas participants felt most strongly about in early discussions and continued to develop throughout the dialogue. They also provide applications of the cross-cutting principles discussed in the previous section.

This chapter explores the following seven topic-specific principles:

- Future Flight technologies and services must be managed safely and held to the same level, or higher, of safety standards as existing technology.
- Flight paths must limit the negative impact of noise pollution and visual congestion on people.
- Future Flight vehicles and operations must be designed with accessibility for all those with access barriers in mind from the start.
- Future Flight services must be affordable to the public.
- Limiting negative impacts of Future Flight technologies and services on wildlife must be a priority, avoiding tick-box exercises.
- Future Flight job opportunities must be available in a fair and accessible way.
- The use of drones for surveillance must be proportionate to the level of the potential threat, with clear guidelines.

viii. Safety: Future Flight technologies must be managed safely and held to the same level, or higher, of safety standards as existing technology

There was a high level of consensus that:

- Safety standards should be applied in the same way across the board i.e. by different operators.
- There should be robust training and licensing to fly Future Flight vehicles, particularly drones.
- Safety should be monitored by an independent body.
- There should always be human accountability when it comes to safety, even if vehicles are pilotless.
- Safety standards should consider the safety of fuel and factor in passengers and non-passengers.

- There should be significant consequences and accountability for those who contravene rules on safety or threaten national security.

A key and ongoing concern

Initially participants had high levels of concern about the safety of Future Flight technologies, particularly around the manufacture and piloting of these vehicles, how they would avoid collisions, and the additional risks of unmanned flights. They imagined that an increase in the number of vehicles in the sky might lead to an increase in collisions between existing aircrafts, buildings and birds. Some voiced concerns that eVTOLs in particular would be less safe than other existing vehicles (i.e. helicopters, private jets) because they are passenger-carrying and felt newer compared to RAM, which felt similar to existing planes. These fears were compounded by the fact that some of these vehicles could be autonomous.

> *"I don't want them flying around, automated, with no one watching over them because that would feel not just a little bit creepy but a safety issue. I think if they implement it carefully, drones could be a really massive benefit to our society." - Workshop 1*

After learning about existing safety standards within the aviation industry for higher airspace (that would cover eVTOLs and RAM) they felt somewhat reassured. However, participants were still concerned about the safety of lower airspace, as it is currently unregulated and used by hobbyists such as hang gliders. This was a particular concern for drones, as they will be flying in a lower airspace, but also for RAM and eVTOLs as they take off and land.

Participants were more comfortable with the level of risk for eVTOLs and RAM, given the level of regulation already in place for higher airspace. However, they noted that the consequences would be more severe as they are carrying passengers.

There was consensus that safety standards should be stronger than for existing modes of transport and be consistent across all operators, given the technology is so new and likely to be deployed at an unprecedented scale of operation. They also called for extensive, continuous and thorough training in the areas of safety procedures, piloting new aircraft and maintaining these new technologies. However, dissenting voices

worried that an overly restrictive focus on safety would lead to stifling innovation through over-regulation.

When discussing drones, participants also had safety concerns that centred more around hacking and terrorism. Fears around the technology being misused focused on bad actors hacking into the technologies to abuse them. Participants pictured this abuse as stealing payloads, using the technologies to crash into buildings, for terrorist attacks, or that criminal groups would use drones to transport illegal goods. Participants wanted regulation and enforcement in place to address crime and misuse, protecting the public from security as well as physical safety threats.

Autonomous vehicles

There were concerns about the prospect of autonomous systems and a potential lack of human intervention. For passenger vehicles (particularly for eVTOLs), participants worried about risks around system failure, unforeseen collisions (e.g. with birds), and the potential knock-on effect of there being no pilot on board to take back control.

Consequently, they felt it was important that humans should remain responsible and in control overall and be accountable when things go wrong e.g. software failures. This meant having systems in place that would enable human operators to take back control of compromised vehicles.

Participants expressed a strong level of discomfort with autonomous passenger-carrying flights, and worried about the implications on safety. They did not feel comfortable about the lack of operator on board, even if there was adequate human oversight on the ground. Participants were told that fully autonomous systems were a possibility for eVTOLs, further downstream. Detailed information was not provided and extended deliberation on autonomous passenger-carrying flight was not specifically prompted, though participants touched upon this in a number of discussions. Since participants did not discuss their conditions for the acceptability of automation, and what systems they would want to see in place, this area would be deserving of further public dialogue.

"How many humans are sitting at their desks? What are the controls and what do they look like? Are we creating opportunities for people to be responsible for the safety of these vehicles? Potentially crashing into lamp posts or someone cleaning windows." – Workshop 4

Fuel/Batteries

Concerns persisted throughout the workshops around the safety of powering Future Flight vehicles. This was especially in relation to the safety of batteries, and to a lesser extent, of hydrogen. Participants questioned whether battery technology was ready to be used in airborne technology, particularly by those who had first-hand experience or had seen news stories about batteries combusting in bikes, factories and electric cars, causing explosions and fires. Participants also questioned whether hydrogen was stable enough and well understood enough to be safely stored, transported and used given it is currently not widely used in transport, with mentions of the Hindenburg disaster.

Consequently, participants felt that safety standards should account for the safety of different fuel or energy supply types, factoring in both passengers and those on the ground.

Regulation

Participants felt that the consequences of safety breaches need to be serious, a slap on the wrist would not be sufficient. To support this, there was a strong sense that regulation should be independent and free of conflicts of interest. For example, participants regularly cited the CAA as an organisation of concern, as they worried that their funding may risk bias from industry. This stemmed from the CAA being funded primarily from service and regulation fees, with participants worrying that this meant they were industry funded and might therefore work with industry's benefits in mind only. There was agreement in principle that the government should be involved in oversight, but a general lack of trust in government led participants to question how competently and quickly they would mitigate any problems.

> *"It needs to be clear what the consequences are and ensure that it will sting. Like if it's a fine, that it's not free or legal for rich people. The consequences have to be enough that people will feel the sting" – Summit*

For drones, participants felt there needs to be a requirement for all drones to be identifiable e.g. through ID numbers and registration, so that operators can be held accountable to safety protocols that protect people on the ground from collisions, as well as those on board or operating aircraft. They felt this was especially important if there is a significant increase in the number of drones in the sky for delivery services.

Further considerations

While less top of mind, participants were also concerned about the safety of using Future Flight technologies in different types of weather, particularly in high winds. They wondered whether climate change will be considered during safety regulation and technology development. There were also calls for transparency around the quality and safety of materials used in Future Flight technologies. This especially surrounded the idea of retrofitting older crafts as this was seen as less safe compared to new vehicles, though this was not a widely vocalised view.

ix. Noise pollution and visual congestion: Flight paths must limit the negative impact of noise pollution and visual congestion on people

There was a high level of consensus that:

- Operators should consider the impact on people on the ground when deciding new flight paths or installing transport hubs, in balance with the potential benefits.
- Defined flight paths should consider negative impacts on the public, especially in rural areas or places where this is particularly important (i.e. national parks, schools).
- The public should have a say on flight paths.
- There should be regulations on maximum levels of noise, taking into account noise profiles, time of day, the impact of large amounts of vehicles and differentially impacted groups.

Mixed views remained on:

- How, and by who, flight paths should ultimately be decided.

Crowded skies

From the outset, participants foresaw significant congestion in the sky as a result of the introduction of these technologies and services, particularly in terms of transport and delivery services for the public. They worried that these three technologies would be rolled out in significant enough numbers to cause congestion and collisions, particularly in urban areas where there would be many people ordering deliveries and using public transport services. There was a feeling that more technologies and therefore more vehicles being introduced would lead to several issues:

- **Visual pollution:** due to a higher number of vehicles being in the sky, which they anticipated would be aesthetically unpleasing. Participants did not initially express concerns about light pollution, though this was noted in later discussions.
- **Noise pollution:** due to a higher number of vehicles, particularly drones, being present in lower airspace and closer to residential buildings. They felt this would lead to more noise, which they anticipated would be disruptive and annoying.
- **Commercialisation of the sky:** some participants felt uncomfortable that introducing these technologies would mean 'commercialising the sky', which they saw as a relatively well-preserved natural resource that should not be tampered with.
- **Impact on wildlife:** participants were concerned about the impact on birds and other wildlife of a larger number of vehicles in the sky. *There is more detail on this within principle xii focused on wildlife.*

"I just have this vision of all these amazon parcels flying around in the sky and the noise! How many will there need to be for all those parcels? It fills me with dread cos I won't be able to see anything or hear anything from the buzz." – Workshop 1

Throughout the workshops, participants expressed strong concerns about an increasingly cluttered sky, with worsening noise pollution and visual congestion. This was furthered when participants learned about the current lack of legal limitations related to noise levels.

"I was more focussed on actually hearing [specialist demonstration of the noise of a drone in flight] for the first time because I didn't really think noise was going to be a problem, but I didn't really factor in how big these things were going to be. Then I heard it for the first time and thought oh this actually could be a lot bigger of a problem than I thought it would be." – Workshop 5

Overall, participants responded negatively to any suggestion of increased noise. They felt uneasy about what the landscape of noise pollution and visual congestion might be like in the future, after the introduction of these technologies. Participants pictured there being a much higher volume of vehicles in the sky, at more times and in a wider spread of locations than we have currently. They worried about the impacts of noise on wellbeing, sleep and general stress levels of the population. A dissenting view was that people and wildlife will quickly get used to the

noise from Future Flight vehicles, and that it would fade into the background. However, this view was not widely held.

Minimising noise

Participants felt strongly that Future Flight technologies should not be louder than existing technologies. It was important to them that these vehicles be developed to be as quiet as possible and that this should consider both the number of decibels and the 'annoyance' of the frequency. In addition, participants hoped that these quieter technologies would replace louder existing vehicles such as helicopters, rather than adding to noise levels.

Light pollution

There were some concerns around light pollution caused by Future Flight technologies, though this was seen as less of an issue in the daytime. Light pollution was particularly important to those living in rural or semi-rural areas, who worried about the impact on wildlife, and the beauty of the night sky.

> *"Visually when you look up at the sky and the nice sunset, even in an urban… in a city, you can look up and see the sunset and appreciate it. But if it's full of drones buzzing around, oh god where's the sky gone?" – Workshop 1*

Flight paths: proximity and places

Drones were of particular concern due to being in a lower airspace, and therefore in closer proximity to people and buildings on the ground. While still concerning, eVTOLs and RAM were assumed to be quieter than their helicopter and plane counterparts, and would be travelling in a higher airspace. Concerns around the noise of eVTOLs and RAM initially surrounded the positioning of vertiports and airfields, but as the dialogue went on participants focused more on the impact of flight paths, as these were felt to impact more people.

Participants tended to focus on noise pollution and visual congestion, as the worst future they imagined was one with skies filled with aircraft that made the environment around them feel noisy and congested. They focused less on light pollution, potentially because they were not provided with information about the kind of lighting requirements and fixtures Future Flight vehicles would have.

Certain uses were of particular concern to participants when it came to noise pollution and visual congestion:

- Drones delivering to individual homes were expected to have a high impact on noise pollution and visual congestion due to them being used in populated areas, and potentially travelling close to homes. Participants also worried that there would be many deliveries being made throughout the day and night, due to the number of goods people order online.
- Drones used for police surveillance were expected to be used mostly in cities, close to the ground. Participants also thought they would be more likely to be used at antisocial times.
- eVTOLs used for inner city connectivity were expected to increase air traffic and create constant noise in already noisy and congested areas.
- RAM in rural areas were expected to increase the levels of noise and light pollution in an otherwise quiet and dark space (though participants did not expect there to be high numbers of these vehicles). The focus on light pollution here is likely due to the focus on otherwise dark spaces, though may also have been influenced by their similarity to current planes, providing participants with a sense of the likely extent of light pollution.

Involving the public

Participants felt that the public should have a significant say in relation to this principle because of its impact on their everyday life. They wanted any new technology to be quieter and aim to replace older, louder technologies such as helicopters in the long run.

They wanted flight paths to minimise the impact of noise on the public and discussed the right to refuse flights over your own house. They acknowledged that this would be difficult in practice, with some suggesting that local authorities could have the power to feed into decisions on flight paths using the outcomes of consultations with the public to make this practice feasible. However, this suggestion was not well supported due to concerns around NIMBYism (i.e. people refusing to let Future Flight technologies fly over their properties) and concerns around local councils being corrupt. Participants also worried that this would unnecessarily hold up decision making. Participants wanted to balance their concerns about noise pollution with the need for efficient flight paths that offer benefits around convenience and boost the economy. There was ultimately no consensus on how these decisions should be made, but there was a sense that decision-makers will need to prioritise minimising the negative impacts of noise pollution and visual congestion on the public while enabling the benefits of efficiency.

"I don't agree with them following the same flight path, spread it out. If they're all together it's going to be noisy, they're going to crash into each other, if they're going over roads then drivers are going to be distracted." – Summit

Research for public good

There was consensus that research is needed on how the technologies and new services they enable will impact people, and that this should be used to inform decisions and regulations around acceptable noise levels, type of noise, and flight paths. In turn, impacts should be monitored and evaluated, and regulation adjusted accordingly, potentially by the CAA, including a clear definition of what is acceptable when it comes to noise pollution, visual congestion and light pollution, although the latter was seen as less of a priority overall. They felt this evaluation should consider:

- The frequencies, noise profiles and volume of vehicles. Also the impact of vehicles collectively, not just individually, particularly for drones that will be in closer proximity to people.
- How regulation should vary across urban and rural areas, as well as specific places such as schools and Areas of Outstanding Natural Beauty (AONBs).
- Whether Future Flight vehicles should be allowed to travel by night. There were mixed views across the groups on this, with those in favour of banning flights at night feeling this would support a better quality of life, especially for those living near transport hubs. Those against the ban felt that this would limit the potential benefits around speed and efficiency.
- The impact on people who are more affected by noise, for example those who are neurodivergent or living with other relevant health conditions.
- Where exceptions may be appropriate. For example, participants were happy to overlook the impacts of noise in emergencies.

In line with the first principle, participants wanted decision-makers to weigh the potential social good with the negative impact of noise and air pollution, working towards decisions that maximise social good and minimise negative impacts.

"I live near the airport in Aberdeen, and they have a cut off unless there's an emergency. So if you woke up at 2 o'clock in the morning to helicopters then you know it's an emergency and that's fair enough. But not 9, 10, 11 o'clock at night" – Summit

x. Social inclusion and accessibility: Future Flight vehicles and operations must be designed with accessibility in mind from the start

There were high levels of consensus that:

- Future Flight technology and service development should take into account all disabilities, including non-visible disabilities, health conditions, and neurodivergence – on the ground as well as passengers.
- People living with disabilities, charities and experts on disability design should be actively involved in decisions from the start.
- Operators should consider accessibility end to end through the journey, and staff should be trained on how to support those with access needs.
- Manufacturers and operators should absorb the additional costs of making vehicles accessible.
- There should be a consistent code of practice that is conditional for operation.

Accessibility: A key opportunity

Initially, participants recognised that Future Flight technologies, infrastructure and services could increase social inclusion and accessibility for those living with disabilities or health conditions. Still, there were concerns about whether this would come to fruition, and whether some technologies would be less accessible than others. For example, there were concerns around accessibility for those in a wheelchair or with additional mobility needs in relation to RAM, owing to their assumed physical similarity with existing aircrafts. While social inclusion and accessibility was less of a concern for participants at the beginning of the dialogue, this increased over time. For some, hearing from the specialists was the first time they considered accessibility.

As the dialogue progressed, participants felt increasingly supportive and invested in Future Flight technologies, infrastructure and services as an opportunity to be accessible for all, particularly those who experience access barriers to current public transport.

"This is an area in which massive improvements could be made. There's a window of opportunity here" – Summit

There was an expectation that as the technologies are new and are not constrained by existing infrastructure, they should be more accessible

than existing modes of transport. As the dialogue progressed, participants expanded this consideration from thinking in terms of physical disability to thinking in terms of vulnerability to ensure inclusion of, for example, older people, children and those living with mental health conditions.

> *"Accessibility, every sort of accessibility, obviously physical accessibility, but also everything else. In a best-case scenario, it could completely free some people, especially if the other infrastructure is improved as well, it could mean absolute freedom to some people." – Summit*

When speaking about social inclusion and accessibility, participants were not talking about general economic inclusion, beyond the importance of not pricing out those with access requirements, which is discussed in more detail below. Economic inclusion was instead discussed under the umbrella of affordability. *There is more detail on this within principle xi on affordability*.

Passenger-carrying aircraft

Participants spoke about this principle mainly in relation to eVTOLs. It was seen to apply less to drones as non-passenger-carrying aircraft. There was much less consideration of RAM specifically, perhaps because of a perceived relative lack of opportunities, given RAM infrastructure and vehicles may be retrofitted to begin with. Participants felt that eVTOLs presented better opportunities for those living with disabilities, for example giving them opportunities to travel further and faster than current accessible transport. Despite participants being generally unsupportive of the use of eVTOLs within cities, worrying it would just be another form of elite transport, they did see opportunities to provide alternatives for people facing barriers to using existing modes of public transport.

> *"I just think that they should be the priority because that's who is going to benefit the most. A lot of people with disabilities don't use public transport and do use cars and that's the easiest way for them to get around. So if we're moving away from road transport and we know that those people use cars more, then they should be the priority." – Summit*

There was consensus that Future Flight journeys should be fully accessible end to end. Participants felt it was important that every aspect of the journey, including booking, was accessible to all. This also included making all supporting infrastructure accessible, such as vertiports, airfields and transport links for onward travel.

Drones

For drones specifically, participants saw a need to consider conditions and neurodivergence, such as those living with autism or with hyper sensory issues, as drones flying low in the sky could have detrimental effects due to the noise and visual pollution. In the case of emergency response there was discussion about the need for eVTOLs to be fully accessible for all potential users, to avoid any issues around accessibility preventing rescue or putting lives at risk.

Ensuring accessibility

Participants felt strongly that manufacturers should be engaging with those living with disabilities and disabled charities/organisations at the inception of these technologies ensuring social inclusion and accessibility is built in from the very beginning. To support this, they discussed ideas such as an accessibility code of practice that should be mandatory and independently enforced and regulated. They felt that operation of Future Flight technologies and services must be conditional upon adherence to this code of practice, which could include standards such as minimum width doorways for wheelchairs and training requirements for staff. Participants were less clear on who specifically should be deciding on the standards of the code of practice, but agreed that this is important and must include organisations and individuals with direct experience of disability in relation to transport use. Further, they felt that operators should be mandated to assist those with additional needs. Towards the end of the dialogue there was a suggestion that there should be additional benefits or privileged access for those living with disabilities to encourage use.

> *"Operation of Future Flight technologies must be conditional upon adherence to a consistent and complete code of practice…they should spend a good amount of time in design and development ensuring that disabilities are given rules like the average width of each chair is used in terms of gangways because the average plane gangway is not the width of each chair. it comes down to who do you prioritise more?" – Summit*

Participants debated the costs associated with making these new technologies fully accessible. Participants generally felt that these costs should be fully integrated into initial costings for manufacture and service development, and absorbed by manufacturers, not service users. There were concerns about the feasibility of this and the knock-on effect to overall affordability, but participants still strongly felt that this should not

impact ticket prices, especially for those with accessibility requirements. This was partly due to participants' distrust in industry, and the fact they pictured large and well-funded corporations running Future Flight services – who could easily afford to make services accessible.

xi. Affordability: Future Flight services must be affordable to the public

There were high levels of consensus that:

- Future Flight services should not be only available for the wealthiest in society, while there are negative consequences for the rest of the public.
- If Future Flight services will only be available to the wealthiest at the beginning, they should eventually be affordable for the public (within 10 years).
- Future Flight services should not cater only to the elite if they are funded by taxpayer money.

Affordable to all

Throughout the dialogue, participants thought about the affordability of Future Flight services in relation to the publicly accessible services they could provide, rather than the affordability of private ownership by individuals and businesses. In this context participants agreed that Future Flight services should be open and affordable to all, with concerns from the outset that Future Flight services would only benefit the wealthy while the rest of the public only experience the negative side-effects. However, throughout all the workshops, participants could not see how affordability for all would be viable, especially for eVTOLs and RAM. These technologies were seen as more expensive to operate compared to traditional public transport like trains and buses (at least in the short term), given the upfront costs of building necessary infrastructure and staff-related capacity. They would also not be able to transport as many passengers per trip. While they recognised that these services would likely become more affordable once roll-out is widespread, concerns remained.

Affordable over time

Some, though not all, participants agreed and accepted that eVTOL and RAM services would not be affordable to normal people for a long time,

comparing them to the introduction of other technologies such as mobile phones that started out very expensive but are now commonplace. However, all agreed that these services should not become a plaything for the rich long term, particularly if taxpayer money is involved. While initially participants were often unable to imagine how these technologies or services would be able to benefit the population at large, over time participants came to the view that it is reasonable to expect passenger-carrying services to be affordable to most of the public within 10 years.

"It's like when mobile phones first came out, they were expensive but now who hasn't got a mobile? The most important thing is driving the economy." – Workshop 4

Reducing the carbon footprint of frequent fliers

Some participants did feel comfortable with Future Flight technologies and services not being affordable to the public if they significantly reduce the carbon footprint of the wealthiest members of society and frequent fliers, for example by replacing fossil fuel powered private jets with electric ones. However, they did not want taxpayer money supporting the roll-out if this were the case.

Affordability in practice

Participants stressed that to make eVTOL and RAM services affordable, prices would need to be comparable or cheaper than current public transport options (e.g. trains and buses) or be significantly more convenient than cars. Some, though not all, felt that after significant roll-out, prices could become cheaper than existing or alternative travel options. However, while participants were still sceptical this would come to fruition, this ideal scenario in turn led to concerns that cheaper tickets and improved convenience would lead to overly busy skies, especially when considering the capacity of an eVTOL or RAM compared to that of a train.

"One of the prices has to go down... either trains or this new technology. Otherwise, there will still be issues continuing in terms of accessibility. There needs to be another option." – Summit

This presents a tension between participants' desire for affordability, with a recognition that for this to be feasible it requires scale of operation. This scale of operation underpins many of participants' other concerns around noise pollution and visual congestion, impacts on wildlife, and a sense of personal privacy.

Prioritising areas across the UK

Participants felt strongly that the roll-out of eVTOLs and RAM should prioritise areas with bad transport infrastructure such as rural and isolated areas. However, with the acknowledgement that these areas would have low demand and therefore are less likely to be profitable, there was scepticism as to the likelihood that this would happen. Participants agreed that the acceptability of this outcome depends on how the roll-out of Future Flight technologies, infrastructure and services is funded. There was a strong consensus that if the roll-out of any systems, infrastructure or services are funded, even if only in part, by taxpayer money, there should be a concerted effort to deploy eVTOL and RAM services in areas with current gaps in transport provision. In this case, these services should also be affordable to everyone i.e. through government subsidies for rural areas. Subsidising tickets for those on low incomes was also suggested, though not widely supported.

"When it comes to taxpayer money being used… a certain portion will have to benefit people socially. So part of it has to be earmarked." – Summit

Drones

There was less concern regarding drones, which participants assumed would be cheaper to run per journey, though participants assumed delivery drones would be run by private companies that would charge more than current deliveries. They were keen to ensure their use for public services would be affordable, due to their potential for delivering medical supplies and use for emergency services, but showed less concern about affordability for private use.

xii. Wildlife: Limiting negative impacts of Future Flight on wildlife must be a priority, avoiding tick-box exercises

There were high levels of consensus that:

- There needs to be more independent research about how Future Flight technology, services and infrastructure impacts wildlife.
- Experts need to be involved in decision-making to ensure that the impact on wildlife is taken into account in the roll-out of Future Flight operations.

- Research and decision-makers should consider:
  - The impact of Future Flight technology, services and infrastructure on wildlife generally, not just collisions.
  - The impact on different types of wildlife, including birds, insects and farm animals.
  - How vehicles being in a lower airspace may impact wildlife.
  - How the Future Flight industry can improve wildlife and biodiversity, not just limit negative impacts.

Mixed views remained on:

- How wildlife should be prioritised alongside other topic areas

Wildlife was a key concern for participants from the start of the dialogue, with questions around whether vehicles would collide with birds, disrupt wildlife and livestock, or have a negative impact on ecosystems more generally. This became more of a concern as participants learnt more about the potential impacts of Future Flight technology and infrastructure on wildlife, and that it is a significant gap in current research efforts. While safety remained a concern, participants worried that considerations around the safety of humans would eclipse a need to consider the safety and protection of wildlife.

Slide from specialist presentation on potential impacts on wildlife in workshop 5.

"The bird population is controlled in a 10-mile radius [around airports] that's quite shocking. Over the last 50 years we've lost 38 million birds. We've damaged the whole ecosystem. The public aren't aware of a lot of these things… light pollution, disruption, circadian noise, collisions. It seems to be that it's always an afterthought." – Workshop 5

Key concerns

Participants felt that with more aircraft in the sky, as well as different types of aircraft in a lower airspace, there would be considerable negative impacts on wildlife. This largely focused on birds and livestock, though over time, participants also became concerned about insects, mammals and biodiversity. The greatest concerns were about:

- Collisions between wildlife and vehicles, particularly the use of drones e.g. for inspecting infrastructure, in rural or remote areas since they operate in a lower airspace and closer to habitats.
- Noise and light pollution affecting behaviours such as migration, nesting and breeding.
- New infrastructure for eVTOLs and RAM i.e. airfields and vertiports (and associated infrastructure like parking and roads/increased traffic) leading to more habitat destruction and wildlife/biodiversity loss, particularly in previously quiet areas.

Mitigations

To mitigate these concerns, participants stressed that different areas would need different approaches for wildlife protection. They agreed that there should be some general limitations on where Future Flight vehicles should be flown in line with protecting wildlife and biodiversity. Specifically, they wanted flight paths to avoid migratory bird routes and areas of high biodiversity such as national parks. Participants agreed that there should be genuine accountability and regulation for the protection of wildlife.

Research and expert input

Overall, there was consensus that more research was needed to better understand the impact of Future Flight technology, services and infrastructure on wildlife and livestock. In particular, participants felt it was important to gain clarity about potential impacts on migration and biodiversity. In line with the principle on research, they felt this research should continue throughout roll-out, to continuously monitor impacts, so that learning could be fed into ongoing development of the technology and of regulation. They felt decisions about how and where Future Flight

services are rolled out should be based on research about the impacts of Future Flight operations on wildlife.

In line with the principle on collaboration, participants also wanted to know that experts (e.g. experts from wildlife NGOs and ecologists) would feed into decision-making on balancing the needs of wildlife and people. Participants agreed that these experts, focused on protecting wildlife, should have more authority overall on these decisions over and above government and industry.

> *"We have to listen to them, the ecologists, are they going to be heavily influential in what's happening? Are they going to cover all the hedgerow to stop birds nesting there? We saw about them culling birds at airports, is that going to happen? Birds, bees, butterflies, lots of insects, all of these contribute, and we need all of them. Ecologists need to be listened to… it shouldn't be yeah yeah whatever." – Summit*

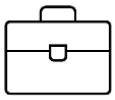
Wildlife alongside other principles

At the summit the principles were considered more holistically, where wildlife (and other topics) had previously been discussed as a single issue. This led to participants voicing a need to balance concern for wildlife with other areas of concern. While still important, there was debate about how much of a priority wildlife should take overall, particularly in relation to safety, emergency response, social inclusion and accessibility. There were also concerns that prioritising wildlife would excessively impact cost and viability. Some stressed the importance of thinking of humans and wildlife together rather than one or the other, and to consider how these technologies might lower the impact of current transport on wildlife by slowly replacing them. For example, in the context of emergency response eVTOLs could be quieter and therefore less disruptive than helicopters.

> *"If we're so focused on wildlife, what other priorities are we ignoring that we haven't thought of yet, in addition to wildlife? Things like vulnerable groups of people and I think that's a big thing to consider as well. There has to be some sort of a balance." – Summit*

For the most part, participants did not discuss wildlife and biodiversity in relation to wider sustainability, which focuses more on the pollution associated with the production and operation of Future Flight technologies, infrastructure and services. However, some raised concerns that if the sustainability claims, for example of lower emissions, of Future

Flight technologies are not realised this will have further negative impacts on wildlife as well as society as a whole.



xiii. Jobs: Future Flight job opportunities must be available in a fair and accessible way

There were high levels of consensus that:

- Future Flight jobs should include entry level jobs.
- Training opportunities should be vocational as well as academic.
- Training should be open to all, with opportunities for those who have lost their jobs due to the introduction of Future Flight technologies and services.
- Diversity should be considered from the start.
- There needs to be ongoing monitoring on whether jobs are created and at what level.
- There should be transparency around salaries and earning potential.
- Training should be funded by a combination of industry and government: industry as they understand their needs and will benefit from profits, government if there is opportunity for social mobility.

Participants initially focused on job losses that could be caused by Future Flight technologies and services. They discussed the potential for those in existing services, like deliveries or manned aircrafts, to lose their jobs due to the introduction of automated versions of these technologies. Some felt there was an opportunity for job creation, while others questioned whether the labour market would be able to keep up with the demand for new skill sets e.g. pilots and engineers. There was a strong feeling, however, that drones replacing physical tasks that put people at risk e.g. accessing offshore wind farms or large infrastructure, would be beneficial as this can reduce risk to human life.

As the dialogue progressed, participants became more interested in job creation and more concerned about how the new roles needed for Future Flight technologies, services and systems would be filled. This was likely influenced by a lack of information available about the scale of potential job losses, and the focus of the specialist presentation being on the jobs that will be needed for Future Flight technologies, services and systems.

Research

Participants felt there needed to be more research into whether these technologies, systems and services will create more jobs overall than losses, and whether it would create as many jobs as, for example, investing in existing public transport. Some participants also discussed the social value of jobs created in Future Flight services, for example, whether investing in more train drivers, rather than eVTOL operators creates more positive impacts because it serves more passengers. This speaks to a broader point that participants wanted to define and weigh up the potential benefits of Future Flight technologies and services with other uses for the same resources, not just the potential negative impacts. This balancing of impacts and benefits was crucial, and needed to be an active and ongoing process, involving evidence and research, not just a blanket policy.

> *"If we subsidise the creation of 10 jobs, but otherwise you could train 10 for the train service… then that serves 200 people in a carriage, so the net social value of these new jobs is less than what you can get with existing infrastructure" – Summit*

Job losses

As the dialogue progressed, participants became less concerned with job losses as they saw the evolution of technologies and types of jobs available as an inevitable part of societal progression. However, some concerns remained in relation to delivery drones where participants felt there would be a significant loss of delivery driving opportunities. While there was no consensus on how to approach issues around job losses, participants saw opportunities for those impacted by this to retrain e.g. in drone operation. Similarly, there was concern around RAM regarding rural connectivity. Participants worried about the displacement of jobs from more traditional forms of transport, but others saw potential for new job creation in rural locations.

Participants felt there should be protections against the impact of job losses caused by Future Flight services, including ensuring there are opportunities for those who lose their jobs to retrain in related roles within Future Flight services and systems. However, others were not convinced that re-training opportunities would be an adequate solution for job loss. Participants also discussed concerns about technology replacing jobs. They felt that jobs – such as having a conductor on board passenger-carrying aircraft with first aid and technical training – need to

be retained if the technologies become autonomous. This speaks to issues of safety as well as job protection.

Job creation

Participants could see job opportunities in the manufacturing and running of Future Flight technology and services, including infrastructure such as airfields and vertiports. Some felt that keeping manufacturing in the UK would support job creation, particularly for RAM due to their bigger size.

It was important to participants that Future Flight manufacturing and services jobs should be created at all levels, including entry-level and vocational positions, rather than just highly qualified STEM roles. They also felt that where these jobs are created is important, with potential to create opportunities in more rural or less affluent areas across the UK.

> *"I'd quite like to see efforts into apprenticeships schemes and school leavers to encourage social mobility so a wider range of people can get into the industry. Make it a more appealing and accessible field to get into. Try to create social mobility and involve people from lower financial backgrounds." – Workshop 6*

Futureproofing

While participants saw the opportunity for developing more jobs for pilots, there were concerns around the impact of the job losses when eVTOLs become autonomous, leaving recently trained pilots out of work. Participants worried about the waste of developing training and services to rapidly hire pilots, only for those opportunities to disappear a few years later.

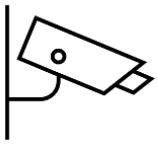
Participants had some concerns about the types of jobs needed in Future Flight industries and services and the potential shortage of skills to fill in a short amount of time. They saw a need for high quality training and qualifications to ensure the safety and smooth running of these new technologies. They felt training should be open to all, with a particular focus on retraining those who have lost their job due to the introduction of the technology. They also suggested that basic technical skills should be included in the school curriculum as a foundation for these new jobs. A less widely held view was that training should be provided only with the aim to replace jobs that are currently dangerous, rather than supporting a push towards significant roll-out.

Training

There was some discussion about who should be providing training. It was generally felt that new players are needed in this space, and that current

airlines are not well placed to offer training on the new technologies given how different they are to current transport and aircraft. In contrast, others felt that existing airlines were in the best position to provide training, updating their current training to include these new technologies that at least resemble what they specialise in. This was particularly true in relation to eVTOLs and RAM.

There was also a lack of consensus on who should be funding training – government, industry or a combination of the two. There was a consensus however that this depends on who will be benefitting from these technologies. If the aim is to create opportunities to access higher quality jobs and enhance social mobility, then participants felt this would be an acceptable use of taxpayer money. Later in the dialogue, discussion on the topic expanded to include jobs that provide more benefits to the wider public, for example, creating jobs within a public transport service that is available to all rather than in a service that is much more exclusive. In turn, participants felt that if Future Flight job creation does not aim to benefit the public, then training should be funded by industry.



xiv. Surveillance: The use of drones for surveillance must be proportionate to the level of the potential threat, with clear guidelines

There were high levels of consensus that:

- Excessive use of drones should be avoided e.g. only used in specific or extreme cases.
- Drone use for surveillance should be authorised through careful processes and independent bodies.
- Regulation should be carried out independently by an organisation that has the power and resource to be effective, actively avoiding 'mission creep'.
- Vulnerable and targeted groups should be taken into account i.e. the risk of police targeting minorities, and how surveillance may impact neurodiverse people.

Mixed views remained on:

- Whether processes for authorising drones for surveillance should be bypassed in emergencies.
- Which uses of drones for surveillance should be authorised.

In response to use cases with drones being used for surveillance, there was strong support for drones being used for wildlife conservation or surveillance of large natural areas. These uses were described as having positive impacts for society by protecting the natural world. In contrast, participants discussed several concerns around surveillance of people.

First, they were worried about individuals being the subject of surveillance, especially if drones were flying overhead and those on the ground were unable to establish what the drone is doing and why. In the context of drones delivering the post and parcels to their homes, participants felt nervous about the possibility of being recorded by drones in their own homes, which they said would feel intrusive and unsettling. They also mentioned drones or other associated technologies being hacked, and worried that data protection would become an issue if the technologies fell into the wrong hands.

The issue of being, or feeling, observed by an unknown operator using a drone is addressed in the principles on transparency and safety. These also address issues of privacy, security and misuse.

The use case of police using drones for surveillance was, from the outset, a particularly contentious issue. Some saw it as a useful tool for the police to gather intelligence and become more effective in tackling crime, whereas others voiced concerns that the police would use the technologies to perpetuate over-surveillance of marginalised communities without justification. Police surveillance is the sole focus on this principle and is explored in more detail below.

Opposing views

Opinions on using Future Flight technologies for surveillance varied strongly across the group, depending on participants' initial levels of trust in the police and government. Some participants had high levels of trust and positive experiences with police, and so felt they had nothing to hide from a trustworthy police force.

> *"It really doesn't bother me because I consider myself to be an upstanding member of society and don't do things I shouldn't do unless it's by accident." – Summit*

Others worried about the police using Future Flight technologies to abuse their powers, citing examples such as curtailing rights to protest and disproportionately surveying disadvantaged areas. Participants also voiced strong concerns about using the technologies to target ethnic and religious minorities. There was some element of demographics to this,

with those from ethnic minorities, younger people and those from Northern Ireland being generally more distrustful of police, though this was not limited to these groups. Police surveillance was a particular concern for those living in Northern Ireland due to past issues around the abuse of police powers.

> *"We live in Northern Ireland, have you not seen the last 40 years of Troubles, it could lead to a lot of abuse of it by the police. There is a tempestuous time in Northern Ireland from March to October that create a lot of animosity between two sides, and I don't think by using this… I don't think surveilling people is going to make people act any differently" – Summit*

Even for those with higher trust in police, there were strong concerns around the use of Future Flight technologies for policing minoritised communities, as participants felt they would be disproportionally surveilled compared to less ethnically diverse or affluent areas.

Changes over time

Fears were somewhat alleviated by specialist input. Participants learnt that police would only use drones in specific circumstances, would have to explain their reasons for use and that the camera-feed would be viewed live by an operator, not recorded. However, mistrust remained for participants on how these assurances could be guaranteed to the public, expressing a strong desire for independent oversight. Reassurances about data collection and storage, and internal processes for justifying using drones for surveillance, also did not alleviate participants' fear that overuse of drones for surveillance could lead to the UK becoming a police state.

> *"If it ends up being used for military or police state reasons or cronyism and not being used for the public good" – Summit*

The public good test

Participants questioned whether drone surveillance would be providing a public good (particularly when thinking through the lens of cost implications) like some of the other use cases for Future Flight technologies e.g. emergency use. Participants felt that the use of drones in policing could be beneficial in some cases but with clear limitations. For example, using drones to help police find missing persons was considered acceptable, and managing large crowds from the perspective of safety, while still contested, was seen as more acceptable than other uses.

"I think we all agree, well mostly, that the use of these should be if a bomb goes off or whatever… send them out to make sure everyone is okay where it's dangerous. But they shouldn't be used to surveil if someone has called and said 'I've seen the neighbour buying weed'… you shouldn't be sending out drones because I'm sure there will be all those types of people. We mostly pretty much agree with everything in principle, it's our red lines that are very specific and where we draw those lines." – Summit

Oversight and regulation

As views diverged strongly on which uses would be acceptable, participants felt there needs to be careful thought on what is an acceptable use of this technology as proportionality feels too open to interpretation. For example, participants discussed what might be considered a human rights violation when it comes to privacy and where the boundaries should be set. There was strong agreement that the police should not be determining this for themselves, and that they should be regulated by an independent body or watchdog, which could offer a less biased view.

"There needs to be something about how misuse and abuse is going to be tackled. It's a bit like who polices the police. who is going to police the use and abuse of drones. It needs to be an independent body." – Workshop 6

Participants wanted strong regulation and oversight to surround the use of drones for surveillance, especially to avoid abuses of power by individual members of police staff, and to avoid scope creep. These should include:

- Requiring drone operators have DBS checks, as they will likely be infringing on people's privacy to some extent and recording personal data.
- Strict guidelines regarding who can access recorded material, with strict privacy permissions in place.
- Rules to maintain the privacy of bystanders, for example blurring people's faces.
- Transparency about when and where drones are being used for surveillance, in a format that is acceptable to all.

As mentioned previously, there was strong consensus around the need for independent regulation. Participants felt this regulator should have

powers to enforce these regulations, with strong consequences for breaking the rules.

> *"There has to be independent regulation for this because if you're leaving the police in charge of the regulation of surveillance, laws can be passed, rules can be made, surveillance can be done. There has to be independence and it has to be properly monitored." – Summit*

Non-police use

Participants did not consider non-police organisations in much depth, as this was an afterthought given their primary focus on police use. They did not explicitly differentiate or discuss private companies delivering surveillance services on behalf of the police, instead focusing on other organisations as entirely separate entities.

There was strong discomfort at the thought of other organisations using this technology for surveillance, particularly private companies due to concerns around them being driven by profit rather than public good. Despite concerns around the police, participants felt they were more likely to be held accountable by the government and independent parties. However, the conversation was dominated by police use, as this is already in place to some extent.

Participants felt that surveillance of people should ideally be limited to police use but if not, then this principle should apply to other organisations (e.g. private security firms, insurance companies) carrying out surveillance of individuals using drones.

Findings part 4: Responsibilities

In workshop 3, participants were asked to consider the kinds of people and organisations they thought would be involved in the regulation, oversight, development and deployment of these technologies, systems, infrastructure and services. After top-of-mind discussions, they were presented with an ecosystem of different key sectors and actors to discuss, including what their roles might be and reflections on the benefits and drawbacks of how different people might be involved.

This ecosystem was revised by the dialogue team in line with their feedback and revisited at the summit, allowing participants to explore which actors should be involved across which principles, use-cases, and points in time. They also explored the level of involvement people should have, from having a say to being fully responsible.

Example of 'actor' cards provided to participants to aid discussions in the Summit.

Overview

There was a high level of consensus that:

- Government should be overseeing the development, roll-out and regulation of Future Flight systems and services, managing the other actors.

- Government should be responsible for ensuring Future Flight technology and services are rolled out for public good, and that appropriate legislation is put in place ahead of roll-out.
- Industry should be developing technology so it meets safety standards and supporting training into Future Flight jobs and careers.
- Independent bodies should be helping to set and enforce regulation, particularly when it comes to safety, noise and ensuring transparency and public good. They should also be responsible for devising flight paths.
- Interest groups should feed into the development of Future Flight technologies and services, supporting the principles of public good, social inclusion and wider accessibility. They should also feed in their expertise and hold government and other actors accountable when they are considering impacts on jobs, noise pollution and visual congestion, and wildlife, and be involved in developing parameters for the use of drones in surveillance of people.
- Research conducted by independent research organisations should feed early on into the development of Future Flight technologies, carrying out research into the safety of the technologies, the impacts on wildlife, and whether Future Flight services adhere to the public good principle.
- The public should have the opportunity to feed into decisions around surveillance, flight paths, noise and jobs, as potential end users and citizens who may be impacted by Future Flight services and systems.

Mixed views remained on:

- The way in which end users should be involved in decision-making, to ensure their views are reflected while limiting the expense.

Initial discussions centred around government, universities, and big business with considerable differences on what roles these actors would have and who would be included:

Government: was largely seen as the key enabler and financial backer of Future Flight systems and services, as well as occasionally the regulator, with a general sense that government backing and funding will ultimately decide how far these technologies or services go in their roll-out across

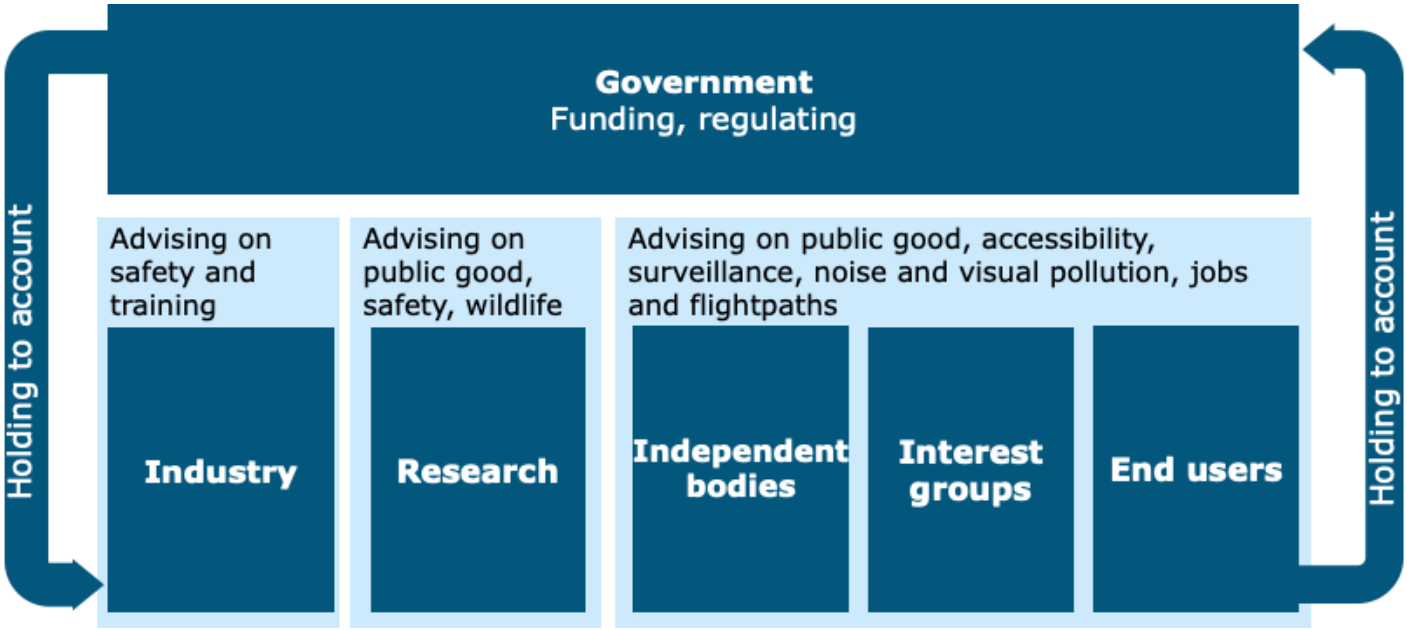
society. There was little trust that government would be able handle this much oversight in a competent way.

Big businesses: with a stake in the outcome, larger businesses were generally expected to be heavily involved in enabling these technologies. Amazon and other logistics companies came up frequently in relation to drones. Other ideas on who would be involved centred around manufacture, for example battery manufacturers and software companies. While they were prompted to consider a range of businesses in terms of scale and type of operation, participants rarely thought about start-ups when discussing industry.

Universities: were often seen as the default institutions that would be conducting research and development. Industry-led research was noted on occasion but was generally seen as less trustworthy given profit-focused incentives. Participants frequently posed questions about who ultimately funds academic research and what their priorities might be, with particular concerns about whether industry could fund and therefore bias findings.

Participants spoke about the different actors in a similar way across principles, rather than identifying clear discrete areas of responsibility. They mapped out an interplay between the different actors. For example, government were seen as the ultimate overseers of the roll-out of this technology. It was widely assumed that government are the only actor with the authority to regulate, fund and propel the project forward, with ultimate responsibility for aspects such as being world leaders and positive economic impacts for the UK. However, participants saw important advisory roles enabling this authority from industry and research, mainly covering aspects such as regulation, safety and technology development because of their technical knowhow and scientific knowledge. While they felt highly suspicious of industry, as they are profit-focused, they did feel they should be feeding into the roll-out to ensure government and industry are aligned. Participants felt that independent actors, particularly the public and interest groups, should also be feeding into government decisions as important advisors on aspects such as social inclusion and accessibility, privacy/surveillance and noise and visual pollution, playing a crucial role of holding government and industry accountable to the public and these principles.

"So maybe a collaboration between government, universities and industry. Industry have the money, and then academia have the research and are able to combine the engineering and the behavioural aspects. And then the government do some funding for research and they're the ones who will put in the regulations." – Summit



Government

There was strong consensus that government should play a pivotal role in Future Flight systems and services, and that they should be involved from the start, and throughout the roll-out. Participants felt that government should be leading on Future Flight systems and have oversight of the broader transport ecosystem, ensuring that different actors are involved at the right moments and in the right ways.

When discussing government, participants often conflated elected representatives and state officials. Local authorities were only occasionally mentioned, as while participants felt they may need to be involved with roll-out, this felt further in the future.

There was a low level of trust in the government's motivations to roll out Future Flight technologies, infrastructure, systems and services – with participants feeling it was for political gain rather than public benefit. There was also low trust in their ability to successfully lead. Participants felt the government had a poor record across the board, but particularly in leading on infrastructure projects such as HS2. Throughout the

dialogue, participants raised concerns about the use of public money to fund the development and roll-out of Future Flight operations, which also tempered their desire for government involvement across the board.

"It's going to have to be industry [funded] because it can't be government, it can't be coming out of my taxes because I'm not going to use it." – Summit

However, after deliberation in the workshops, participants felt that government is more easily held accountable than other actors in this space, particularly industry. As such, participants felt it should come down to the government to decide how, and whether, to move forward with Future Flight technologies, infrastructure, systems and services.

While government was expected to head up much of the development and roll-out, participants felt they should also be involved in the following specific ways.

Public good: participants felt strongly that if government is supporting the development of Future Flight technologies, infrastructure, systems and services, they should be used for public good. Conversely, if the benefits outlined above are realised, then participants saw value in government continuing to support development and roll-out. While there was scepticism about the UK's ability to lead on Future Flight technology and services development and whether the government's intentions are well placed, it would ultimately be the government's responsibility to ensure that Future Flight technologies, infrastructure, systems and services are contributing positively to the economy and more widely. This should be a focus from the beginning, to ensure that the technology is rolled out in ways that benefit UK society as a whole.

"If the Government are funding it then they need to be transparent and give us the reasoning behind it and what the benefits are to the taxpayer" – Summit

Accountability: participants felt that government would be responsible for creating legislation, as well as putting regulatory schemes in place. There was strong consensus that this should be done ahead of roll-out.

"Whether it's oil and gas or HS2 whatever it was, when you are putting the governance together of this project it's about taking all those learnings in...You've got on one side the fundamental research, universities etc who are developing technology, on the other side you've got industry who will only invest when they see

the risk is worth their while, and then you've got the government, who are the main drivers. – Workshop 3

Safety: participants expected government to be working closely with industry, academics and the CAA to research the safety of the technologies, and feed this into regulation. This would then inform industry standards, which in turn, both government and the CAA should be responsible for enforcing.

"You can push some of the training on industry, but they can't be responsible for that alone - because they'll be interacting with infrastructure but they're not responsible for it, because it subsidises you can't take the Government out of anything, they'll always be connected." – Summit

Noise pollution and visual congestion: government was seen as having overall responsibility for noise levels and visual congestion, including where flight paths lie and what times of day technologies can be operated. Participants felt they should ensure research is carried out on the levels of noise and the impact of these on people and wildlife, to feed into regulation.

Resourcing and training: participants wanted government, specifically the Department for Education, to administer education schemes (both technical and graduate). They also expected government to ensure Future Flight opportunities and careers were promoted to students. Ultimately, they wanted government to fund the training and upskilling of staff only if it would support social mobility and improving people's lives. Otherwise, they felt taxpayer money would be spent subsidising industry, with too few benefits for the public.

Industry

Participants tended to think of industry bodies as large, profit-focused businesses, citing established manufacturing and aviation companies such as British Airways, Delta or Rolls-Royce. They felt these organisations had the most money, investment and influence, so would dominate the industry. This shaped how they felt and talked about industry involvement in Future Flight systems. Throughout the workshops, there was strong concern about industry priorities and the sway they may have over the Future Flight ecosystem. Participants had little trust in industry to do the 'right' thing, and felt they were motivated by profits at the expense of other potential benefits of Future Flight services, and regardless of the downsides.

"I trust industry zero percent." – Summit

"Making profits is the industry's main aim. That's their main aim and everything else is secondary." – Summit

However, participants recognised that they still have an important role to play, and that their involvement will be key to ensure roll-out is done appropriately, and that policy is suitable for what the industry is developing.

There was near consensus that this involvement from industry should be tempered by the leadership of other actors, namely government.

"How it's developed comes down to the developers […] A public body can come in and say what are you doing but actually the industry itself is the one that is ultimately responsible." – Summit

Participants felt that industry should have a role, although never the final say, on the following key areas.

Safety: participants expected industry to be heavily involved in upholding safety, across both manufacturing and operation. They felt industry should be involved in developing vehicles and processes that are as safe as possible, as well as having responsibility when things went wrong. They wanted industry to collaborate with government, researchers and the CAA on safety – with these three bodies helping to temper industry's profit-focused interests.

Accountability: participants felt that industry should be responsible for adhering to regulation and should ensure that there are lines of human oversight and accountability, in case things go wrong.

"If they can set their own standards they will do so according to their vested interest. So the safety standards will drop. To actually set the rules, then yes it should be in the industry's interest to follow those rules but not to set those rules." – Summit

Transparency: participants felt industry should commit to being transparent, particularly around safety, and the sustainability and ethics of the supply chain.

Resourcing and training: participants felt industry should be responsible, in part, for training and upskilling the public to take on Future Flight jobs. They felt industry should also be partly responsible for ensuring that job opportunities are available to a diverse group of people,

across types of education and demographics. However, participants did not trust industry to address this alone, as this might not fit their profit-making agenda. They therefore felt government should be involved to ensure training and job opportunities benefit the UK public as much as possible.

Independent bodies

There was a strong consensus that independent bodies should have oversight of the roll-out of Future Flight technologies, systems and services, to ensure oversight with as little bias as possible.

Participants pictured these bodies as regulators, ombudsmen and groups of experts, which they described as unbiased and independent of profit incentives. They wanted these bodies in place to ensure that important aspects of Future Flight technologies and systems, such as safety and sustainability, are properly regulated. This meant that industry should have little involvement, and the bodies should be composed of a broad range of stakeholders. Participants often spoke about 'independence' without fully articulating what that would mean in this context. Independent oversight was generally used as a shorthand solution for tempering the profit-led motives of government and industry.

There was a high level of trust in independent bodies such as the CAA or British Standards Institute, as they were thought to be publicly funded and accountable to the public. Participants placed value on these types of organisations having no agenda when it came to Future Flight systems and felt they would therefore act with the public's best interests. Participants were happy for independent bodies to have final say on different aspects of Future Flight technologies, infrastructure, services and systems. There was also consensus that independent bodies should be responsible for holding industry to account, and consequently should have powers to police and enforce regulation around the use of Future Flight technologies.

> *"I think public interest bodies because I think they would be pivotal in keeping the Government and everyone else transparent…They would also lay out consequences if regulations aren't followed and also make sure that these things are carried out." – Summit*

Participants viewed the CAA as having a key role, either by acting as the independent body itself and/or coordinating other organisations to feed in. Unlike the Department for Transport, the CAA was seen as separate

from the government and any associated political agenda. This focus on the CAA was partly due to the role of the CAA being explained as part of the dialogue, and the resulting familiarity with this body compared to other existing bodies. On the other hand, there were also concerns raised around the CAA's capacity to oversee and regulate what participants saw as a sudden and marked increase in air vehicles. Participants felt it was particularly important for independent bodies to be involved in the following areas.

Public good: participants wanted independent bodies to scrutinise the way in which government interprets public good and works to enable it. They wanted independent bodies to help feed in research and hold government, and to some extent the industry, to account on this principle. However, participants did not detail how these bodies should be involved in practice.

Safety: participants wanted the CAA to continue their work on regulating airspace to maintain the safety of Future Flight technology and services, working closely with government, research and industry to develop regulation. They also thought the CAA, alongside the government, should oversee enforcing these standards. While participants felt that independent bodies should be involved in overseeing the safety of Future Flight manufacture, no existing bodies were explicitly mentioned.

Flight paths: participants felt that as the CAA is currently responsible for flight paths they should remain so, taking Future Flight services into consideration and working with National Air Traffic Services (NATS) to manage air traffic control. They also felt they should be leading consultation with local authorities and end users on where flight paths should go, to ensure that one body has complete oversight.

Noise: some participants wanted the CAA, or other independent bodies, to be involved in developing regulation on noise to ensure that, for example, maximum noise levels are developed with public wellbeing in mind. This was less widespread than the areas participants felt independent bodies should be acting on outlined above. In practice, they pictured the police being in charge of enforcing these regulations on the ground.

Transparency: participants wanted independent bodies focussed on transparency to be involved in the regulation and roll-out of Future Flight technologies, systems and services. They felt it was important to include their scrutiny to ensure that the government is holding industry to account on the principle of transparency e.g. around sustainability.

Interest groups

Interest groups were defined as groups that want to protect their interests, or the interests of groups they represent, during the roll-out of Future Flight services. For example, other airspace users such as helicopter service companies protecting commercial use of unregulated airspace, consumer rights groups or unions protecting public and employee interests, or environmental groups with an interest in protecting wildlife.

Participants recognised that interest groups may be biased on some issues, as they represent the interests of small and specific groups (e.g. hobbyists) rather than the public as a whole. However, they felt it was key to involve them in conversations across the following topics to potentially counteract louder, more powerful and biased voices, such as industry or government.

Public good: participants wanted interest groups to be involved in discussions about the use of Future Flight technologies, to ensure that their views were represented when deciding whether to go ahead with the development and deployment of Future Flight technologies, systems or services, and which use cases to prioritise. For example, they should be feeding in on the sustainability of Future Flight technologies and services compared to other modes of transport and helping measure the public benefits and drawbacks of the technologies. However, participants felt that interest groups should not be ultimately responsible for these decisions, as they felt they wouldn’t consider all aspects of Future Flight services without bias.

Surveillance: there were concerns around the potential for discrimination when using drones for surveillance. Therefore, involving human rights groups to explore the ramifications of surveillance on privacy and human rights was felt to be paramount.

Wildlife: participants wanted environmental groups to be involved from the start, to inform regulation around wildlife and feed into ongoing monitoring of the impacts of Future Flight infrastructure, operation and services. There was a high level of trust in environmental groups, although some felt they needed oversight to ensure that wildlife wouldn’t trump any other concerns or benefits. Livestock was felt to be part of wildlife but separate from the interests of wildlife groups, so farmers were also noted as an important group to be consulted e.g. on flight paths.

Social inclusion and accessibility: participants wanted interest groups that represent people living with disabilities or health conditions and others who may face access barriers to be involved in the design of Future Flight technologies and services.

Jobs: participants felt that unions should help determine how jobs will be impacted, and how to navigate that.

Supply chains: participants felt public interest groups should have a say in whether these technologies, or aspects of them, are ethical and should be used on the basis of their supply chains. Some participants felt an international body should oversee supply chains to monitor exploitation and human rights abuses.

Noise: Participants felt that groups representing those who are more vulnerable to noise (e.g. those who are neurodivergent) should feed into regulation on noise.

Safety: some participants felt that public interest groups should feature here, as safety is a public interest though again this view was not widely supported.

"There's a lot of public interest groups already out there so this is a great opportunity actually to put them in place and put them central. So they'd always be part of the process rather than try and deal with the problems afterwards." – Summit

Research

Participants had a high level of trust in research, particularly academic research, which they saw as independent and unbiased by industry or government. There was strong support for research across many areas that could be impacted by Future Flight technologies, infrastructure, systems or services, particularly wildlife, noise, sustainability and accessibility. Some participants also saw UKRI as important here, supporting the industry to continue developing the technologies.

Public good: participants wanted to see deeper thinking from decision-makers like government about what would constitute a public good, when it comes to Future Flight services and systems. This would include measuring and monitoring over time, to ensure that these benefits were truly being realised. Through this, they felt that independent research could help determine which use cases and aspects of Future Flight technologies and services were worth focussing on and prioritising.

Safety: there was strong support for research to enable safety. Participants had a high level of trust in universities to do the right thing and be unbiased by politics or profits (unlike government and industry). They wanted to see research organisations support government, the CAA and industry to research and test technologies, to help inform safety regulation.

Wildlife: there was consensus around the need for additional research into impacts on wildlife. Participants wanted to know research was being done into how Future Flight technologies, infrastructure or services will impact wildlife throughout roll-out with clear monitoring in place. In contrast, some participants expressed concern that assumptions were being made about the impacts on wildlife, in lieu of research.

UK leadership: participants were excited about the idea of UK research and academia contributing to the development of these technologies and pushing technological advances. They felt that this was one area where the UK could lead, with less concern than the ethics and fairness of operationalising.

"It's research that makes the innovation and creativity, we need that to be world leading." – Summit

End users

End users were described as those who will ultimately drive the development, uptake and eventual scale of Future Flight services by either choosing to use them, or not. This included the public as – at least potential – personal users, companies as business users, and public services such as the NHS who might use the technologies to deliver public services.

However, throughout the workshops, conversations around end users of Future Flight technologies and services often overlapped with discussion of specific communities such as people living with disabilities and farmers, or publics more generally. Despite recognising the role of end users in driving uptake of services, participants generally discussed the public less as potential customers and more as citizens who will be impacted and so should be consulted whether they use the services or not.

"If there's some way to get a group of people together who have nothing to do with anything or no ulterior motives to put something good together" - Summit

There were mixed views on how publics should be involved in the development and roll-out of Future Flight technologies, services and systems. While participants felt including public views is important, they also worried about the potential expense. The following areas are where participants felt public involvement should be prioritised.

Surveillance: participants felt this topic was very challenging and expressed many divergent views. They felt that views from specialists should be considered alongside views from a wide range of the public. Participants felt that a citizens' jury or dialogue approach would work here, when deciding if and how surveillance should be done.

Flight paths, noise and visual pollution: participants wanted the public to feed into where flight paths will be, from a noise and visual congestion perspective. They also felt they should have a say on the times at which Future Flight technologies and services should be used (i.e. with potential cut offs at night) to limit the level of noise pollution. This included the involvement of farmers, who participants weren't sure whether to classify as part of the public population or as an interest group. However, there was a lack of consensus on how the public should be involved in practice. When considering the potential benefits of new services, for example in rural areas with little existing noise or visual congestion, participants could see the difficulty of balancing impacts and benefits. Some referenced NIMBYism as a risk if too much decision making was devolved, leading to benefits being missed. Some suggested local communities and authorities could feed in here, but there were concerns around their neutrality. Ultimately, participants felt the public should feed in, but not have the final say on this, as it would overly limit the roll-out of Future Flight services.

Jobs: participants felt it was important to consult those working in potentially impacted careers so that their views are taken into account when considering job creation and the response to large-scale job losses.

Conclusion

While participants initially had many concerns and reservations about the roll-out of Future Flight technologies and services, through the course of the dialogue they began to see how these could be counterbalanced by valuable opportunities. This was particularly true in terms of improving the environmental sustainability of public transport, delivering services in hard to reach, rural or remote communities, provision of emergency or public services and the accessibility of transport services. Even for use cases they were less supportive of e.g. drone surveillance of people or passenger-services available only to the wealthy, they could see how appropriate safeguards and conditions would make these more acceptable. However, they expressed low trust in the capabilities and commitment of government and industry to realise the potential gains for the UK public.

Participants wanted prestige and profit driven motivations for the development of a Future Flight industry to be tempered by independent bodies acting in line with public interests. They called for decisions to be made by independent bodies, for government and industry to be led by independent research, and for careful consultation with a range of specialists, interest groups and publics. This was particularly important to participants on matters of safety and security; sustainability; protection of wildlife; social inclusion and accessibility; protection from noise pollution and visual congestion; and surveillance.

Participants recognised the challenge they set out with their principles, particularly in terms of measuring and demonstrating 'public good'. In doing so, participants were not just weighing up the potential benefits and negatives of Future Flight technologies and services, but how well any resource spent on Future Flight compares to other uses of the same resource. Using 'public good' as a guiding principle for weighing up the best use of available resource, Future Flight technologies and services would be welcomed by participants if – and only if – investment in this technology would offer something better than investing the same resource in existing transport technologies and services. This could be in terms of sustainability, connectivity and accessibility of public transport in the UK, or use cases which enable the protection of human life.

Given participants' doubts about the feasibility of the ambition set out in the Future Flight Challenge, nervousness about new technologies, and current lack of information about Future Flight technologies, systems and services, there will be value in conducting further public engagement as

the ambition is realised. As technologies and services are rolled out, the scale of operation and potential impacts will become more tangible and better understood. While there is potential for public support and engagement with Future Flight services, clear red lines and limits e.g. increased noise pollution and visual congestion without demonstrable public benefits or improved public transport at the expense of exploiting people in other countries, have emerged through this dialogue. Even with demonstrable 'public good', participants have provided a strong sense that there would be a tipping point, beyond which the number of vehicles in the sky would feel unacceptably negative, regardless of the benefits provided.

Government, industry and independent bodies would therefore benefit from revisiting the issues raised in this report as the roll-out emerges, and to maintain ongoing engagement with specialists, interest groups and publics. This will improve the likelihood of a socially desirable and successful deployment of Future Flight technologies and services. Concerted efforts to address participants' wishes, with transparency and reassurance, would likely help to build public trust and interest in Future Flight services.

Most pressing, is the need to set up and embed independent bodies, regulation, and the means for consultation to be successfully conducted by government.

Appendices

Appendix A: target and actual sample

The below table shows target quotas, the achieved sample that the dialogue began with, and the final sample that the dialogue ended with. The achieved sample included people with all the characteristics the quotas were designed to capture, with some variations in the numbers in each category. In the initial sample, no people from SEG A were included, which is standard practice given the additional level of financial incentive that would be required to involve these groups. There were fewer people from SEG E backgrounds than originally outlined, given work patterns and the length of time they'd need to commit for. People from SEG D backgrounds were better represented in order to balance this out. The combined number of people recruited from rural and semi-rural areas achieved the combined quotas, balancing out confusion about the term 'semi-rural' throughout the recruitment process. The achieved sample was also somewhat low on people unconcerned about the environment, as recruiters noted that participants may have provided answers based on social desirability bias.

The final group who attended the summit comprised 43 participants, with two participants dropping out after workshop 3 and 4 respectively, and 5 participants not attending the summit due to unforeseen circumstances.

Characteristic	Quota	Achieved sample	Final sample
Age		50	43
18-24	Min 8	13	10
25-44	Min 8	17	16
45-64	Min 8	12	11
65+	Min 8	8	6
Gender		50	43
Men	Min 20	23	23
Women	Min 20	25	18
Other		2	2
Ethnicity		50	43

Asian or Asian British	Min 8	7	6
Black, Black British, Caribbean, or African	Min 8	8	7
Mixed or multiple ethnic groups	Min 8	9	7
White	Min 8	26	23
Finance (SEG)		50	43
B	Min 8	8	7
C1	Min 8	16	15
C2	Min 8	10	9
D	Min 8	12	10
E	Min 8	4	2
Financially struggling	Min 10	13	13
Location		50	43
England	Min 5	31	25
Scotland	Min 5	8	8
Wales	Min 5	6	5
Northern Ireland	Min 5	5	5
Location type		50	43
Urban	Min 10	17	13
Suburban	Min 10	12	11
Semi-rural	Min 10	9	8
Rural	Min 10	12	11
LGBTQ+		10	10
Identify as LGBTQ+	Min 5	10	10

Disability and Health		16	15
Physical disability	Min 2	4	3
Sensory disability	Min 2	2	2
Mental health condition	Min 2	2	2
Behavioural / learning disability	Min 2	3	3
Long term health condition	Min 2	5	5
Attitudinal		50	43
Early Adopters	min 10	14	12
Mainstream Consumers	min 10	24	22
Traditionalists	min 10	12	9
Mix of attitudes to the environment		50	43
Concerned	min 10	36	32
Neither concerned nor unconcerned	min 10	8	5
Unconcerned	min 10	6	6

In the first two workshops, participants (who were comfortable identifying as such) were organised into breakout groups that brought together those with characteristics that may lead to being disproportionately or differentially impacted by Future Flight services and technologies. This enabled them to have a shared space to explore issues that mattered most to them, without the potential of being 'drowned out' by the overall direction of the group. For all subsequent workshops participants were mixed, ensuring participants were exposed to different perspectives throughout the process and for disproportionately or differentially impacted groups to feed into the wider discussion. These groupings were:

- Those with less socio-economic power, defined for this dialogue as those who felt pessimistic about their ability to afford day-to-day

essentials. We hypothesised that this group were least likely to have access to new technologies, at least at the initial stages of deployment.
- Those with disabilities and long-term health conditions who may have different physical or social requirements from transport services.
- Those who lived in rural and remote areas, and those who lived in dense urban areas, as we hypothesised these groups would have different perspectives on the potential use cases and impact of Future Flight technologies.

This approach did not lead to findings that were specific to these groups, as their discussions generally aligned with discussions held in other breakout groups.

Appendix B: Detailed approach

The overall format of the dialogue comprised of six 3-hour evening workshops hosted online, followed by an in-person 6-hour summit to conclude the process. This format gave the participants a total of 24 hours deliberation time.

Alongside these workshops all participants were able to engage with each other in an optional online community. This was an online platform which allowed participants to review past materials and presentations, and supplementary materials, as well as take part in discussion boards related to the workshops.

Workshop 1 began with an initial discussion on transport and delivery services. This supported participants to think about Future Flight technologies and services in the context of their current experience of transport or transport related delivery of good and services. Workshops 1 and 2 then provided participants with essential information and example use cases about each of the three Future Flight technologies. These were discussed in turn with a focus on potential opportunities/benefits and potential drawbacks/concerns.

Workshop 3 focused on the people and organisations that would be involved in Future Flight technology and service development. Here participants responded to a set of people and organisations likely to be involved, with discussions around who they would add to the list, and who they would want to be responsible for different aspects of Future Flight systems. Following this, participants were invited to reflect on the topics, opportunities and concerns they'd surfaced so far and to prioritise the

focus of discussions in workshops 4-6 and the topics they wished to hear from different specialist speakers on.

The topics selected for workshops 4 – 6 were:

- Feasibility
- Safety
- Affordability
- Sustainability
- Noise and air pollution
- Wildlife
- Privacy and surveillance
- Impact on jobs
- Social inclusion and accessibility

Participants addressed the prioritised topics in turn, with specialist presentations or panel discussions followed by discussion on what participants wanted to see in place regarding this topic as Future Flight technologies are developed for use within the UK. Facilitators prompted consideration of different technologies, use cases and people. Specialists included a range of representatives from the Innovate UK FFC team, industry, NGOs and charities, and independent researchers from academia and private companies. This ensured a range of perspectives were presented to participants throughout the process. A full list of specialists who presented during the dialogue can be found in Appendix B, and the content from presentations can be found in the Appendix of workshops materials.

The final workshop was an in-person summit, where we asked participants to consider a set of 14 draft principles developed based on their discussions throughout, particularly their discussions in workshops 4 to 6. These principles were discussed, amended and developed, and the conditions/implications were explored in detail through table discussions. This was followed by a free-form activity where participants visited each updated principle to provide their views and give an indication of what they did and didn't support. The remainder of the summit focused largely on how the principles would apply to different use cases, technologies or places, and who should be responsible for different aspects of the principles. This involved revisiting the (revised) people and organisations they discussed in workshop 3. To end the process, participants discussed their hopes and fears for Future Flight services, technologies and systems in the UK. A full set of materials, including discussion guides and stimuli, can be found in the Appendix of workshops materials.

Appendix C: Oversight group members

The table below details members of the oversight group:

Name	Organisation
Gary Cutts	UKRI
Kerissa Khan	UKRI
Professor Lucy Budd	DeMontfort University
James Pardy	Department for Transport
Kay Jones	Civil Aviation Authority
Dr Alexander Carter	University of Birmingham, qualitative Future Flight social researcher
Dr Caroline McCalman	University of Birmingham, qualitative Future Flight social researcher
Dr Alisi Mekatoa	University of Birmingham, qualitative Future Flight social researcher
Dr Christina Demski	Centre for Climate Change and Social Transformations
Ed Weston	Civil Aviation Authority
Corinne Matthews	South-West Local Enterprise Partnership
Tim Murrell	Lancashire Fire & Rescue

Appendix D: Specialist contributions

The following table lists the specialists who contributed during the workshops:

Specialist	Role / Organisation	Topic area covered
Gary Cutts	Director of Future Flight Challenge, UKRI	Safety and feasibility

Vicki Murdie	Future Flight Challenge	Safety and Feasibility
Will Nathan	Head of Public Affairs, Vertical Aerospace	Affordability
Darrell Swanson	Director and Founder, EAMaven	Affordability
Craig Roberts	Head of Drones, PwC	Affordability
Emily Prestwood	Energy Institute, University of Birmingham	Sustainability
Chris Crean	Friends of the Earth	Sustainability
Adrian Clark	National Air Traffic Services	Sustainability
Michael Thornton	Heathrow Strategic group and former Local Authority Planner specialising in transport	Sustainability
David Hiller	ARUP	Noise and visual congestion
Antonio Martinez	Reader in Acoustical Engineering, University of Salford	Noise and visual congestion
Charlotte Clark	Professor in Epidemiology, St George's University of London	Noise and visual congestion
Deborah Lovatt	Aviation Environment Federation	Wildlife

Duncan McDougall	Rolls Royce	Wildlife
Paul Davis	West Midlands Police	Privacy and surveillance
Anna Colom	Public participation and Research Lead, Ada Lovelace	Privacy and Surveillance
Kay Atkin	Coventry University and Motability	Accessibility
Gordon McCullough	Research Institute for Disabled Consumers	Accessibility
Amy Heywood	Innovation Lead, UKRI	Jobs