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Future Flight Challenge – Mini Public Dialogue

A Sciencewise report prepared for the Future Flight Challenge and UK Research and Innovation

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This report contains images of materials created for the dialogue by The Liminal Space.

Ipsos

The Liminal Space

sciencewise

UKRI UK Research and Innovation

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Executive summary

The development of future flight technologies is accelerating, with increased investment and a recognition of the growing potential of the capabilities these technologies could offer. This report outlines the findings of a UKRI and Sciencewise funded mini public dialogue on three different types of future flight technologies for civilian use - drones, advanced air mobility ('air taxis') and regional air mobility ('eco-planes'). 72 members of the UK public were convened to represent a broad cross-section of UK society as a 'mini public' over March – April 2022. The dialogue explored the benefits, disbenefits, risks and potential areas of concern presented by these technologies alongside their related infrastructures, and enabled deliberation on-ground infrastructure and participants' perspectives on what a future 'Skyways Code' for the governance of these technologies could look like. As these technologies are emergent and not yet fully realised, participatory futures techniques and tools, as well as engagement through an online community and Zoom workshops, were used to support participants to think through the future implications of these technologies. The use of participatory futures techniques was supported through the development of innovative and creative stimulus materials created by The Liminal Space.

Cross cutting expectations and concerns

Participants recognised these technologies **had potential and promise** but expressed concerns about issues such as **personal safety, security, collisions, and privacy**; and attached conditions to their use. Many felt that the concerns and negatives outweighed the benefits, although there were some exceptions dependent on purpose, use and context. The exceptions included **emergency and humanitarian use, improving infrastructure in rural, or remote locations**, or improving the **sustainability of public transportation**. Others expressed that there remained considerable uncertainty about how these technologies were likely to evolve, contributing to some ambivalence about their future development. Participants sought and expected **appropriate levels of governance** over the use and development of these technologies, at both central and local government levels, in order to **constrain uncontrolled expansion of commercial uses of future flight technologies**. Participants wanted the introduction of future flight to be **intentionally slowed by regulation and licensing** so that the safety, social impacts, and environmental impacts can be fully observed and monitored during a controlled and cautious introduction.

Social considerations

Accessibility and inequality: Participants highlighted concerns about the **affordability of the technologies** and sought assurances that they would not become a 'luxury' service which displaces investment in existing transport services. They recognised the importance of ensuring the **technologies are affordable and accessible** – as such, they felt that development of future flight technology must avoid creating or worsening inequalities.

Employment, jobs and training: In considering the impact of future flight technologies on job creation, displacement and the development of skills, **participants were optimistic about the balance** of new job options in lieu of job displacement. However, they felt that **investment in relevant skills** would be critical to enabling the emergence of new jobs for a new sector, and that opportunities for skills and development should be **targeted towards those from underprivileged backgrounds and/or those whose jobs have been displaced.**

Privacy: Appropriate restrictions on data and video recordings were seen by participants as important for privacy and data protection, and the nature of future flight technologies themselves raised particular

concerns – for instance, that privacy would be compromised by **intrusive vehicles, busy skies, and video recording on vehicles (particularly in urban areas)**. There was particular concern about the privacy implications of unmanned vehicles being able to access and potentially record personal spaces – with participants highlighting the risk of **potential intrusion into people's private and domestic lives**. As a consequence participants highlighted the importance of **identifying no-fly zones, in addition to clarity about regulation of data gathered, collected and used by future flight technologies**. Other participants also indicated the potential for 'fly-zones', in addition to 'no-fly zones'.

Safety and security considerations

Safety was one of the most immediate and spontaneous concerns raised by participants, who asked how an increased volume and variety of air vehicles could be introduced without **undue risk of harm to people, the environment and animals, and sought regulation and testing to ensure that these technologies were safe**. Beyond the physical impacts of these technologies, the issue of cybersecurity was also raised by the participants. Participants saw **cyber security as a greater or lesser risk depending on the type of future flight vehicle,** and where they might be implemented. Participants saw **automated future flight vehicles as more open to hijacking** than manually controlled vehicles. The potential use cases of drones for freight and maintenance elicited these comments most consistently.

Environmental considerations

Participants recognised that the use of these technologies had **potential to generate sustainability benefits** through the accelerated use of electric vehicles for transportation purposes. However, many balanced this with some pessimism about **the risk of 'greenwashing' and expected regulation and licensing schemes** on how precisely those technologies met environmental criteria before they were approved. It was suggested that operators would need to **demonstrate that their proposed use would be greener than their current method**, **as well as greener than other alternatives such as rail or electric road vehicles**. In general participants sought evidence for any claims that these technologies would benefit the environment, recognising other impacts such as concerns about the **impact of future flight technology and infrastructures on wildlife and biodiversity** as well as on **air and noise pollution** specifically.

Next steps

Participants outlined these key considerations as areas for **future potential research and public engagement**. They felt it would be important to ensure that these potential conflicts, impacts and trade-offs are more fully engaged with from a broader range of perspectives – such as existing transport service operators, farmers, biodiversity specialists, cyber security specialists, public health groups, disability groups and diverse publics. In particular, they felt this was an important next step to help **inform a cautious and measured approach to governance before public investment in these technologies' development is accelerated.**

1 Introduction

Background

The UK is at a key point in technological development for future flight, with Government and industry preparing to enter the 'Third Aviation Revolution'. The potential developments in flight technologies such as drones, advanced air mobility and regional air mobility could have significant effects on everyday life in the UK.

The Future Flight Challenge is a programme aiming to position the UK as a world-leader in the third aviation revolution. It aims to transform how we connect people, transport goods and deliver services in a sustainable way providing socio-economic benefits using new classes of air vehicles with novel technologies.

As of yet, very little discussion has taken place to capture the views and thoughts of the UK public about the implications and opportunities these future flight technologies present. It is particularly beneficial to involve the public in these discussions now, while future flight technology and infrastructure development is still in the early stages, so that findings can shape both policy and technological development.

This project was supported by UK Research and Innovation's Sciencewise[1] programme, which helps to ensure policy and research is informed by the views and aspirations of the public. They commissioned Ipsos UK and The Liminal Space to undertake a mini public dialogue exploring the public's views of future flight technology.

For the purposes of this research, future flight included three categories of vehicle:

- **Drones:** Unpiloted, non-passenger carrying vehicles varying in size

- **Advanced air mobility (often referred to as 'air taxis'):** Electrical vertical take-off and landing vehicles that provide short journeys for up to 10 people

- **Regional air mobility (often referred to as 'eco-planes'):** 10+ person electric, hydrogen or hybrid aircraft providing short-medium range hops between fixed locations

What is a mini public dialogue?

As defined in the Sciencewise Guiding Principles,[2] public dialogue is a process during which members of the public interact with scientists, stakeholders and policy makers to deliberate on issues relevant to future policy and research decisions. This "**mini** dialogue" was carried out at speed and with modified oversight and evaluation arrangements,[3] with the in-principle intention to use the outputs to inform a subsequent larger-scale dialogue. This foundational project begins the process of informing future research, innovation and policy and provides a starting point for future social science and public engagement on this topic.

The project and its impacts are being evaluated by the Sciencewise programme evaluation lead.

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[1] https://sciencewise.org.uk/

[2] https://sciencewise.org.uk/about-sciencewise/our-guiding-principles/

[3] These modified arrangements comprise a light touch evaluation, carried out by the Sciencewise programme evaluation lead, and a three-strong Challenge Board which has been invited to review the final report.

Objectives

This mini dialogue engaged the public through reconvened deliberative workshops and an online community. The overall objective was to inform those stakeholders who are steering the development of technology, including policymakers, regulators, innovators and technologists, as well as researchers, so that the public's hopes and fears can shape their work. This mini dialogue invited participants to consider the potential implications of these technologies, recognising that they are at an early stage in development with a range of potential options for their future use and development. To enable meaningful dialogue and deliberation about the future, Ipsos worked with The Liminal Space to design innovative and creative stimulus materials. These are outlined with some examples in the next section: Participant Journey.

Research questions

The FFC Team (Future Flight Challenge Team - UKRI and Sciencewise), Ipsos and The Liminal Space worked together to define the key research questions that the dialogue aimed to explore:

- What awareness do people already have about future flight? What are the gaps in awareness?

- How do the potential "winners" and "losers" of future flight technology feel about them?

- What drives people's (un)acceptance of future flight technologies?

- How do people imagine future flight becoming part of their everyday lives?

- How should future flight technologies be locally and/or nationally regulated? (*N.B. since regulation is a highly technical subject for an upstream dialogue, we asked participants open questions about what safeguards or controls they would like to see in place, regardless of what regulations are already in place or the feasibility of their suggestions*)

- What do people prioritise for future dialogue, research, and engagement on future flight?

2 Methodology and stimulus materials

Choosing our participants

Our 72 public participants were chosen using a sampling approach that balanced capturing a broad reflection of the UK population with a purposeful approach, focusing on representing the differential benefits and harms which specific groups in the UK might experience as a result of future flight (based on existing evidence). As Figure 1 below illustrates, participants were drawn from across the four nations of the United Kingdom and also with a range of rural areas, towns, and cities.

Figure 1: Regions where the mini-dialogue participants were recruited from
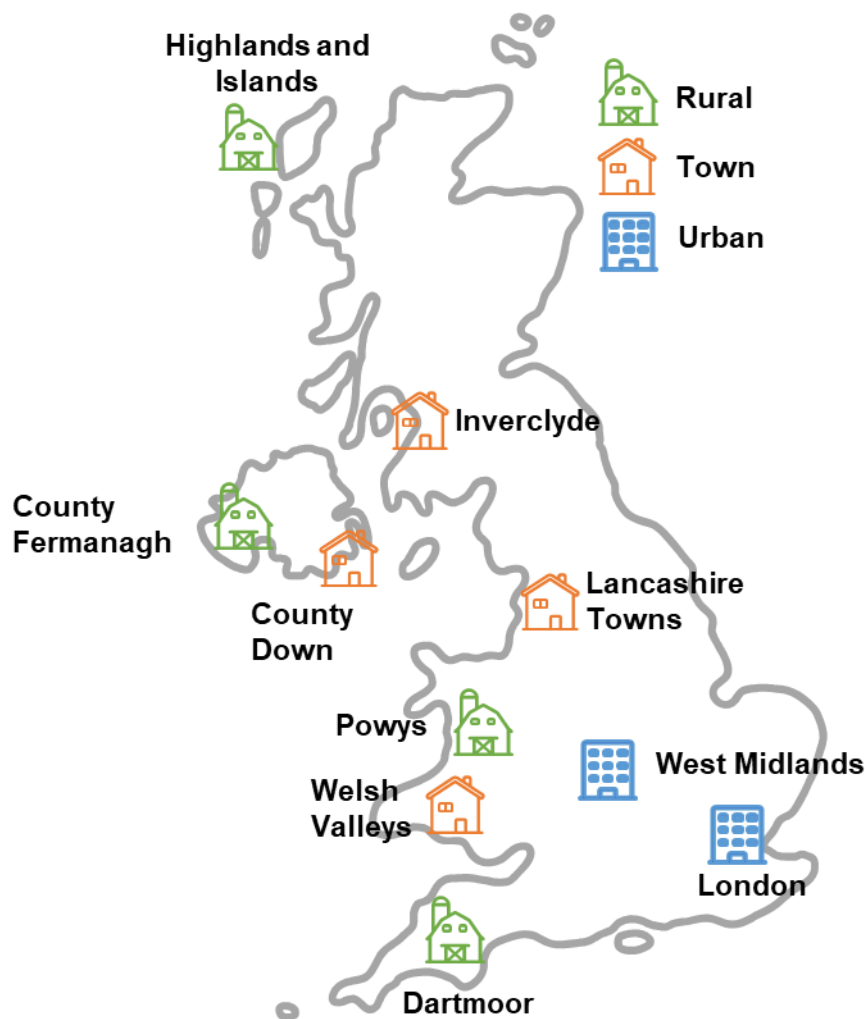
Demographic considerations included:

- Older people fly less and have more concerns about drones, while younger people have greater awareness and knowledge about drones and flying taxis.[4] To capture this diversity of views and lived experiences, the sample aimed for range rather than reflecting the UK's age profile.

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[4] DfT Transport and Technology Public Attitudes Tracker, Wave 7 - https://www.gov.uk/government/publications/transport-and-transport-technology-public-attitudes-tracker

- Low-income groups are less frequent flyers, less aware of drones and flying taxis and believe there are more disadvantages than advantages from drones.[5] Because of this, we skewed our sample towards lower-income households to reflect the potential differential impacts of future flight technologies.

- People from ethnic minority backgrounds are less likely to have access to a motor vehicle and are more concerned about drones being used for surveillance.[6] As a result of this, and the broader literature highlighting systemic racism, the sample increased the ethnic diversity of dialogue participants instead of reflecting the UK's 86% white population

- Since the dialogue explored both local and national regulation of future flight, the quotas sampled for range on both urbanity-rurality and the four nations (to account for devolved governments' decision-making).

For further details, please see the proposed quotas and achieved sample in Appendix A.

Recruitment was conducted by two trusted agencies, including specialist recruiters to reach participants in remote or isolated areas. Participants were renumerated for their time in line with the Sciencewise guiding principles.

Prepaid internet dongles were provided to any participants without access to a stable broadband connection.

Twelve special interest group participants were recruited to take part in **in-depth interviews**. The categories for these participants were chosen with a focus on specialised or specific perspectives that may not have arisen spontaneously in our general public sample. To recruit these participants, we drew on Ipsos' and the FFC Team's own industry contacts with additional participants identified and recruited by our trusted agencies. For further details, please see the proposed quotas and achieved sample in Appendix A.

Participant Journey and stimulus material development

The public participants participated in an initial interactive webinar, two online workshops and an online community. This took place over March and April 2022. The flowchart below outlines the process, with the focus and aim of each stage of fieldwork summarised below.

Figure 2: Flowchart showing the fieldwork process

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[5] DfT Transport and Technology Public Attitudes Tracker, Wave 7 - https://www.gov.uk/government/publications/transport-and-transport-technology-public-attitudes-tracker
[6] DfT Transport and Technology Public Attitudes Tracker, Wave 7 - https://www.gov.uk/government/publications/transport-and-transport-technology-public-attitudes-tracker

Webinar (72 Participants)	Workshop 1 (Rural 24 participants)		
	Workshop 1 (City 25 participants)	Online Community (72 participants)	Workshop 2: (65 participants)
Special interest group interviews (12 participants)	Workshop 1 (Town 23 participants)		
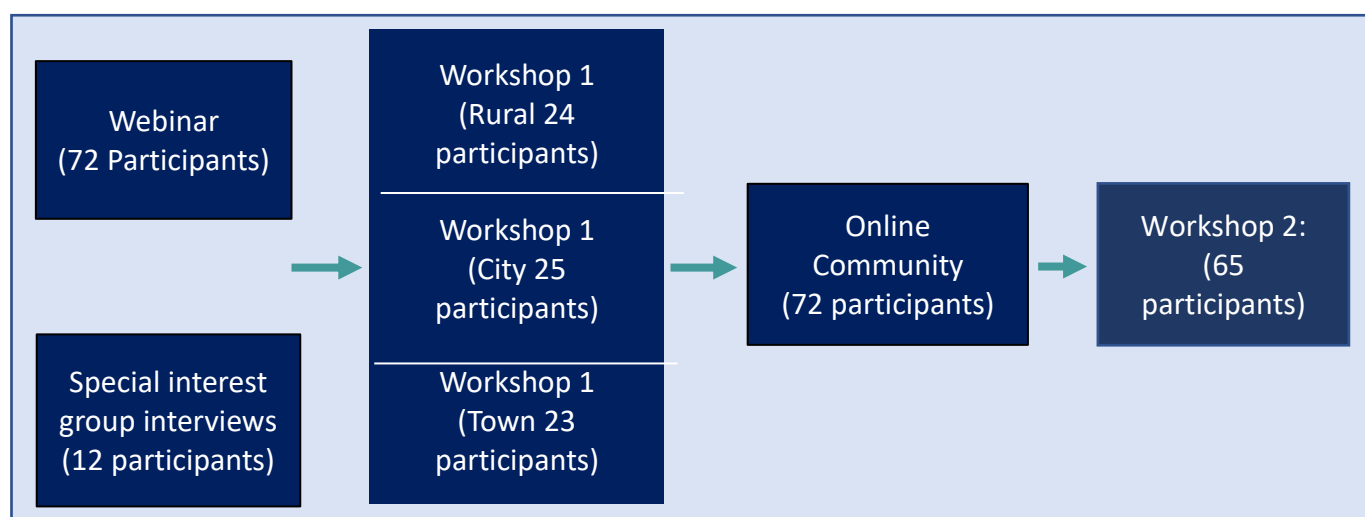
Special interest group interviews

The interviews took place over February and March 2022 with 12 interviewees. The interviewees represented different groups who had some interest in the technology and issues surrounding the future of flight. The interviews were 1 hour long in-depth interviews that took place over MS Teams or telephone. Those interviewed represented or had knowledge or experience of Emergency services, aviation impact, state surveillance, logistics industry, remote NHS user, infrastructure surveyor, humanitarian aid worker, civil liberties specialists, environmental crime officer, recreational air space user and the Police. For the interview topic guide, and more information about the interviewees, please see the Appendices.

The insight gained from these interviews was used to inform the workshop design, outlining some key areas to probe and explore with participants. Clips from these interviews were also used in the online community, so that participants could listen and react to the interviewee's own words and the issues raised in relation to the future of flight.

Webinar

The aim of the Zoom webinar was to get all 72 participants together to bring them up to speed on The Future Flight Challenge. The presentation slides were based on UKRI's Future Flight Vision and Roadmap, with industry specialists from the Future Flight Challenge board briefing the participants on the technologies.[7] The webinar was also interactive, with polls to gauge base awareness, knowledge and attitudes to future flight technologies (using adapted questions from the Transport and Technology Public Attitudes Tracker).[8] . There were also multiple Q&A sessions in which participants could submit questions via the chat box for the specialists to answer live. Though it was not possible to answer every question during the event, all questions and comments were captured and included within the broader analysis.

Our approach to designing the mini-dialogue

While the special interest group interviews and the webinar focused on the present-day looking towards the future, the dialogue workshops and online community were designed to suspend participants' disbelief and immerse them in an imagined future. We used UKRI's Future Flight Vision and Roadmap as a starting point, to ensure we were testing a diverse range of vehicle types and potential use cases. However, The Liminal Space went beyond this to create experiential stimulus materials that might

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

[8] https://www.gov.uk/government/publications/transport-and-transport-technology-public-attitudes-tracker

appear in a real world future (e.g. flying taxi timetables, letters from a local council, radio traffic announcements). These were all either sent to participants through the post, or hosted on the online community (see below). Excerpts from these materials can be found throughout the report, the full materials can be found at The Liminal Space's website[9].

The dialogue discussion guides used by Ipsos' facilitators were designed with a focus on **open questions and user-led conversation**. The participants' own interest determined the order in which the materials were discussed, we used creative drawing and art activities, and facilitators were briefed to enable spontaneous conversation as much as possible, only using prompt questions when it was necessary to ensure that less talkative participants were able to fully engage.

Workshop 1

The first set of online workshops took place on 21st (urban group), 23rd (town group) and 24th (rural group) of March 2022. The aim of Workshop 1 was to create a dialogue around the (un)acceptability of the technologies and participants' hopes and fears. Each workshop was broken down into four breakout rooms with a facilitator to foster manageable and interactive conversation. The workshop activities were supported by stimulus materials designed by The Liminal Space in discussion with Ipsos, Sciencewise and the FFC team. These materials were posted to participants' homes in advance:

▪ **Six items showing potential future uses of future flight technology,** including a Vertiport Brochure & Discount Card proposing new services and infrastructure locally, a council letter discussing a 'sky waste route' for recycling, a leaflet promoting 'Direct Drone Drop, a premium drone delivery service' with different price options for hub drop, street drop and door drop, and a 'Keep our Skies Clear' campaign badge fighting for more no-fly zones. As mentioned above, participants determined the order in which these materials were addressed before providing their spontaneous expectations and fears in response to them. See some examples in Figure 3 below .

**Figure 3: Extracts from three of the stimuli showing potential future use cases**

▪ **'Out of My Window' sticker activity**, which provided three window scenes (rural, town and city) and stickers depicting different types and uses of future flight technology. Participants applied the

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[9] https://www.the-liminal-space.com/future-flight-workshop-toolkit

stickers to the window that best represented where they live (they could choose between urban, town or rural, regardless of which group they were recruited into), to demonstrate how they imagined the future of flight to look in their area. Facilitators told participants that these views could be as empty or as crowded as they wished, and represent either their hopes, their fears, or something in between. Figure 4 shows a blank 'town' window before stickers were added corresponding to the key in the bottom left-hand corner.

Figure 4: Blank 'Out of My Window' sheet, showing a 'town' view
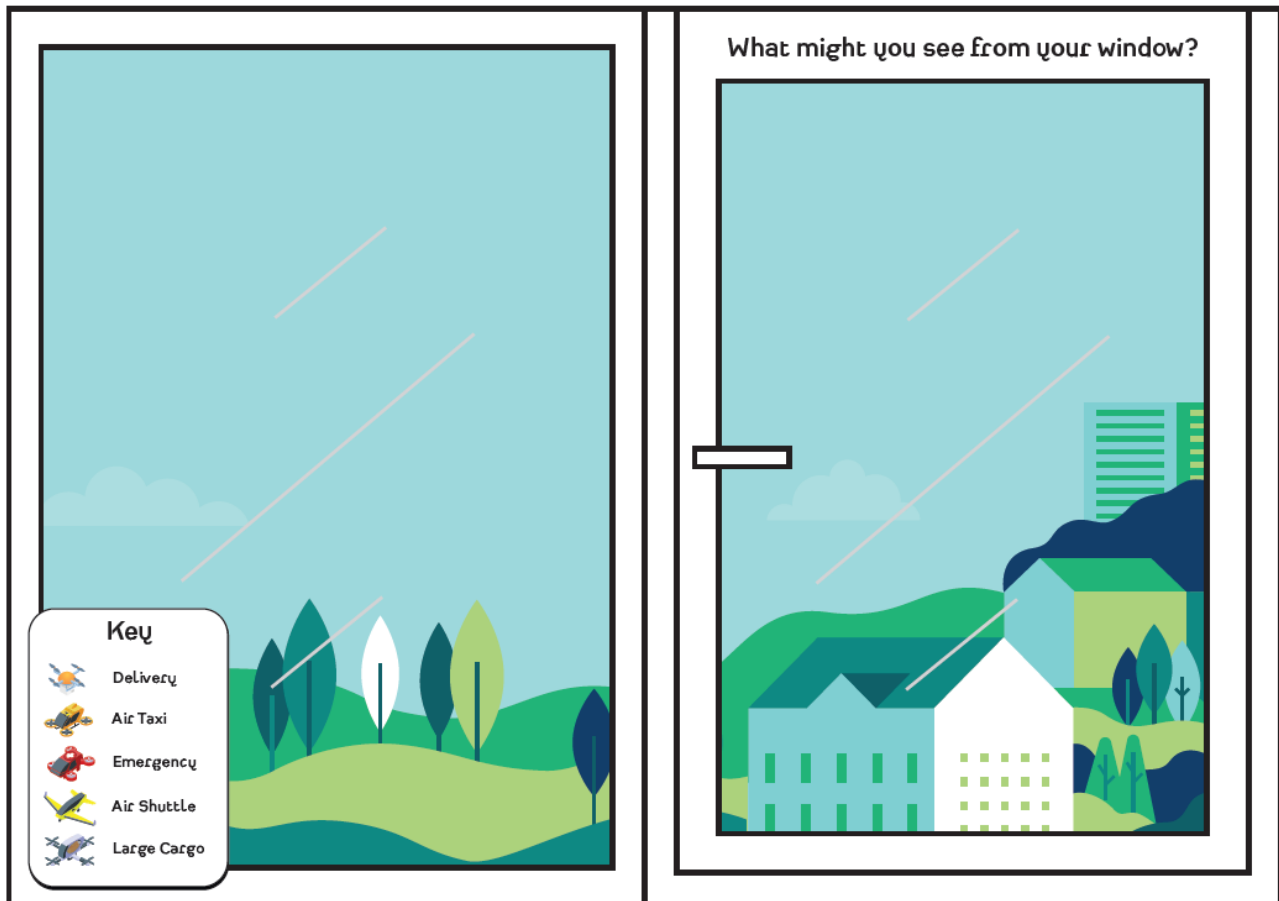
- **Audio-Visual stimulus,** consisting of three videos played to the participants that showed future flight technology assisting after severe flooding, helping to build in remote areas, and a traffic alert about a drone collision with a bridge, that also explained how other drones were assisting access to the site and redirecting traffic. See the scripts for these videos in Appendix C.

Online community

The online community took place between 28th March and 2nd April. Each participant took part in a series of questions or interactive activities to gauge how people imagine future flight becoming part of their everyday lives. The key activities included:

- '**Word on the Street**': A series of audio clips from the special interest interviews, showing a range of perspectives. Participants listened and then posted their responses and were able to interact with each other's posts.

- **'Your Environment' (photo prompts):** Participants had received 'tokens' resembling beer mats, which had a photo challenge on each one. For example, one challenge was 'Show a location in

your life that you think a vertiport could be, or that shows how you feel about them'. Participants uploaded their photos to the online community and added their thoughts.

Figure 5: A few of the 'Your Environment' photo prompt responses uploaded by participants to the online community

- ▪ **'Change of Scenery'** – Carrying on from the 'Out of My Window' activity from Workshop 1, participants used their two remaining window scenes and stickers to show how they imagined future of flight might look in areas different from where they live (rural, town or city). Again, participants were told that these views could be full of air vehicles, have no air vehicles in at all, or anywhere in between. They uploaded their window scenes to the online community and added their thoughts.

Workshop 2

Workshop 2 took place on the 2nd April 2022 with all 65 remaining participants.[10] In this session we asked participants to consider what a future flight system might (or might not) look like, the checks and balances that would be needed at local and national levels, and what they thought the FFC Team should prioritise after the mini-dialogue. Participants were split out into 12 breakout rooms (mixing up both regions and nations of the UK) to allow dialogue and deliberation to take place. Participants interacted with another set of materials created by The Liminal Space to encourage discussion:

- ▪ **A 'Skyways' map, in the style of a game board:** This displayed different cities, towns, islands, rural areas, towns and infrastructure. Participants used stickers to plan routes for future flight on the map and use as a springboard for a discussion into considerations about why a route may or may not happen.

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[10] There was some drop out between workshop 1 and workshop 2.

Figure 6: The Skyways map, used in Workshop 2
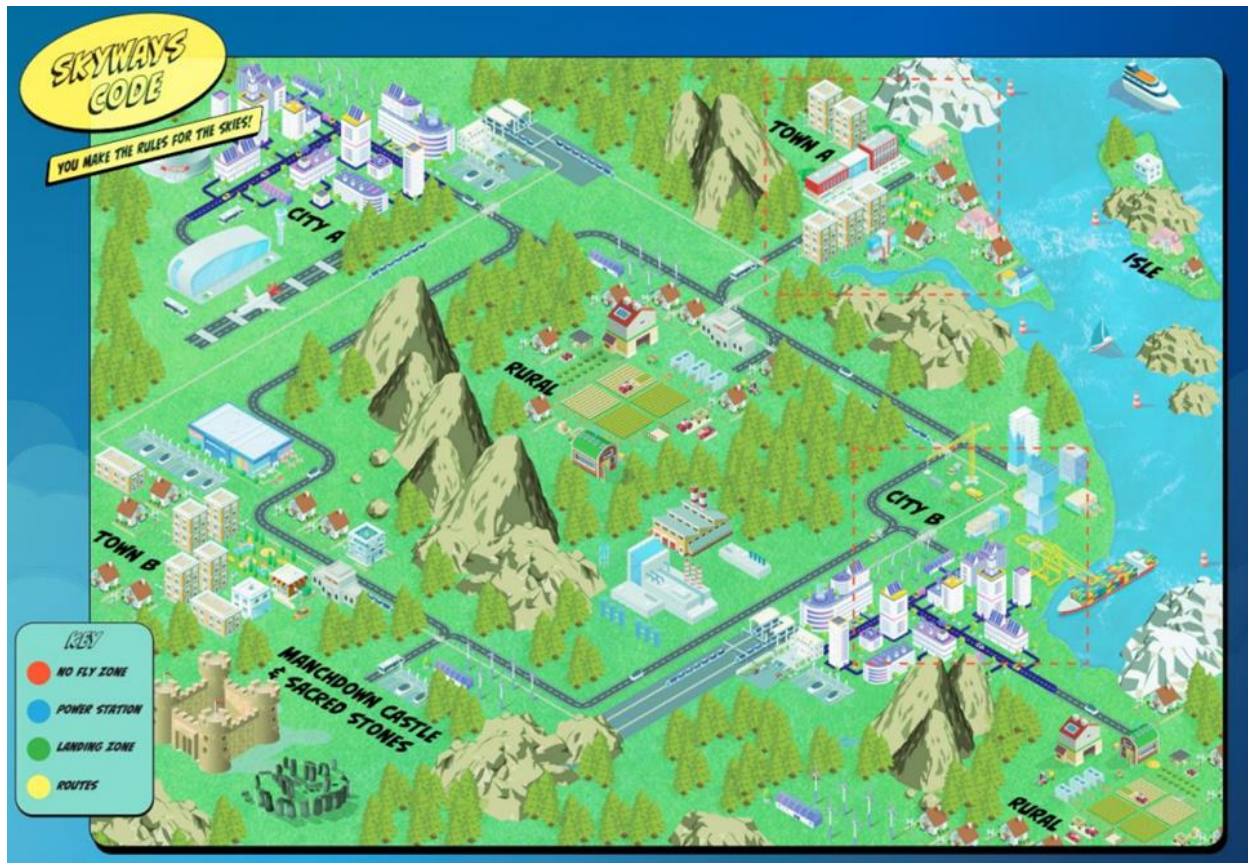
- **Player cards:** these gave participants different perspectives to consider when planning routes. Each participant took on the role of a character for part of the discussion.

Figure 7: Some of the 'Player Cards' used in Workshop 2

- **Wildcards**: Three wildcards prompted participants on different scenarios and how this affected their views on planning, safeguards, and opportunities. They included 'A storm devastates the area', 'A new Skyways training college opens', and 'There has been a Skyways cyber attack'.

- **Skyways code:** Participants worked together to formulate a set of codes that future flight developers, planners and operators should follow. These expressed their 'red-lines' and priorities for the future of flight. Some of these codes are included in boxes throughout this report where relevant. A fuller list of suggested Skyways codes is included in Appendix B.

▪ **Reflections sheet:** Participants shared what the next steps for the Future Flight Challenge should be in four distinct areas: What needs to be researched?, What needs to be resolved?, Who needs to be heard from?, and Who needs to be involved in decision making?

3 Cross-cutting expectations and concerns

This chapter summarises overarching expectations and concerns. It also outlines the cross-cutting 'conditions of acceptability'/red-lines - the conditions that participants felt needed to be met for future flight technologies to be acceptable to them. These themes outline the roles that the public feel that future flight technologies should and should not play in the future.

Key findings include:

• Participants expected future flight technology to be better for the environment than existing travel options and to provide rural areas with more convenient travel

• There were fears over potential air collisions, creating a very busy sky and disturbance

• Participants were very accepting of emergency services utilising these technologies

• They were also accepting of the technology if it led to significant improvements to convenience or connectivity (regional or for isolated communities) and if the environmental benefits were guaranteed through regulation

• There was an appetite for public control over commercial organisations and for central and local governance responsibility for and decision making power over future flight technology

Overall expectations and concerns

Throughout the discussions participants voiced their expectations, hopes and fears for how future flight technology will be applied, and the impacts it may have. During the webinar and Workshop 1, these emerging themes were captured in order to recap with participants in a presentation at the beginning of Workshop 2 (see Figure 8 below).

Figure 8: Hopes and fears arising from Workshop 1, as presented via slides to participants in Workshop 2

Several of the key hopes were based on assumptions, such as future flight causing less air and noise pollution than road vehicles, and that moving some transport and freight to the skies would cause a reduction in road congestion. Not all participants shared these assumptions, with others questioning whether this would be the case.

> **"[I hope] congestion in the sky means less congestion on the road, otherwise what's the advantage?... If it's one or the other then which do you prefer, but if it's both, that's terrible."**
> Workshop 1, rural group

Those in rural and town groups expressed hopes for improvements to everyday convenience (e.g. quicker deliveries) and improving access to isolated areas. Those in cities were less focused on convenience, with participants sometimes clarifying that most cities already tend to have existing convenient delivery and public transport services.

Generally, there were more fears than hopes, with participants feeling more strongly about their fears.

The key reasons for fear were:

▪ Concerns about risk of collisions due to technical malfunction or human error (see Chapter 5)

▪ Safety concerns due to cyber security threats (see Chapter 5)

▪ Concerns that privacy would be impacted by intrusive vehicles, busy skies, and video recording on vehicles (particularly in urban areas) (see Chapter 4)

▪ Concerns that the technology would be a 'free for all', leading to rapid escalation of use cases and too little control and public say (see the 'Appropriate levels of Governance' section, in this chapter).

▪ Concerns about the impact on wildlife (see Chapter 6)

A leading concern was the risk of collisions in the air. Air collisions were seen as more alarming than road collisions due to the risk to people and to property below. Participants were also fearful that the skies would quickly become very busy with a multitude of different future flight services being launched, which would be visually unacceptable, and may also have noise pollution and air-quality implications. Those in cities were more concerned about privacy, assuming that there would be more air traffic and delivery drones in their area, which may record video footage of them or cause more general disruption.

There were high levels of apprehension, with participants describing the concept of the 'third aviation revolution' as 'scary' or like something they see in sci-fi movies, which felt ominous to them. There were participants who felt that this development could lead society to become over reliant on technology and disconnect people from each other and from nature.

> **"My view is that this world is further away from the basics of life. Technology isn't fool proof. I don't see this as a utopia. I see it as a nightmare."**
> Workshop 2

Among those who were apprehensive, there were participants who felt resigned – although they did not like the idea of the development of future flight technology, they saw it as inevitable. With this perception they either felt that they had to tolerate it, or to be positive and look for the benefits. These participants sometimes made comparisons to other significant leaps in technology such as mobile phones and

computers, commenting that when these were first introduced there was apprehension, and most people couldn't imagine how crucial they would become to our current way of life.

> **"I don't want to live in a world with more things in the air however I feel like it's out of our hands and it's happening, so I have to live with it."**
> Online community – 'Change of Scenery' activity

However, despite high levels of apprehension overall, there were participants who felt excited and optimistic about the future of flight. They described it as 'a positive step forward' and expressed that they hoped it would happen in the near future so that they can experience the new possibilities.

> **"I think we're getting there quicker than we think. It is being developed…It will be here before we know it. And that's probably a good thing."**
> Workshop 1, City group

> **"I look forward to the future and hope this is a reality in the new future and that I don't have to wait too long to experience this form of travel. 😊"**
> Online community, 'Change of Scenery' activity

Conditions of acceptability

When discussing how acceptable they find future flight technologies, participants often declared non-negotiable conditions that they viewed as key to justifying this development.

These conditions of acceptability were raised by participants when discussing many different topics, and therefore are consistent themes throughout this report. They are outlined here to emphasise their significance to public acceptability. Following chapters will refer back to this section.

The key 'conditions of acceptability' discussed below are:

- What is a justifiable application of future flight technology (e.g. emergency services, or those that are seen to bring about significant public good) or conversely what isn't a justifiable application

- How environmental benefits will be guaranteed through regulation

- Whether there are less risky and equally beneficial alternatives to future flight

Emergency service use is justified

One of the strongest and most widely held views was that use by the emergency services is the most justifiable reason to use future flight technology. This included ambulances, natural disaster response, terrorism incident response, search and rescue, and providing humanitarian aid (nationally or globally).

It is important to note that many of the participants who felt this way explicitly stated that this use is the ONLY acceptable use of future flight technology. They explained that in an emergency situation the benefits of faster, more agile response clearly outweighed the concern and implications of future flight, whereas they did not feel this way for other applications. Some went further to emphasise that emergency services should only deploy future flight technology in emergency situations or even 'life and death' situations, not as part of delivering everyday services.

> **"Comparing it for someone's convenience to saving someone's life is a big difference. I'm not keen on there being lots in the air but when it comes to emergency services, I support it."**
> Workshop 1, City group

Participants suspected that using future flight for emergencies, given how acceptable this would be, is likely to be how these new technologies are introduced to the public before they are expanded to other applications. There were mixed views on whether this is appropriate or not. Some felt that this was a logical progression as the technology could be tested, improved and gain public trust before being expanded. Others felt that it should not be expanded from emergency use, as it should not be applied for 'unnecessary' purposes.

> **"They're trying to justify drones by doing that, then take a bit of time to normalise them and get them into everyday life."**
> Workshop 1, Rural group

Chapter 4 discusses views on use of future flight technology for emergency services in more detail.

Significant (rather than marginal) convenience and access to benefits is justified

Participants articulated a distinct difference between marginal improvements to convenience (where there are no significant improvements to quality of life), and significant improvements that improve quality of life for members of the public. It was strongly felt that future flight is more acceptable for the latter, and not for marginal improvements.

Some key benefits that were seen as justifiable significant improvements were:

- **Surveying and maintaining infrastructure in risky or remote environments:** Examples such as railways and power lines were used here. Participants referred to recent storms and how many homes had been left without power for days afterwards. They could see clearly that being able to assess damage and possibly repair infrastructure quickly and without putting workers at risk would be a worthwhile application of future flight technology.

- **Connecting island or remote communities:** Participants noted that very isolated areas such as those living on islands or the Scottish Highlands are often lacking the basic connectivity and services that most places in the UK already have. Because of this they said that future flight would be appropriate in these areas to improve transport, access to medication, delivery of goods, and as a way for farmers to sell their products further afield.

> **"I live on an island and the benefits to health care would be significant, as well as availability of medicines & tests. Some islanders faced delays to covid test results because ferries couldn't sail due to Covid within the crew. Drones could resolve that."**
> Online community, 'Word on the Street' activity

- **Regional travel**: While still controversial, there was a strong view that some existing transport links could be improved significantly enough to justify the potential impacts of future flight travel. These tended to be regional trips that were longer distances. Participants spoke about how indirect ground journeys currently take too long because routes are constrained to roads and rail. They gave examples such as having travel by train to London, to catch a second train to their destination with a significant route detour to do so. Therefore, they felt that eco-planes would be justifiable to improve the connectedness of the UK.

> **"One thing that struck me was how restrictive we are with the rail lines. Sometimes I have to travel into London, then get the Tube, then change, then get a train out of London, almost in the direction I've just come…That journey would probably take me an hour and a half. At the moment it would take me 3 and a half hours."**
> Workshop 1, City group

In contrast, participants felt strongly that some of the use cases outlined in the stimulus did not provide enough significant benefit to be a justifiable application of future flight technology. These use cases tended to be where the existing services function well enough as they are, and future flight technology would be likely to duplicate rather than improve services; namely, individual drone delivery services, and short haul 'air-taxi' transport.

Individual delivery drones were not particularly popular amongst participants. While they recognised the benefits of quick deliveries, it was seen as offering only a marginal convenience improvement or being less convenient than existing services such as Amazon Prime.

> **"What difference is it going to make if you had to wait an extra day for a parcel? Just leave things as it is. Keep things safe, and the people in employment."**
> Workshop 2

Participants questioned how practical such a service would be in reality. For example, those who live in high-rise flats would not be able to receive drone deliveries at their front door. Not having a driver within the delivery service was seen as over-complicated, with participants questioning how a drone would problem solve if the recipient was not at home, or if they wanted another person to accept their delivery. They noted that with current services there is no need for the added complication of a passcode or biometric authentication. When posed with the idea of drone 'hub drops', participants thought they were less convenient than existing doorstep delivery services.

Individual drone delivery services were also seen as the most likely to spiral out of control, leading to busy skies and causing logistical and regulatory issues. Participants made many references to Amazon and Deliveroo, commenting how many deliveries for these services are on the streets, and imagining how quickly these services could crowd the skies in highly populated areas.

> **"If Amazon is delivering your packages, we're going to see it everywhere, and it horrifies me…Drones for delivering stuff to the hospital, that's essential stuff, and I agree with that, but not for everyday items. A bottle of shampoo being delivered to your house by a drone, that's not right."**
> Workshop 1, city group

The appropriateness of short haul travel with air taxis was challenged by participants. They were unconvinced by the justification when public transport and taxis already exist. Participants felt that, rather than reducing road congestion significantly, this would simply add congestion to the sky. There was a strong desire to focus on improving and investing on existing ground services, rather than replacing them (See Chapter 4).

Participants frequently spoke against striving for unnecessary levels of convenience and said that this feeds into a harmful culture of overconsumption and expectations of instant gratification. They used words such as 'frivolous', 'unnecessary' and 'over the top' when discussing this type of application of future flight technology.

> **"It's a whole psychology of disconnection...About buying more and getting it delivered more conveniently. We're meant to be buying less, let's foster that and not keep perpetuating and buying into a problem and making it worse."**
> Workshop 1, rural group

Guaranteeing environmental benefits

Participants were supportive of the potential environmental benefits of future flight technology and pleased to hear that vehicles would be powered by electricity or hydrogen (see Chapter 5). However, they were sceptical that this would happen automatically and felt that there were ways that operators and the industry may undermine this key benefit.

> **"It's got to be a benefit and reduce the carbon footprint, otherwise how is it beneficial? Because it doesn't have a zero-carbon footprint, inevitably."**
> Workshop 1, rural group

In some discussions participants referred to 'greenwashing' and 'marketing trying to overcome the realities', emphasising their pessimism that the industry and government would truthfully seek to make environmental improvements through the application of future flight.

Participants wanted regulation and licensing of future flight services to dictate that they must meet environmental criteria before they are approved. It was suggested that operators would have to prove that their proposed use would be greener than their current method, as well as greener than other alternatives such as rail or electric road vehicles. It was also suggested that all operators must have an independently assessed carbon footprint for a new service and take measures to offset this so that the service is carbon neutral at a minimum.

> **"On the justification side, that would be a good part of it; having to prove it was a greener option than an electronic [road] vehicle."**
> Workshop 1, town group

This strong priority was raised throughout discussions. Participants would often caveat unrelated points or preferences with 'as long as it's sustainable', consistently emphasising that the third aviation revolution must build environmental benefits into design, policy and application.

Assessing future flight proposals against all other alternatives

Across potential use cases and benefits, participants often suggested that new uses of future flight technology should be assessed against alternatives for risk, costs and benefits. Participants suggested that the possible future flight benefits of reduced carbon emissions, efficient freight, reduced road congestion and faster travel could all be better delivered by investing in public transport improvements on the ground, moving to electric vehicles for transport and deliveries, or shifting freight to rail. All these alternatives also felt safer, and financially cheaper to implement.

While this did not necessarily mean participants opposed future flight being used to seek these benefits, they wanted to know that the best option would be used. There were some concerns that enthusiasm to bring future flight to market may mean that it is prioritised over safer, cheaper and more effective alternatives.

Appropriate levels of governance

A key concern held by participants was that the introduction of future flight technology would not be well controlled, properly overseen, and too fast. Participants wanted the introduction to future flight to be intentionally slowed by regulation and licensing so that the safety, social impacts, and environmental impacts can be fully observed and monitored during a controlled and cautious introduction.

Public control over commercial organisations

Participants described their fear that large companies such as Uber and Amazon will adopt the technology and escalate its application before policy and research have fully grasped the implications of it, quickly filling the skies with far too many vehicles. They worried that profits will be prioritised over public good and emphasised the need for governance to maintain control over the development of future flight technology.

> **"Just looking at society the way it's gone, very greedy, big companies, it's all going to end up about money. There will be all of these deliveries, the more stickers I put on, the more scared I got, it looks like my worst nightmare. The thought of it is awful."**
> Workshop 1, rural group (in response to the 'Out of the Window' sticker activity)

There were participants who took this further, arguing that future flight services should only be publicly run, rather than commercially run. They made comparisons to Transport for London (TfL) and Uber and suggested that a TfL model would ensure that services were for 'the greater good', supplementing public transport and remaining affordable to most people. They worried that commercial services such as Uber would duplicate existing transport and delivery services and create an impractical and inaccessible second tier of service (see Chapter 5).

There were also concerns that the influences of money and politics could undermine sensible and moral decision making by the government, with participants suggesting that licensing and tendering could favour 'the highest bidder'. These participants felt that this would likely lead to substandard services and risk wasting very large sums of public money.

Central governance

There was a strong feeling amongst participants that a central governance body, specifically tasked with overseeing future flight technology, would be critical to maintain control of its introduction.

Participants suggested that this central governance body include specialists in aviation technology, cyber security, and environmental science. Transparency was also seen as key to ensuring that decisions were made for the public good, and to also build trust with the public that the introduction of this new technology was being managed carefully and sensitively.

> **"There should be an overarching, transparent regulatory board, with cross party, non-political steering with experts so we know who is making the rules and why, and we can have input into the rules."**
> Workshop 2

It was strongly emphasised by participants throughout discussions, that access to this technology should be very tightly regulated. Participants wanted every new route and application of future flight technology to be subject to an approval process by the central governance body. The criteria for this approval process should consider:

- Safety and environmental impact assessments

- Acceptability of the proposed route and frequency (with overall caps on how many vehicles can operate in any single area)

- How necessary or beneficial the proposed application is for the public (with very high thresholds for this)

Local governance:

While there was a clear preference for a strong central governing body, participants also felt that some decisions should be made locally and in the hands of local authorities and communities. For example, participants felt that specific routes, heights and no-fly zones should be informed by the priorities and local knowledge of the community in which they are set.

Participants suggested that public consultations should play a large part in this local decision making, to ensure that changes to the community are open to feedback from those living within it.

Aside from planning considerations, some participants also felt that local councils could manage the tendering of certain local public future flight services. They explained that this would help make sure that the choices made meet the needs of the community and avoid large companies taking over local services and causing the money generated to leave the local economy.

However, if local councils were able to manage tendering for such services, participants emphasised that there must be oversight and transparency to ensure providers meet the centralised national standards, and that public money is spent efficiently and for the benefit of the community.

4 Social and economic considerations

This chapter discusses the themes relating to how future flight technologies may (or may not) change society as well as what participants feel must be protected, avoided or prioritised in mitigating the impact of these technologies on society.

Key findings include:

- Participants desired the technology to address inequality and ensure that the technologies promote accessibility, both from a socio-economic and disabilities perspective

- Ensure that the technologies enable job creation and skills development

- Address the risk of surveillance and protecting privacy and data security

Accessibility and inequality

Participants expressed concern that future flight technologies may unequally benefit different groups in society and emphasised the importance of considering how best to address this inequality. One concern was that the technologies would be too expensive for the majority of the public to benefit – with a socio-economic divide between the "wealthy" who can afford a premium drone delivery service or air-taxis, and the "average people" who could not. Another concern was that the design of the infrastructure for these technologies might be better suited to some types of residential living (for instance, houses), rather than multi-unit living and flats:

> **"There are so many flats compared to houses. How convenient is it for the general public?"**
> Workshop 1, city group

Affordability, ownership and public control

Affordability was also a key consideration, with participants recognising that new technologies often benefited wealthier groups (becoming a *'Rolls Royce service for the wealthy'*) due to the price point of new technologies, and identifying that the cost of air travel would be comparatively expensive compared to the cost of land travel:

> **"If this is going to be useful, it's got to be useful for ordinary people to use it. You don't want it for oligarchs to fly stuff around and the rest of us have to just watch it."**
> Workshop 2

Underpinning some of these concerns were considerations about who would own and control the infrastructure – for instance, some participants expressed fears that future flight technologies might be privatised, with commercial organisations running services in a way that maximises profit at the expense of affordability. These participants felt that genuinely affordable services that contributes to accessible transport would be less profitable, and therefore be less likely to receive investment by commercial organisations. There were also concerns that a shift to air travel may lead to less investment for already underfunded public transport on the ground, resulting in fewer and poorer quality transport options for those who rely on it.

Some also felt that unaffordable private future flight services or ownership of future flight vehicles would be accessible only by the "wealthy" for conspicuous consumption:

> **"It depends if it's run for public service or profit...I dread the idea that people can have private vehicles like this how they use cars, and there will be a status thing, which I'd love to avoid."**
> Workshop 1, rural group

Participants explored how more public benefit (and in turn, increased acceptability of these technologies) could be enabled if future flight technologies are introduced in ways that complement and enhance existing public transport infrastructure, rather than creating a second tier of transport. However, there was also some concern expressed that these technologies may divert resources and investment from existing public service infrastructure, worsening inequalities, rather than improving them.

Other concerns included questions about the design of the technologies themselves – ensuring, for instance, that they were able to accommodate different needs, including the needs of those in a wheelchair, as well as accounting for the impact that the noise of the technologies might have on those who are neurodiverse.

> **"The wheelchair user should be able to use the air shuttle and air taxis as easily as anybody else."**
> Workshop 2

Balanced alongside some of these concerns, however, were hopes that with time, these technologies could become more affordable and therefore much more accessible to the general public, perhaps aided and supported by government subsidies and less reliance of fossil fuels.

Participants also expressed the hope that the development of these technologies could help disabled people in rural areas to be able to develop greater independence and control over their lives, as well as to access critical services and infrastructure such as healthcare, supermarkets and emergency services, particularly in more remote areas.

> **"From my perspective, I wouldn't have to rely on anybody else. It would give me independence and anybody with disabilities independence."**
> Workshop 1, rural group

Suggested Skyways Codes included:

Future flight services should be affordable for people on everyday incomes.

Future flight technology should link to existing infrastructure (rather than replace it) to remain accessible and useful to all

Accessibility for all people including those living with disabilities is essential

Air taxis / transport should be managed centrally and publicly (like TfL for all of London) so that there is no discrimination based on where you live

Employment, jobs, and training

Participants expressed concern about job displacement, some optimism about the potential to create new jobs, but overall, they felt that investment in relevant skills is seen as critical.

Job displacement

A key theme that participants explored was the impact these technologies might have on employment, jobs, training and skills. Whilst participants recognised the potential for new jobs to be created and replace other jobs that may be lost during the move towards future flight technology, they identified that adequate investment in skills and training would be critical to enable this to happen.

Participants expressed concern in particular about the potential loss of jobs for HGV drivers (a consequence of increased traffic in the air and reduced traffic on the roads), and other service workers, for instance refuse collectors. However, they also expressed some hope that adequate government and private sector investment in retraining displaced roles as well as boosting underrepresented communities in roles could help address and offset the impact of displacement, bringing gains in efficiency and productivity

Participants also expressed some mixed views about the potential for the creation of new jobs in the context of construction – with concerns expressed about the role of job displacement for manual construction jobs and a fear of the loss of 'traditional' manual skills where future flight technologies may be used to aid automation.

> **"Taxi drivers, crane operating companies, delivery drivers, Amazon partners - they'd all be negatively impacted."**
> Workshop 1, city group

Impact on productivity and efficiency

However, not all participants expressed concern about job displacement. One participant, who was a farmer, indicated that they would be able to use a drone to monitor their animals, and thus help improve their own business's efficiency and productivity.

> **"You could say that's costing someone a job, but I'm also saving money so it's more money in my pocket."**
> Workshop 1, rural group

More generally, some participants indicated that they felt that future flight technologies may not create as many jobs as those displaced, but might have potential to enable increased efficiency, increased productivity through, for instance, more efficient transportation of goods and people. Others identified and recognised that there might also be indirect benefits – for instance, the installation of vertiports in an area might well ensure that additional revenue, jobs and opportunities could be generated.

Participants also recognised that additional, more flexible transportation options could help address employment inequalities by making additional transport available where it was already infrequent:

> **"I think actually, I can see that working...I've heard stories about people not being able to take jobs, because they can't get to them because the buses don't exist."**
> Workshop 1, rural group

Impact on skills development - 'Skyways College'

Figure 9: The 'Skyways College' Wildcard used in Workshop 2

A NEW SKYWAYS TRAINING COLLEGE OPENS

Over 1000 people a year can get qualifications

Who might attend this, and what will be taught?

As some of the stimulus materials referenced the Skyways College (see Figure 9), this elicited great interest and engagement from the participants. Some participants expressed the hope that initiatives such as these (training centres for skills to help pilot and manufacture future flight technologies) could give more secure employment opportunities in comparison to the precarity of zero-hour contract jobs; retrain people who may otherwise be displaced out of their jobs and generate new jobs for younger generations.

"It will retrain people who might lose their jobs because of new technologies, people can retrain in the industry. It gives new jobs to the youngsters as well who are very technology-aware at the moment."
Workshop 2

Some participants, however, expressed the concern that such an initiative might disproportionately benefit people from wealthier backgrounds, as well as men, potentially reinforcing existing inequalities rather than necessarily directly replacing displaced jobs.

"Those who are fairly well-off would find it appealing and get involved, and folks from poorer backgrounds would be put off. It would be good to reach those groups that aren't normally involved in this kind of thing."
Workshop 2

As a consequence, some participants suggested that admissions to the training and employment opportunities should be prioritised for those whose jobs had been directly impacted or otherwise displaced and should be made free or otherwise subsidised.

Some participants indicated that initiatives such as the Skyways College may be a way for manufacturers and designers of future flight technologies to invest in the development of skills and training, but also generate broader social value and ensure that the adverse risk of job displacement is directly addressed and accounted for. Participants felt strongly that this should not be exclusively funded by the government, but that the technology sector in particular should be expected to invest in such initiatives.

"Aerospace should be paying for it. They've got a vested interest. They want it to take off. They should invest. It shouldn't be the government. If they're going to benefit from it, they should put it back in."
Workshop 2

Suggested Skyways Codes included:

Minimum qualifications must be in place, appropriate for different sectors of future flight (e.g. maintenance, piloting, planning, security)

GSCE's and higher education qualifications should be created to build skill set

Employment in the new sector should have opportunities for all

> There should be intentional outreach to underprivileged communities to ensure accessibility and support to take up new opportunities
>
> People who become unemployed from the change (e.g. drivers) should be prioritised for new opportunities

Future flight as an emergency service

The public safety potential for future flight technology was warmly received by participants, as outlined above in Chapter 3 on Cross-cutting Themes. In this section we explain the motivations behind this preference, and participants' differing views on how this use case might be implemented.

Fundamentally, future flight technologies were perceived as a means of overcoming geographical barriers to get help to those who need it. This was readily apparent to the rural participants, who flagged their existing dependence on helicopter services from as early as the initial webinar. These participants referred to their isolated positions on islands and mountains to explain their optimism about 'quicker', 'cheaper' and less 'bulky' alternatives to helicopters and ground vehicles.

Figure 10: Participant response to the 'Your Environment' photo activity on the online community
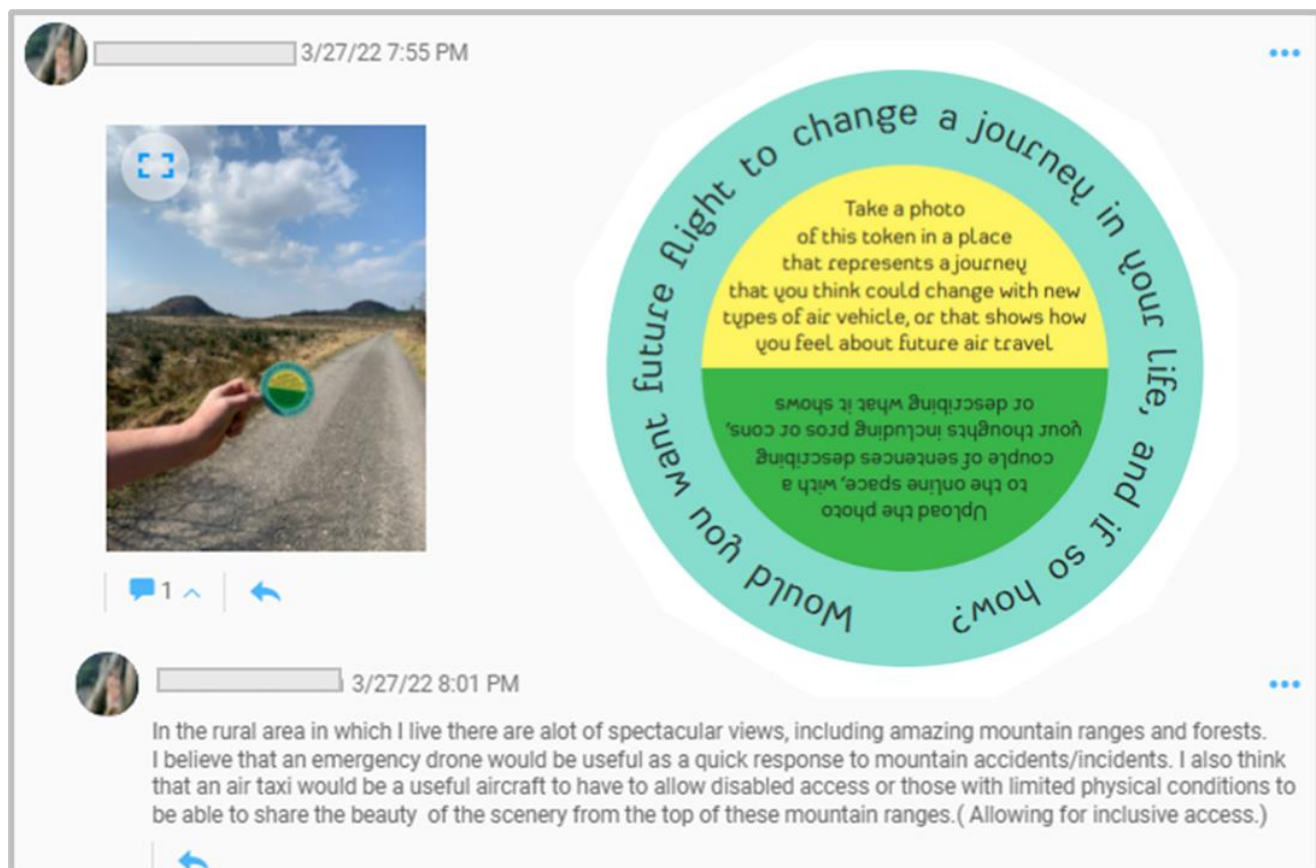
In more built-up areas, on the other hand, participants referred to their experiences of congestion and crowding on the ground to justify the benefits of future flight emergency support.

> **"With policing, it's useful for getting to points of attack. If there was a suspected bomb attack on a civilian area. It'd be a quicker response time than a vehicle trying to get through on the roads."**
> Workshop 2

Inspired by the fictional video news footage stimulus participants discussed the practicalities of what emergency support might look like in the future. They recognised a potential safety benefit to using future flight vehicles to assess the risks of a situation before sending in emergency services personnel. In this respect, there was a greater preference for new air vehicles being used to complement rather than replace existing services, and participants argued that there would always be a need for human judgement. This sentiment was echoed by our interviewees working in these sectors:

> **"You know you're trying to use all of your experience and your training to interpret what the situation is and make the appropriate response and I think in a situation like that, if you have a drone camera, it could be could really take it to the next level of information."**
> Depth interview – emergency responder

A more divisive issue around emergency support was the desired balance between piloted, manually-controlled and automated vehicles. Automated vehicles drew the most suspicion, due to participants' perception that human "quick thinking" and "instinct" remained superior to any algorithmic decision-making processes. In that vein, there was a greater level of comfort with manually-controlled drones as they delivered a satisfactory balance between the safety of emergency responders and the level of control.

> **"If it were in those situations, it would have been operated. You can't have autonomous when there are emergency situations… AI still isn't clever enough to think in those circumstances."**
> Workshop 1, rural group

However, as elaborated above under "cyber security", there was a fear that both automated and remotely-controlled aircraft could be maliciously hijacked. Piloted passenger-carrying vehicles, on the other hand, prompted little concerns as participants considered them as just a more efficient version of an air ambulance helicopter.

Despite the numerous rules suggested by participants elsewhere in this report, there was a strong belief that future flight emergency services should be exempt from restrictions like time of day or height. Additionally, participants often went further to say that this use case should be given priority over others, citing the existing Highway Code rules for blue light vehicles like ambulances, fire engines, and police cars.

> **"I'd hope the emergency drones would be able to go wherever they want…they'd have to go off the beaten track, and not on the current roads."**
> Workshop 2

Suggested Skyways Codes included:

In emergency situations, emergency drones and air ambulance to be exempt from the skyway code, including no-fly zones, pre-set routes, time and noise restrictions

Privacy

Participants recognised that the introduction of some future flight technologies would impact on individual privacy, considering the increased risk of surveillance and increased levels of data collection and use involved. There were concerns that technological advancement would be prioritised over privacy regulations, raised both by participants and by a special interest group interviewee.

> **"You just kind of like hope that it's not a case of regulation being thrown out to make it easier to push forward for the sake of technological advancement."**
> In-depth interview, State surveillance campaigner

The risk of intrusion for both private and public spaces

There was particular concern about the privacy implications of unmanned vehicles being able to access and potentially record personal spaces – with participants highlighting the risk of potential intrusion in people's private and domestic lives. These concerns were stronger for those who lived in cities, where private spaces are closer together and future flight routes and infrastructure may be close to or above homes. Participants discussed the issues with the risk of drones and vehicles in flight being able to gather data and information through people's windows, for instance.

> **"I believe residents would not be happy with it and there will be campaigns against this as it does affect privacy etc. I would not feel too comfortable, a drone might be going past our window and could record what is inside, this is invasion of my privacy."**
> Online Community ('Change of Scenery' activity)

However, some participants recognised that these could be designed to address privacy concerns.

> **"It would require quite sophisticated programming, but I don't think it's impossible. Drones delivering post could go straight to people's front doors rather than hovering around bedroom windows."**
> Workshop 2

Beyond the immediate vicinity of the home, participants identified the potential broader safeguarding implications for the use of future flight technologies and data collection for areas such as schools. They suggested geofencing drones away from schools or having 'no photography' rules around schools.

Ensuring adequate regulation of data collection and use

Participants identified that it would be necessary to consider the risk of increased data collection, use of audio and video recording, and develop appropriate restrictions and boundaries for the use of data and video recordings, accordingly.

> **"When a drone comes in to play there's a lot more exposure in terms of GDPR. If there is a live recording, where does it go? When the drone comes to deliver the package, what will they see of me?"**
> Workshop 1, city group

Given the sensitivities of the gathering and use of data generated from these different contexts, participants expressed their views that there should be strict regulations on access to data and how it is enabled, developed and managed. Ensuring adequate data protection rules are in place was emphasised throughout. In this context, the use case of delivery drones in particular (in comparison to passenger carrying flying taxis) generated particular concern – predominantly because of the lack of clarity about what data is being gathered, where/how it is being stored, as well as how it is being used.

Transparency about data collection and privacy enhancing design

Whilst participants did express some concern about malicious misuse (for more on this, see Chapter 5), they also recognised the significant risk of unintentional or otherwise accidental loss, or misuse of data. Particular types of data were considered higher risk – for instance, the stimulus materials prompted participants on biometric data authentication, and some participants responded and engaged with that,

expressing their concerns about ensuring adequate data control over what is sensitive, uniquely identifying individual data.

> **"If every little bit of data is kept in a data stream somewhere, that can be abused by someone at some point."**
> Workshop 1, town group

Given the sensitivities of the types of data likely to be collected, participants placed a strong emphasis on transparency about how the data is collected, as well as privacy enhancing and sensitive design of these technologies. They also suggested that training and skills development on ethics, privacy and data security should be key components of the 'Skyway College' offer. Participants also proposed that entrants to 'Skyways College' should be vetted to ensure they do not misuse the technology to infringe on people's privacy. On balance, some participants made the distinction between what they saw as the intrusive nature of current 'hobbyist' drone usage and indicated that there was potential for well-governed future flight technologies to be developed in less intrusive, and more privacy enhancing ways than is currently the case.

Suggested Skyways Codes included:

No-fly zones near residential areas and schools for privacy and safety reasons

Any cameras used purely for navigation, not allowed to film / record

Delete recordings when successful trip/service has been confirmed, and recording no longer necessary

Data / info collection and storage must abide by GDPR or similar framework

5 Safety and security considerations

This chapter details the concerns that participants had about safety and security risks posed by future flight technologies, what safeguarding they expect to be in place to address these, and what the public may need to know to feel confident in the safety of new types of light technology.

Key findings include:

- Mechanical accidents, human error, and cyber security risks were all prominent concerns for participants

- Participants feared 'crowded skies' and made suggestions about airspace heights, segregation, zoning and corridors to keep skies 'clear'

- Participants felt these concerns could be addressed with maintenance, training, and campaigns for building public trust

Mechanical and human error

Safety was one of the most immediate and spontaneous concerns raised by participants, with comments and questions in the initial webinar asking how an increased volume and variety of air vehicles could be introduced without undue risk.

> **"People can't even use the Highway Code, let alone drive safely in the skies!"**
> Webinar chat comment

Once participants started discussing the issues in break out groups, a range of views emerged. While some believed that air travel was generally safer than road travel (citing statistics they had heard), others argued that this was only the case since the UK's airspace is currently sparsely populated and tightly controlled. Learning the larger size and heavier weight of commercial drones (and that some future air vehicles may be powered by hydrogen) prompted worry about potential crashes and freight falling off them onto the ground.

> **"We think of a drone like a toy and if it crashes it's funny. If it's carrying a one ton payload that would be different."**
> Workshop 1, rural group

Though this was a specific issue regarding freight drones in densely populated areas, this formed part of a broader discussion about the relative risks of mechanical and human error. Some believed that the automated or remotely-piloted vehicles were at risk of malfunction (e.g. GPS failing) or hacking (see "cyber security" below) because there was no human present to manually remedy the situation. However, other participants saw the human pilot as the riskiest part of the equation due to inadequate training or health concerns. To make this point, they cited examples of air crashes they had heard about in news media and road accidents due to driving while under the influence of alcohol or drugs.

> **Participant 1: "My brother is a pilot and he spent years learning to fly. I'd trust a human's hands in a cockpit over a drone." …**
> **Participant 2: "A lot of air disasters have been down to the pilots, like the German one in the mountains or the one in the Philippines."**
> Workshop 2

Regardless of how new air vehicles might be guided, participants highlighted the potential safety risks of flying in adverse weather. This issue arose spontaneously among rural participants from island or mountainous regions. For most groups, however, this topic came up in response to the audio-visual stimulus about emergency services responding to a major flood. Though this use case was widely supported (see 'Future flight as an emergency service' below), participants did raise concerns that new air vehicles may be more vulnerable to adverse weather than existing air or ground vehicles.

> **"Flying a plane in poor weather is sketchy, so something lighter like a drone might get blown away or crash into the water."**
> Workshop 1, town group

Suggested Skyways Codes included:

All aircraft and pilots should be fully licensed and strictly regulated

Operators must take regular breaks and be limited for how long they can fly for

Disaster plans must be in place if things go wrong e.g. a drone falls out of the sky

Unmanned vehicles must be constantly monitored by humans

Vehicles must be a sufficient charge level to take off

Weather must be taken into account when planning and vehicles cannot fly in certain conditions

Cyber security

Beyond accidents, participants also expressed fears of intentional damage done to, or caused by, future flight technologies. The saboteurs in these hypothetical scenarios (referred to variously as 'terrorists', 'hackers' and 'protestors'), were imagined crashing air vehicles against each other or into ground infrastructure. In comparison to the small electric recreational drones that participants had experienced already, the inclusion of hydrogen power (perceived as particularly flammable) and larger payloads exacerbated their worries. These fears were voiced from the initial webinar up until the end of the second workshop, with references made to drones' previous military applications, the 9/11 attacks, the Manchester Bombing and incidents during The Troubles in Northern Ireland.

> **"Being from Northern Ireland, we had years of getting bombed. We don't want an easier way of terrorists to do things. It's a bit scary."**
> Workshop 1, rural group

It is worth noting, however, that participants saw cyber security as a greater or lesser risk depending on the type of future flight vehicle, and where they might be implemented.

Participants saw automated future flight vehicles as more open to hijacking than manually controlled vehicles. The potential use cases of drones for freight and maintenance elicited these comments most consistently, though participants did also express concerns around the future automation of flying taxis.

> **"I would rather a pilot, a human being able to see what's around them. Although humans make errors… look at how many people get hacked on banking. I don't see as many issues as with pilots flying a plane."**
> Workshop 1, city group

Figure 11: Workshop 1 stimulus for 'Air ride' service, promoting autonomous rides coming soon
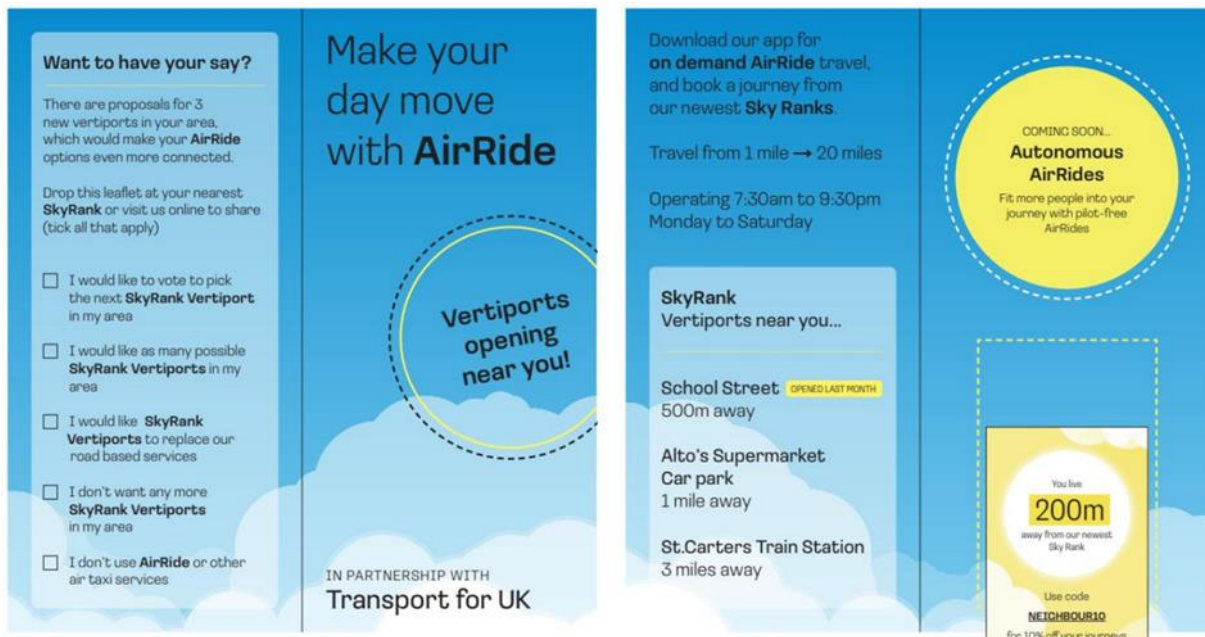
Beyond potential physical damage, the stimulus material's reference to 'optical scanning' technology (see Figure 2 in Chapter 1) for verifying deliveries raised alarm in participants that these 'hackers' might steal their personal data (see 'Privacy' in Chapter 3 above).

To guard against these threats, participants suggested safeguards referred to variously as 'overrides', 'kill switches' or 'fail safes' – in all cases it was important that human input could be prioritised if needed.

> **"There has to be fail safes in the technology, nothing is fool proof…the software has to have fail safe human intervention."**
> Workshop 2

Areas with high population density, according to participants, were at greater risk of cyber attacks involving future flight vehicles (referring again to the geographical pattern of previous terrorist attacks). While participants from cities highlighted this earlier on in the process, during Workshop 1, those from more rural areas tended not to consider this until being more directly prompted by the 'Cyber Attack' Wildcard.

As participants marked potential 'fly'/'no-fly' zones during the 'map game' exercise, they prioritised routing future flight routes away from densely populated areas and key infrastructure.

In relation to public governance (Chapter 2, above), participants believed that in order to bring about the above safeguards, there would need to be a proactive and concerted effort made by operators, government agencies and regulators.

> **"[There should be] cyber security devoted to regulating the drones skyways community. Similar to what airlines have with the current regulators. A new branch of GCHQ guarding them."**
> Workshop 2

Suggested Skyway Codes included:

Geo-fencing/remote fail safes must be in place and tested for high-risk areas such as: high density residential areas; infrastructure targets such as airports, power stations, petrol stations; civil buildings such as government buildings, hospitals, schools

All future flight vehicles must be grounded upon warning of a cyber-attack

Invest properly in staying ahead on cybersecurity. Develop new fit-for-purpose cybersecurity systems rather than piecemeal improvements

Actively monitor and protect against potential threats

Clear and crowded skies

Another recurrent fear described by participants was that the skies above their heads would become too busy. Though this concern appeared early on in the participant journey, it came to the fore particularly during the 'View out your window' exercise and the subsequent 'Change of scenery' exercise on the online community which asked participants to imagine what areas more urban or rural than their own might look like with (or without) future flight vehicles. Participants across all regions saw urban areas as at particular risk of "crowded skies" and that the safety levels might resemble crowded roads.

> **"In the city location, I foresee a huge congestion issue, and thereby an equally huge safety issue, with the need for the variety of vehicles requiring the ability to take off and land in the same built up airspace."**
> Online community – 'A change of scenery' activity

Figure 12: Accompanying photo to the quote above, uploaded by participant to the online community.
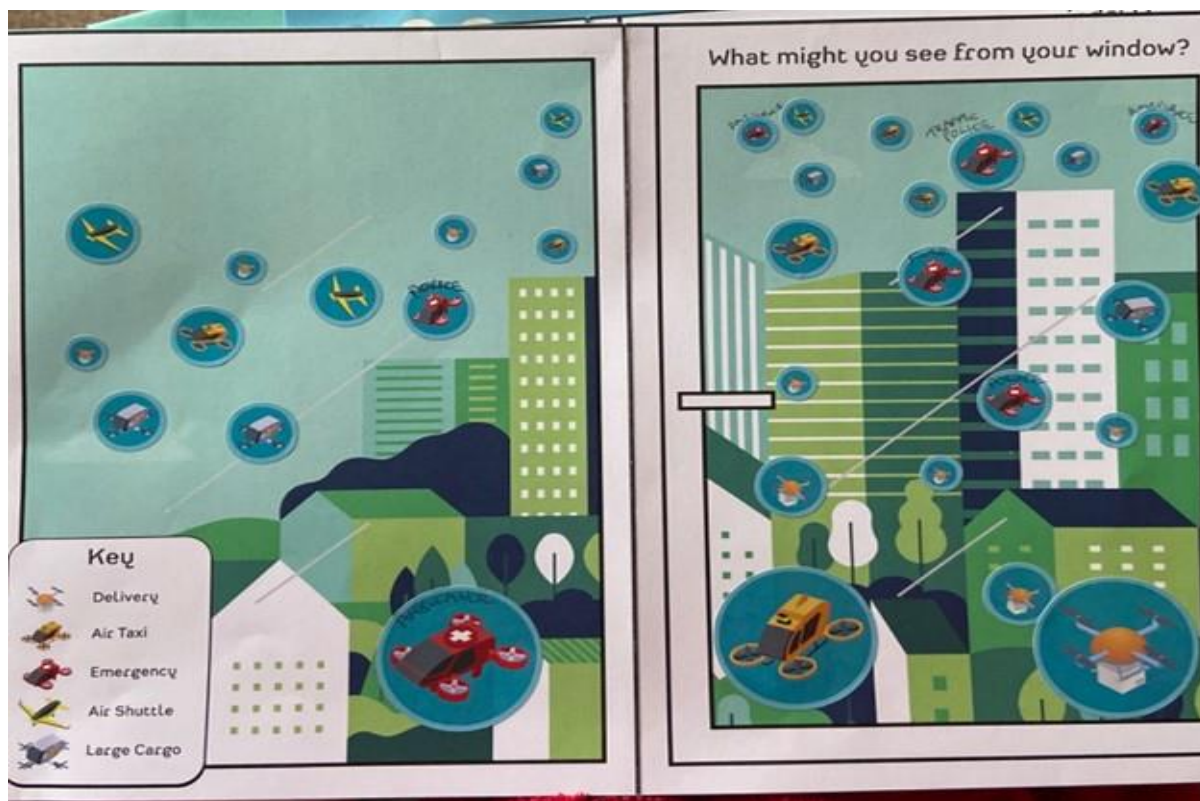
Though there was some discussion about high level airspace, participants considered that this was already well controlled compared to low-level airspace, a view shared by our depth interviewee from an aviation impact NGO.

> **"I think we're going to have to think about how that lower level airspace is managed and how the safety standards are adhered to, so I think that's potentially a lot of work still for the Civil Aviation Authority."**
> Depth interview – aviation impacts NGO

A common suggested solution to this was clear airspace segregation, both laterally and vertically. Laterally, participants imagined the different types of vehicles and use cases as incompatible due to the aforementioned debate around mechanical and human error.

> **"I think all drones should take different flight paths. Where one is a no-fly zone for air taxis, there is a fly zone for drones and vice versa. That way it will avoid any incidents."**
> Workshop 2

For similar reasons, participants often suggested that routes follow existing corridors or the sea to avoid densely populated residential areas and infrastructure like power stations, airports and hospitals. Though the mapping exercise prompted participants to mark 'no-fly zones', some subverted this and suggested that 'fly zones' should be the exception to the rule in order to protect public safety (in addition to impacts referred to in other chapters of this report).

Vertically, participants felt much the same way. On the online community, we asked participants to 'Guess the height' of existing air vehicles, ground infrastructure, and birds, then suggest how high they felt drones, flying taxis and eco-planes should fly. Participants' exact height suggestions varied, but the patterns were often similar with the higher number of passengers correlated with the height in the sky - drones at the lowest level, followed by flying taxis and then eco-planes.

> **"Drones should be above the level that birds fly to reduce any collision impacts and for safety. The flying taxis should be further up at 2500-5000 and eco-planes above 6000."**
> Online community – 'Guess the height' exercise

Suggested Skyways Codes included:

Limits on number of vehicles in one area/route to avoid congested skies, reducing impact on urban areas where demand is likely to be high, and retaining rural areas character

Every new route must seek permission, approved before leaves ground. Using geofencing to control. 'Fly zones' rather than 'No-fly zones'

Different routes for different vehicles, for example Large Cargo should not fly over built-up areas

Maximum and minimum heights to avoid interference with other aircraft and ground infrastructure. Height restrictions to be specified by vehicle type and measured from ground level

Maintenance, training and public trust

To address many of the potential issues described above, participants suggested a variety of checks and balances for both the new air vehicles and those who might be in charge of them. For the vehicles, participants once again made a parallel with road vehicles with suggestions of an equivalent to MOTs.

"They have to be inspected regularly and be fit to fly. That'll be under the governing body's remit, but it's an important aspect of it. We know how many lorries potentially have faults that shouldn't be there."
Workshop 2

Similarly, participants suggested that future flight staff (pilots and ground support) would need to be well trained in all sides of safety management in addition to testing their eyesight, cognitive ability, psychological state of mind, and alcohol or drug usage. This theme came out particularly in response to the 'Skyways Training College' wildcard. Though drones' association with the military was considered negatively in the initial webinar when considering international conflict, this wildcard allowed some participants to consider how civil aviation could benefit from the military's knowledge of flying safely and securely.

"I think a lot of the military guys [should teach at the Skyways College]. Ex air force for example, people with real knowledge of the sky. You wouldn't send a novice to teach a novice."
Workshop 2

Participants also thought that the public would only perceive these new air vehicles as safe if they believe them to be safe, based on what they have seen or heard about them. As a result, they thought that there should be investment in public messaging so that everyone knows what these vehicles are and who is in control of them, in addition to a clear governance structure with accountability (see Chapter 3).

"As people become more familiar with the idea and many tests have been carried out, they will begin to feel safer and reassured which would mean they will also be more open to the idea of flight technologies."
Online community – 'Word on the Street' activity

Suggested Skyways Codes included:

There should be a governing body that controls future fight (licensing, ensures compliance with rules, policing, 'drone MOT', pilot training and keeping up to date)

Clear messaging to public that all vehicles have been tested (and transparency about the testing process)

Regulation must be transparent, so the public know how they are kept safe

Strict testing and maintenance rules that include inspections of vehicles to pass an MOT style test and pilot fit to fly check

Bystanders must be able to visually identify what type of vehicle/operator is near them

There must be accountability if an accident occurs

6 Environmental considerations

This chapter lays out the expectations participants have for environmental protection and benefits that should be planned into the future of flight.

Key findings include:

• Participants had concerns about the impact of future flight technology, both on wildlife and on human's enjoyment of areas of natural beauty

• There were demands for these impacts to be monitored and responded to if needed

• Participants had optimism about the potential for future flight to reduce emissions, but some pessimism about how realistic this would be in practice

• Participants wanted evidence that the technology was going to improve the environment

Biodiversity and natural habitats

Concerns about wildlife and animals were raised spontaneously in the initial webinar.

> **"How will this function, harmoniously, with wildlife and birds' habitats?"**
> Webinar chat comment

As the dialogue progressed, so did the realisation among participants that the introduction of these new aircrafts will interfere with the natural world – which is already impacted by humans.

Some participants voiced the assumption that regulation would mean that aircrafts would *not* be flying over animals and livestock, or at the very least wildlife should be a key consideration when planning future flight regulation. Many, however, recognised that this would not necessarily be the case and inevitably wildlife would be impacted.

> **"Hopefully [future flight will have to fly] higher, from a biodiversity perspective. To get it away from animals but, in reality, they won't be really, really high up."**
> Workshop 2

There was a feeling that those likely to be hit hardest should be consulted, for example groups which represent farmers, environmental groups, and charities that lobby for animal welfare rights.

Impact on wildlife

When discussions turned to wildlife, participants initially focussed on aircraft scaring livestock and horses, both when landing and when flying above them at low heights. Some participants also linked this to the safety aspects of the future flight technologies, how animals may be harmed by accidental falls or crashes. They recognised that these issues may become a concern for farmers (including participants who were farmers themselves).

More prominent, however, particularly as the dialogue progressed, were discussions about the impact of future flight on birds and bats, particularly those that migrate long distances. A wildlife crime officer interviewed as part of the special interest depth-interviews echoed these concerns.

> **"Slightly hesitant in terms of the numbers of these and their routes and in terms of any impacts on birds in particular."**
> Depth interview, Wildlife crime officer

Participants spontaneously questioned whether aircrafts would interfere with birds' own flight paths, given the altitude that they may need to fly at, and the impact of noise on birds was frequently raised too. Participants commented that while we can plan flight paths for technology, birds will have no awareness of no-fly zones or permitted routes, and therefore planning around them will have limited impact. There were a few suggestions around designing aircraft in a way that would warn birds that it was coming, for example by using a high-pitched sound inaudible to the human ear but picked up by birds.

Protecting rural areas and areas of natural beauty (AONB)

There was a sense that future flight would need to be controlled in rural areas, as well as in nature reserves and places of natural beauty, such as Snowdonia for example. This was due to birds and wildlife living there, but also to protect these places for humans too (see below). As a result, rural areas were often mentioned during discussions on where no-fly zones should be sited. However, participants also warned against neglecting biodiversity and habitats in urban areas and towns:

> **"There are trees full of birds outside my window every day, and that's just on the edge of a town. I was driving lately and there were two dead badgers on the road within a short distance … You can't protect all the rural areas and not the city."**
> Workshop 2

There was also some concern about the use of green space for landing infrastructure – which was raised by the 'word on the street' activity on the online community, in the workshops, and during a special interest depth interview with a Freight Manager. This was particularly worrying in relation to built-up cities where there is already limited green space.

> **"If you're going to use that between towns, again, you have to have the space. Even though it's short, you're going to have to make some sort of runway to take off land taking up green space."**
> Depth interview, Freight manager

There was also some recognition that even if rural areas were protected, no-fly zones would not necessarily be adhered to in the case of an emergency (i.e. delivering medical aid during a natural disaster).

Some suggested that future flight routes could mirror existing rail and road routes to minimise disruption in places which are currently peaceful for wildlife, even if this meant that routes were not necessarily as direct. With this in place, it was felt that air travel would still be quicker than that on the ground.

The impact of future flight on wildlife needs monitoring

Some groups suggested slow introduction of the technologies, with monitoring to see how it affects wildlife. For example, test drones in certain areas so that specialists can assess the impact on birds and animals living there. Another suggestion - recognising that there could instead be huge benefits to wildlife in terms of the reduction in emissions - was for environmental impact surveys to be conducted by impartial regulators once the aircrafts are introduced.

> **"I feel the bigger picture is if they cut emissions, that's got to be good for wildlife as well and addressing climate change more generally."**
> Workshop 1, rural group

For this reason, some felt it was important that future regulation did not overly take account of animal welfare and wildlife, at the expense of environmental efficiencies.

> **"I definitely think it's important. I live with animals, I do like animals, so of course it would be an important factor to consider. But with the entire concept of flight, you do have to consider the impact on wildlife and animals. But for me the energy efficiency would take priority over that."**
> Workshop 1, town group

Noise and visual pollution and the impact on humans

Aside from the impact of aircraft on animals, participants also recognised that when interacting with nature and the natural world, humans too will feel the effects of noise and visual pollution created by future flight. This concern appeared across different types of region, but in different forms. For those who described living near a "busy road" (primarily urban and town participants) the concern was that the visual and aural disruption at ground level would be duplicated in the air above their homes. In less built-up areas, participants feared that the peacefulness of green spaces (whether rural countryside or urban parks), "beauty spots" and the "sounds of nature" could all be spoilt by the sights and sounds of future flight technologies:

> **"Certain people really chase sunsets because they are beautiful to watch. Like I mentioned before, I think drones would be a lot lower so it would take the beauty of the sunset."**
> Workshop 1, city group

Suggested Skyways Codes included:

Future Flight technology should not fly at all in areas with designated wildlife parks/areas with protected species

Some natural areas should be protected by limited or 'minimal fly zone', with some limited flight allowed

SSSI's (site of special scientific interest), AONB and areas for recreation in nature (e.g. mountains, paragliding sites) should also be protected from disruptive levels of flight technology

Abide by animal protection policy including insects and birds

Emissions

There was widespread positivity about the potential for future flight – electric vehicles for example - to reduce the amount of traffic on the roads and the associated emissions from petrol and diesel vehicles.

> **"If it takes traffic off the streets and lower emissions and we lower our carbon footprint it could be a good thing."**
> Workshop 1, city group

As discussed in Chapter 1 'Conditions of acceptability', for some the reduction in emissions was the only benefit associated with these new technologies – primarily through modal shift away from fossil fuel-powered air, ground and sea journeys.

Reducing emissions at the expense of the cost to wildlife

Again, when discussing emissions, discussions returned to the disruption to wildlife and nature. There were participants who indicated that they were comfortable accepting some level of disruption to wildlife, if it was guaranteed that these aircrafts would reduce emissions overall.

> **"Even if new air shuttles and air taxis have an undesirable effect on local wildlife park, it might be worthwhile because of the emissions."**
> Workshop 2

As well, there were those who were less convinced and more concerned about the impact on wildlife (alongside safety concerns which were covered in Chapter 5).

> **"Because the reasons why we do carbon neutral is to preserve the life, to stop carbon emissions. What is the point if we are killing birds, livestock and people?"**
> Workshop 2

Questions around the green logic

It was important to participants that the need for these new aircrafts was backed up by evidence which proved that they were going to improve the environment. For example, some participants wanted to know if air vehicles powered by hydrogen would be better for the planet. Others wondered whether they were needed given the move to electric ground vehicles.

There were several ways in which participants felt that the environmental benefits may be undermined. This included developers and operators prioritising profit and not fulfilling promises to deliver services sustainably. The sceptics among the groups felt that this agenda was being driven by commercial interests (supermarkets for example).

> **"I'm suspicious of greenwashing, and this advert is giving me that."**
> Workshop 1, rural group

Being electric alone was not a good enough justification to warrant the environmental sustainability argument, as the electricity needed for electric vehicles may not be generated by sustainable methods, therefore still contributing to climate change. Similarly, there were concerns that manufacturing vehicles and batteries may have a carbon footprint that outweighs the carbon benefits of using sustainable or clean energy.

Participants suspected that nuclear energy was going to be important for powering these new aircraft, which did not sit comfortably with some.

> **"I think the future of energy is not just green, it's nuclear energy. That's called clean energy. It's a very artificial way of living. The more we're reliant on technology, the less natural a life we live. We're less grounded and less connected to nature and the earth."**
> Workshop 2

As well, there were questions around displacement and whether in introducing these new technologies we would just be moving pollution from the streets to the skies.

> **"And how are these things powered? Are we just taking pollution from the street and putting it in to the air?"**
> Workshop 1, town group

In this vein, there were expectations voiced around the need for future flight to replace and reduce ground traffic, rather than sit alongside it at existing levels.

Suggested Skyways Codes included:

Ensure carbon reduction benefits are realised through monitoring and comparison with alternatives to future flight technology (e.g. electric delivery vans)

Evaluation of environmental impact should consider off-setting of emissions

Shut down specific services if a (pre-set) limit on emissions is reached

Operators must demonstrate their future flight proposal is at least as sustainable as existing solutions to get a licence

7 Conclusion and next steps

The breadth and depth of our participants' discussions, summarised in the previous chapters, demonstrate once again the public's capacity to engage with complexity—in this case, how future flight technologies might (or might not) interact with their lives. We heard both their hopes—from reduced carbon emissions to faster emergency services— and their fears—from human and animal welfare to concerns over accessibility. Nevertheless, as a foundational piece of work, the mini dialogue had some inevitable limitations. We have gained a deeper sense of how people might **feel** about these technologies, but our participants were keen to know more concrete details (e.g. on costs, carbon emissions, and airspace regulation) in order to better judge the potential benefits or harms to people who may be affected by future flight technologies.

Foreseeing these limitations, we concluded Workshop 2 with a 'reflections' activity, letting participants set out what they believe the next steps should be for the Future Flight Challenge. Continuing in the spirit of this mini-dialogue being led by participants, this conclusion is primarily based on the outputs of this exercise, which asked four key questions:

- **Research**: What further research is needed to inform decision making and public communication?

- **Resolve**: What conflicts, impacts or trade-offs need to be resolved before the technology is put into action?

- **Hear from**: Who needs to be listened to, to ensure their views and priorities are considered by decision makers?

- **Involve**: Who should be involved in the decision making for the future of flight?

Research

The following outlines the areas for further research participants felt were important. It is important to note that while some of this research may already be underway or complete, this does not detract from how important it is to participants. The actions to address some of these may be to conduct further research, but for others it may be to consider communicating this research to the public to reassure them.

- Potential impacts on wildlife and the environment, and if these can be mitigated to an acceptable extent

- How much noise pollution will it create, and how can this be mitigated?

- How sustainable can the production and powering of vehicles be (taking batteries into consideration)?

- How can these best work in unison with our existing infrastructure and transport?

- Safety assessment for likelihood and impact of collisions in the sky

- Level of cyber security threat, and how to protect against it

- How will future flight vehicles be affected by different weather conditions, particularly high wind

- A cost effectiveness analysis compared to investing in existing alternatives (Public transport, electric/hydrogen road vehicles)?

- Assessment of likely impact on jobs, and how skill sets can be re-purposed or retrained to mitigate this

Resolve

This section summarises key conflicts or trade-offs that need to be resolved to decide if and how to take this technology forward in an acceptable, successful way.

- **Convenient vs acceptable routes:** A consistent trade-off that applies to residential areas, protected or natural areas, and deciding where to follow road or rail routes and when to forge a new route in the air. While participants where keen to limit impact of new routes, they could see that this would sometimes detract from the benefits of future flight, such as taking indirect routes to avoid a protected site, or limiting delivery drone services to respect local neighbourhoods privacy.

- **Commercial or public ownership:** Participants often preferred the idea of publicly owned and run services, feeling this would provide more affordability and benefits for the greater good. However, they could also see that investment, innovation and interest would likely come from commercial organisations. They felt that this needs to be resolved so the approach is intentional, rather than allowing commercial use to 'take-over' before controls are applied.

- **Balance of investment in future flight vs existing public transport:** Participants were very wary that future flight could divert attention and resources away from improving and maintaining existing ground services. Many felt that improving rail and bus services would better address issues such as congestion, connectedness and emissions.

- **What does a 'Fly Zone' and 'No-Fly Zone' look like?:** Participants wanted the definition and characteristics of zones to be resolved. Will No-Fly Zones only apply to low altitude vehicles? Would areas be No-Fly by default, or applied in hindsight due to issues or demand? Will there be 'restricted Flight Zones' which are in between?

- **What uses will be permitted?** Participants were clear (but not in consensus) on worthwhile reasons to use future flight, as well as the uses that seem unnecessary and potentially harmful to society. They felt the permitted use cases need to be established in advance so that controls could be set in time.

- **What data can future flight vehicle gather, and how will this be regulated?** Participants made suggestions about limiting the data (personal data, video, biometrics) that vehicles can gather. They felt the regulations which cover capture and storage of such data need to be set well in advance.

- **Terminology:** There were some trends in how participants used terminology. Many used 'Drones' as a blanket term for all future flight vehicles, possibly because they are the most familiar application at this point in time. The term 'Air Taxis' came naturally and made sense to participants. Eco-planes made sense but some found it difficult to distinguish how these are significantly different to current small planes, aside from the fuel used.

Hear from

This section outlines who the participants felt need to be listened to, to ensure their views and concerns are properly considered when planning the potential development of future flight technologies.

- **Existing services operators (airlines, trains etc):** To make sure that future flight compliments these services rather than duplicates or detracts from them.

- **"Normal everyday people":** To make sure services are suited to their needs and way of life, while avoiding negative impacts on them.

- **Bird and insect specialists:** To assess and monitor the impact of future flight on our wildlife.

- **Farmers:** To ensure that their needs are taken into account so that the impact on farming and on livestock can be kept to a minimum.

- **Cyber security specialists:** To ensure we are equipped to protect ourselves from malicious threat.

- **Public health groups:** To fully understand the unexpected and complex ways that future flight could negatively or positively impact public health.

- **People whose jobs are at risk**: To understand how this would affect their jobs, and what possibilities there are for alternative carers or retraining. What support do they need to find new employment that suits them?

- **People who are against future flight:** Depending on participants' own expectations, either for decision-makers to understand their concerns enough to address them, or to "educate" the public on the technology's potential benefits.

- **Disability groups:** To best understand how future flight can be accessible to all.

Involve

Participants were keen for decision making to be predominantly centrally done, with a governance body in charge. This should be done in coordination with local authorities for local decisions such as routes and infrastructure. Other bodies that participants thought should be a part of the governance and decision making were:

- **Unions**

- **Environmental bodies**

- **Emergency services**

- **Air traffic control**

- **Cyber security specialists**

- **RAF**

- **Information Commissioner**

- **Town planners**

- **Scientists on air pollution**

8 Appendix

Appendix A – Sample and recruitment

General public sample

Demographic		Quota range	Achieved quota
Gender	Female	34 - 38	39
	Male	34 - 38	38
Age	16 to 24	16 - 20	16
	25 to 44	16 - 20	20
	45 to 64	16 - 20	25
	65+	16 - 20	15
Ethnicity	Asian/British	13 - 15	16
	Black/British	6 – 8	7
	Mixed/other	6 - 8	3
	White British / Irish / other white	41 - 46	51
Household income	<£26k	28 – 30	18
	£26-£51k	20 – 22	27
	£52-99k	14 – 16	29
	£100k+	6 - 8	3
Nation and urbanity / rurality	London and West Midlands (urban)	24	26
	Lancashire Towns (towns)	12	15
	Dartmoor (rural)	6	6

Demographic		Quota range	Achieved quota
	County Down (towns)	4	4
	County Fermanagh and County Antrim (rural)	6	6
	Inverclyde (towns)	4	5
	Scottish islands and Highlands (rural)	6	6
	Welsh Valleys (towns)	4	4
	Powys (rural)	6	6

Special interest group sample

Categories		Quota range	Achieved sample
Workers facing potential changes	Police	2 - 4	1
	Aviation impact sector		1
	Emergency responder		1
Workers facing potential displacement	Logistics worker	2 - 4	1
	Humanitarian aid worker		1
Potential users / those who could benefit	Remote NHS user	2 - 4	1
	Infrastructure surveyor		1
Potential non-users / impacted groups	People with experience of state surveillance / military conflict	2 – 4	1
	Civil liberties expert		1
	Environmental crime officer		1
	Recreational air space user		2

Categories	Quota range	Achieved sample
TOTAL	12	11

Appendix B – Skyways Code suggestions (full list) and glossary

Emergency services future flight:

- Emergency vehicles exempt from most rules:

    o Can go at any speed

    o Can fly at any time (if in an emergency)

    o Allowed through no-fly zones (in an emergency)

Flight path restrictions:

- Height and distance :

    o Height restrictions to be specified and enforced

    o Each vehicle type should have designated height restriction, i.e., drones, cargo and people never fly at same level

    o Height restrictions must be measured from ground level

    o Must be minimum distance rules between vehicles (e.g., drones not in ½ meter of one another)

    o Min and max flying speeds applicable to different vehicles OR all fly the same (as done by software and control)

    o Different speed limits in certain areas (e.g., residential areas, areas with wildlife/livestock)

Governance:

- There should be a governing body that controls future fight:

    o Manages licensing, with different licenses for different vehicle types.

    o Manages training (must be specific for vehicle types, thorough, and refreshed regularly).

    o Ensures vehicles fit to fly: 'drone MOT'.

    o Ensures compliance with rules, and managing policing of future flight vehicles

Minimising risk of accidents:

- Large cargo vehicles must be routed to avoid flying over very populated areas, and must not transport any dangerous goods (e.g., bricks). If doing so, this must only be at specific times (e.g., between 1am and 4am when there is less people)

- There must be accountability if an accident occurs.

- All vehicles must be thoroughly tested before being rolled out.

- There should be rules to limit how long pilots can fly for, with mandatory break and rest times.

- Regular testing of people operating vehicles e.g. sight, mental ability.

- Disaster plans for if things go wrong – e.g. drones fall and hit car. Coordinated disaster plans e.g. drone and ground police

- Regulation

    o   Insurance must be in place

    o   Qualification standards need to be in place

    o   Air shuttle and air taxi only operate under certain wind speed – different safety rules for vehicle types.

    o   Abide by sensors - e.g. height and congestion safety

    o   Human oversight needs to be ensured

    o   Vehicles should be permanently monitoring and tracking

    o   Vehicles must be regularly and rigorously checked and certified e.g. MOT

    o   Vehicles must have the correct license e.g. drone driver must not have a taxi license

    o   Calls should be monitored for training and quality purposes

    o   Vehicles must be charged – regular battery warnings and checks must take place

    o   Learner pilots should start with simulator training and then move on to segregated flight paths before the existing flight paths

    o   Drone technologies not flying at night

    o   Should be limits on density of delivering/flying in one area

Noise regulation

- Strict max decibels for all vehicle types.

- No-fly time limits e.g. 9pm to 7am, except in emergencies – no noise.

- Limit the frequency of smaller drones – limited slots per day overall

- More cargo/haulage at night

Environmental regulation

- No flying in secure areas – hospitals, police stations, sites of interest (e.g. landmarks, historic buildings, places with police guards), airports, prisons, government buildings, SSSI

- Low flying drones should not fly in areas with wildlife parks/areas with protected species, farmland / where there's lots of animals

- Risk to life of animals should be minimised.

- Minimum flight heights – based on building height, but also rural v urban? Higher for less noise pollution, but higher a problem for migratory birds… and some need to be low to delivery

- No fly zones over (traditional) airports, ports, SSSIs, farms, environmental sites, power stations.

- Limit the frequency of smaller drones – limited slots per day overall - for noise, safety, appearance of skies and bird life.

- Abide by animal protection policy including insects and birds

- You must have a licence and to get a licence a company must be able to demonstrate their proposal is at least as sustainable as existing solutions

- Rules to take account off-setting of emissions in overall evaluation of environmental impact.

- Shut down services if limit on emissions reached.

- Carbon comparison alternatives

Accessibility

- Lower priority for drones (unless emergency use).

- Continuity with existing infrastructure

- Air taxis / transport should be something everyone can benefit from (affordable and accessible to all) – like the TfL model (rules set centrally, no discrimination based on where you live)

- Employment in the new sector should have opportunities for all

- Offer new jobs to people made unemployed from the change

- Local authorities should have services for community

- Access to all, for all ages, which is not prohibitively expensive

Security

- Manual override of future flight technologies in the event of a cyber attack

- No flying in areas that need to be secure – hospitals, police stations, sites of interest (e.g. landmarks, historic buildings, places with police guards), airports, prisons, government buildings, SSSI

- No fly zones over (traditional) airports, ports, SSSIs, farms, environmental sites, power stations.

- No fly zones near residential areas for privacy and safety reasons.

- Any cameras used purely for navigation, not allowed to film / record. [Delete recordings in certain conditions]

- All flights grounded upon warning of cyber attack

- There must be a security and mental fitness check for drivers e.g. similar to DBS

- Data /info collection and storage must abide by GDPR or similar framework

- Develop cybersecurity wholly new

- Geofencing in higher risk areas (e.g. airports, nuclear power plants, petrol stations)

Glossary

Term	Definition
Drones	non-passenger/pilot carrying vehicles varying in size from small to large
Advanced air mobility (flying taxis)	Electrical vertical take-off and landing vehicles (eVTOLs) that provide short journeys for up to 10 people
Regional air mobility (eco shuttles/planes)	10+ person electric, hydrogen or hybrid aircraft providing short-medium range hops between fixed locations

Appendix C – Dialogue materials

Webinar – Discussion guide

Time	Activity	Questions and materials
18.30 - 18.55	**Set-up: Facilitators and speakers check-in** **25 mins**	• Test link, mic, and camera. • Test who has the host/co-host function and ensure it is allocated to the right team member(s) • Change screen name to NAME – Org. • Check everyone is on the WhatsApp group for the webinar team to be able to ask questions, etc. • Meanwhile tech support is checking that all participants are able to join successfully
18.55 - 19.00	**Participant check-in** **5 mins**	**Participants log into the online session** • Participants encouraged to join the zoom session early to check-in and check that they can see and hear the webinar, and are able to type text into the questions box.
19.00 - 19.20	**Introduction and current awareness**	**Ipsos Chair to give a warm welcome to the dialogue, the first part of the online dialogue** • Introduce Ipsos.

	20 mins	• Chair to explain who is here: over 70 people from across the UK (some of whom you will meet in the next workshop), Ipsos staff, experts from the Future Flight Team. commentators, any observers, and facilitators and notetakers. • Explain that this is the first part of the process, followed by a 3-hour workshop, a one-week online community, and another 3-hour workshop. • **Chair to summarise briefly what this dialogue is about, and highlight lack of public engagement and research on** what the public thinks about flying taxis and how the UK's airspace might change more generally (dialogue aims to address this). • **Emphasise:** These different technologies don't exist in our skies yet, and we don't know how (or if!) they will. This is a real opportunity to hear what you, members of the public, feel is the right way for these technologies to develop, if you think they should at all. • We will be exploring opportunities and benefits as well as concerns and harms, together. • Chair to explain that a lot of information will be provided to participants over the course of the workshops, and to always ask or note down any questions/ queries and ask for clarification when needed. For this workshop, put any questions in the chat box. • Chair also to cover housekeeping ○ Don't zoom and multitask. ○ If we lose connection to you at any point in the session [TECH SUPPORT] will call you to see if we can help bring you back in again ○ We'll be recording for our own notes ○ Confidentiality: we are interested in what you say in the chat box, not who said what. Your comments will not be attributed back to you in our report. ○ We have shared materials with you by post. These may or may not have arrived yet, but please don't open them yet as that will spoil the surprise of the workshop! **Ipsos Chair to explain that we're going to do some quick poll questions to see where the group is at before we hear from the experts. Chair reassures them that it's not a test, and that they'll learn more about this topic shortly.** • Chair introduces test question to check that everyone can use Zoom's poll function effectively. Reading the question aloud, and showing on the screen. Q: Which is your favourite? - Cats - Dogs - Neither • Tech support helps any people who are struggling to use the poll function. For anyone who is unable to do this, despite our attempts to assist them, the chair asks them to write their

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answers down on paper and we will reach out to them by email for their answers.
- Chair reveals results of the test poll question and moves onto the first formal question, reading this aloud and showing on the screen.

Q: Before today, how much, if anything, would you say you knew about drones?
- A great deal
- A fair amount
- Just a little
- Heard of, but know nothing about them
- Never heard of them

  - Chair reveals the results, and asks people to type in the chat box **whether the level of awareness in the group was a surprise** or what they expected. Chair reads out some of the answers (e.g. "Jane says she is surprised how much people know as she's not seen many flying around in her neighbourhood")
  - Chair moves onto the second question, reading this aloud and showing on the screen.

Q: Before today, how much, if anything, would you say you knew about flying taxis?
- A great deal
- A fair amount
- Just a little
- Heard of, but know nothing about them
- Never heard of them

  - Chair reveals the results, and asks people to type in the chat box what the idea of a flying taxi brings to mind. Chair reads out some of the answers (e.g. "Mark thinks a flying taxi is something out of a science fiction film")
  - Chair moves onto the third formal question, reading this aloud and showing on the screen.

Q: Before today, how much, if anything, would you say you knew about short-haul, electric or hydrogen regional planes?
- A great deal
- A fair amount
- Just a little
- Heard of, but know nothing about them

  - Chair reveals the results, and asks people to type in the chat box **what they think about short haul planes, powered by electricity or hydrogen, transporting people between regions in the UK.** Chair reads out some of the answers (e.g. "Margaret says she heard something about hydrogen-powered planes, but she's worried about how flammable they would be")
</td></tr>
<tr><td>19.20 - 19.30</td><td>**Introduction to the Future Flight Challenge, air vehicles classes,**</td><td>**Presentation by Kerissa Khan**</td></tr>
</table>

	and potential use cases **10 mins**	Ipsos Chair introduces speaker, and asks participants to think of questions as they listen that they would like to ask them in the Q&A session after. Key points to cover: • What the Future Flight Challenge is, its aims, and how it is funded • The three classes of air vehicles – *during this part, the images of the three classes are shown and described by the speaker while emphasising that these are not set in stone.* • Introduce the current state of play (i.e. current stage in development and what aspects are much more 'long term' and futures oriented); clarify that the focus of this dialogue is on *future use* rather than on *current use* – e.g. clarity on the size of these drones compared to those currently used personally/recreationally • The eight example use cases, stressing that these are only hypothetical at this stage, they may not all be developed fully, are all up for discussion and can be tweaked, or new ideas added.
19.30 - 19.45	**Q&A session 1** **15 mins**	Ipsos chair thanks the speaker for their presentation and asks participants to start posting questions in the chat. They explain that we might not get through all of them, but those that we don't cover, we will try and get answers to in the first workshop. *Pauses for 1-2 minutes to let some initial questions come in before continuing.* Chair reads out questions and puts them to **Gary Cutts and Kerissa Khan** Ipsos Chair thanks all of the participants for being so engaged and announces a 10 minute comfort break.
19.45 - 19.50	**Comfort break (5 mins)**	
19.50 - 20.00	**How airspace works now** **10 mins**	**Presentation by Gary Cutts** Ipsos Chair introduces speaker, and asks participants to think of questions as they listen that they would like to ask them in the Q&A session after. Key points to cover: • The heights at which current air vehicles travel at, and future air vehicles could travel at, the current ways in which airspace is currently regulated – air traffic controllers for regional/international flights, transponders for other flights.(very briefly and only at introductory level) and safety regulations/standards etc (so basically what limits there are in term of who, what and how we can fly)Explain how future flight technologies might need new forms of airspace regulation (as not necessarily in traditional aviation domain etc) • Explaining how air vehicles might be operating Beyond Visual Line of Sight (and define what this means)

20.00-20.15	**Q&A session 2** **15 mins**	Ipsos chair thanks the speaker for their presentation and asks participants to start posting questions in the chat. They explain that we might not get through all of them, but those that we don't cover, we will try and get answers to in the first workshop. *Pauses for 1-2 minutes to let some initial questions come in before continuing.* Chair reads out questions and puts them to **Gary Cutts and Kerissa Khan**
20.15 – 20.25	**Current views on future flight technologies (Poll)** **10 mins**	**Ipsos Chair explains that participants are going to talk in lots more detail over the next two weeks, but before they do that we want to know what your 'gut reaction' is to what you've heard.** - Ipsos Chair asks each of the questions below, then asks them to write **why** they thought that in the chat box. Q: To what extent do you support or oppose new air vehicles being used in the following situations? - Moving people from one part of a city to another - Moving goods to people's homes and workplaces - Moving people from one town to another town - Carrying out maintenance and inspection - Moving people from a rural area into an urban area - Supporting emergency services A: (for each of the above) - Strongly support - Tend to support - Neither support nor oppose - Tend to oppose - Strongly oppose - Don't know - At the end of all of the questions (not before), the Chair reveals the results of the poll questions.

20.25 - 20.30	Next steps & Thank and close 5 mins	**Remind of context:** - This is the first project of its kind, as there is very limited research into what the public think about the future of these technologies and because these technologies are very early in their development, so we're in a unique position to feed public views, hopes and concerns directly into the development of these technologies. That why all their views are of value and so important. - This is what the participants will focus on over the next couple of weeks, and that they will also hear other perspectives from interviewees Ipsos Chair thanks everyone for joining and being so engaged throughout, reminds them of the dates for the next stage, and provides an email address for them to ask any other questions about the process. *Leave email address on screen so participants can write it down/take a photo if they wish.*

Webinar slides
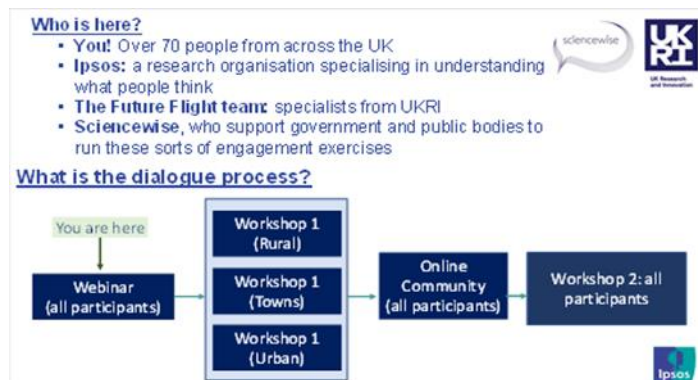

Future Flight Technologies

Webinar

Welcome!

What is this about?
This is a public engagement project exploring your views about the future of flight technology, and how the UK's airspace may change in the future. We will be talking about the future of flight technology – some of these do not exist yet (and may not), such as flying taxis.

This is a real opportunity to hear what you, members of the public, **feel is the right way for this technology to develop, if you think it should at all.**

Who is here?
- You! Over 70 people from across the UK
- Ipsos: a research organisation specialising in understanding what people think
- The Future Flight team: specialists from UKRI
- Sciencewise, who support government and public bodies to run these sorts of engagement exercises

What is the dialogue process?

This webinar – housekeeping....
- A lot of information will be provided - always ask or note down any questions and ask for clarification when needed.
- What you say is confidential
- Put any questions in the chat box.
- Please don't multitask! You may miss important information
- We're online – distractions, cats, dogs, children welcome....
- If we lose connection to you at any point in the session Matt R will call you to see if we can help bring you back in again

- You may want to write down Matt's contact just in case you need it later: 07494078984 Matt.Reynolds@ipsos.com

We have shared materials with you by post. These may or may not have arrived yet, but please don't open them yet as that will spoil the surprise of the workshop!

Before we get started…..

We want to see what your first impressions are before we present our information. So we are going to do a quick anonymous poll!

This is a test question so that we can check that the poll works.
You should see the options pop up on your screen any moment.

Q: Which is your favourite?

a) Cats
b) Dogs
c) Neither

Before we get started…..

We want to see what your first impressions are before we present our information. So we are going to do a quick anonymous poll!

Before today, how much, if anything, would you say you knew about drones?

a) A great deal
b) A fair amount
c) Just a little
d) Heard of, but know nothing about them
e) Never heard of them

Before we get started…..

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e) Never heard of them

Before we get started…..

We want to see what your first impressions are before we present our information. So we are going to do a quick anonymous poll!

Before today, how much, if anything, would you say you knew about short-haul, electric or hydrogen regional planes?

a) A great deal
b) A fair amount
c) Just a little
d) Heard of, but know nothing about them
e) Never heard of them

Introduction to the Future Flight Challenge, air vehicles classes, and potential use cases

Presentation by Kerissa Khan
Innovation lead for the Future Flight Challenge

This presentation will talk about:

- What the Future Flight Challenge is, its aims, and how it is funded
- Introduce to the types of air vehicles are in development and their possible uses
- Introduction to some of the ways in which these new aviation technologies could be used
- Ongoing social research and implications - why your thoughts and ideas are important

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What is the Future Flight Challenge?

- The Future Flight Challenge is a programme aiming to position the UK as a world-leader in the third aviation revolution.
- It aims to transform how we connect people, transport goods and deliver services in a sustainable way providing socio-economic benefits using new classes of air vehicles with novel technologies.
- It is a £300million programme, with funding from the industry and the government.

What type of Future Flight technology are we discussing?

How may these technologies be used?

These are just possible ways, nothing is certain at this stage!

Rapid airport transfer	Emergency services support	Intracity journey	Maintenance and inspection
Passengers have access to on-demand air mobility to provide transit between their homes and nearby airports, between hub airports and local airports for onward transfer or between airports and high-volume cities and towns	Emergency services have a deployable drone operation to support rapid first response in a range of scenarios including road traffic accidents, search and rescue, fire response and situational awareness.	Passengers have access to autonomous Electric Vertical Take-Off and Landing (eVTOL) vehicles for mobility between urban locations as an additional mode of transport.	Rapidly deployed and high-endurance autonomous drones carry out maintenance and inspection operations of infrastructure in complex environments, reducing risk to personnel.

How may these technologies be used?

These are just possible ways, nothing is certain at this stage!

Inter-town transit

Access to convenient air travel for mobility between towns and cities. Passengers can access a scheduled electric- or hydrogen-powered aircraft on high-density routes. The air travel element connects seamlessly with other forms of transport to create a kerb-to-kerb mobility system that users can access with a single ticket.

Rural/disconnected transit

Air taxis for transit between rural and traditionally disconnected areas on a scheduled/on-demand service as part of a highly-distributed aviation system.

Drone delivery

Retail organisations provide on-demand last-mile delivery of cargo within each reach of consumers utilising a network of drones operating Beyond Visual Line of Sight.

Cargo delivery

Cargo is transported as part of an operational service, across the UK between distribution centres by fleets of zero emission eVTOL aircraft and autonomous drones.

How may these technologies be used?

These are just possible ways, nothing is certain at this stage!

Rapid airport transfer

Passengers have access to on-demand air mobility to provide transit between their homes and nearby airports, between hub airports and local airports for onward transfer or between airports and high-volume cities and towns

Emergency services support

Emergency services have a deployable drone operation to support rapid first response in a range of scenarios including road traffic accidents, search and rescue, fire response and situational awareness.

Intracity journey

Passengers have access to autonomous Electric Vertical Take-Off and Landing (eVTOL) vehicles for mobility between urban locations as an additional mode of transport.

Maintenance and inspection

Rapidly deployed and high-endurance autonomous drones carry out maintenance and inspection operations of infrastructure in complex environments, reducing risk to personnel.

Ongoing social research and implications

Why your thoughts and ideas are important

- These different technologies don't exist in our skies yet, and we don't know how (or if!) they will.
- What we hear from you during this research will feed directly into research and innovation ahead of development of new flight technologies.
- This is a real opportunity to hear what you, members of the public, feel is the right way for these technologies to develop, if you think they should at all.

Q&A Session 1

Please post your questions in the chat!

Comfort break!

Please be back by 7.50pm

How airspace works now and the implications for future aviation .....

Presentation by Gary Cutts
Future Flight Challenge Director

This presentation will talk about:

- How current airspace and flight is currently controlled and regulated
- The heights at which current air vehicles travel at, and future air vehicles could travel at
- Points to consider for future regulation and safety

How current airspace and flight is currently controlled and regulated

- Civil Aviation Authority (CAA)
- Who and what can fly......
- Controlled and Uncontrolled airspace
- Danger zones and restricted areas
- Safety and standards

Current flight height restrictions

Plane.....
Helicopter.....
Hand glider....
Hot Air Balloon.....

and **Future Flight Heights...**

Points to consider

- New aviation technologies will be operating in lower airspace and within areas where aviation currently isn't operating (e.g. within cities or towns).
- This opens up a lot of questions about:
  - How we control that airspace ?
  - Who and what can fly in that airspace ?
  - Who and how we decides where new aviation technologies can land or fly
  - Safety and Standards
  - Operating beyond visual line of sight/Remotely Piloted Aircraft

Q&A Session 2

Please post your questions in the chat!

Current views poll

Now you have heard more, we want to get your 'gut reactions' with another poll.

To what extent do you support or oppose new air vehicles being used in the following situations?

1. Moving people from one part of a city to another

a) Strongly support
b) Tend to support
c) Neither support nor oppose
d) Tend to oppose
e) Strongly oppose
f) Don't know

Current views poll

Now you have heard more, we want to get your 'gut reactions' with another poll.

To what extent do you support or oppose new air vehicles being used in the following situations?

2. Moving goods to people's homes and workplaces

a) Strongly support
b) Tend to support
c) Neither support nor oppose
d) Tend to oppose
e) Strongly oppose
f) Don't know

Current views poll

Now you have heard more, we want to get your 'gut reactions' with another poll.

To what extent do you support or oppose new air vehicles being used in the following situations?

3. Moving people from one town to another town

a) Strongly support
b) Tend to support
c) Neither support nor oppose
d) Tend to oppose
e) Strongly oppose
f) Don't know

Current views poll

Now you have heard more, we want to get your 'gut reactions' with another poll.

To what extent do you support or oppose new air vehicles being used in the following situations?

4. Carrying out maintenance and inspection

a) Strongly support
b) Tend to support
c) Neither support nor oppose
d) Tend to oppose
e) Strongly oppose
f) Don't know

Current views poll

Now you have heard more, we want to get your 'gut reactions' with another poll.

To what extent do you support or oppose new air vehicles being used in the following situations?

5. Moving people from a rural area into an urban area

a) Strongly support
b) Tend to support
c) Neither support nor oppose
d) Tend to oppose
e) Strongly oppose
f) Don't know

Current views poll

Now you have heard more, we want to get your 'gut reactions' with another poll.

To what extent do you support or oppose new air vehicles being used in the following situations?

6. Supporting emergency services

a) Strongly support
b) Tend to support
c) Neither support nor oppose
d) Tend to oppose
e) Strongly oppose
f) Don't know

Thank you!

This is the end of the webinar.

Next steps:

- You will receive materials in the post (if you haven't already). Please don't open them until the first workshop.
- Workshop 2 is next – You won't all have the same date, so please check if you are not sure!
- If you have any questions, please email Edward.Camilleri@ipsos.com

Poll results!

Remember, these are just 'gut reactions'.
We will talk a lot about these topics over the next two weeks.

Depth Interview – Discussion guide

Timings	Questions
5 mins	***Introduction*** *INTERVIEWER TO INTRODUCE SELF, IPSOS AND UK RESEARCH AND INNOVATION [BELOW IS NOT TO BE READ OUT VERBATIM, BUT IN A PERSONABLE AND PROFESSIONAL WAY]* KEY POINTS ON RESEARCH: • Ipsos, an independent research company, is running a series of workshops with people from across the country on behalf of UK Research and Innovation. These workshops will explore future flight technologies, which we'll talk about later on. • UK Research and Innovation is funded by the government to invest in science and research. This research is being undertaken for UK Research and Innovation, and has not been commissioned by any government departments or agencies. • To help bring the public workshops to life, we want to bring in the voices of people who might be affected by these new technologies and that's what we'll talk about for the next hour. • Interviewer to explain why they have been selected to be interviewed and what particular perspective they hope will be surfaced [adjust for each interviewee] • CHECK THAT THEY RECEIVED INFORMATION SHEET. • As you will have read in your information sheet, we'd like to record our conversation today and use some clips for our workshop participants to listen to. We wouldn't use anything you say that could identify who you are, where you live or work, or anything else sensitive. Can I check that is okay with you? • CHECK THAT THEY ARE HAPPY WITH OTHER CONSENT DETAILS IN INFORMATION SHEET. **START RECORDING**
10 mins	***Lived experience and future outlook*** MODERATOR NOTE: NOTE DOWN ANSWERS TO THESE QUESTIONS IN ORDER TO REFER TO THEM LATER. **To get started, can you tell me a bit about who are you, and where you live / work [choose most relevant]?** [ALLOW OPEN RESPONSE THEN MOVE ON] **This particular study is about the future of flight, particularly the use of emerging technologies – this can be about the transportation of people but also about goods and services. What has been your experience of flight so far?** - **How have you benefited from flight?** - **What do you think the harms/challenges associated with flight are currently?** - **What do you think the harms/challenges associated with other forms of transport of people, goods and services in the UK are currently?**

Timings	Questions
	Imagine you could go forward in time by ten years. Thinking about the way things seem to be going, what do you think might change about flight, for better or worse (either of people or of goods and services? -

–15 mins	***Awareness and first impressions***
	
	 SHOW IMAGES OF THE THREE NEW CLASSES OF AIR VEHICLES WITHOUT ANY CAPTIONS.
	
	 If you had to guess the name of these three new types of air vehicles, what would you call them? There are no right or wrong answers.
	 • Why do you say that?
	
	 REVEAL CAPTIONS.
	
	 These are what these air vehicles are being called now, but this is not set in stone.
	
	 So, <u>drones</u> are unmanned non-passenger carrying vehicles varying in size from small to large.
	 • Have you ever personally seen a drone?
	      o (IF YES) How did you feel when you saw one?
	      o (IF NO) How would you feel if you saw one out of your window?
	 • What kinds of uses have you heard of drones being used for?
	      o (FOR EACH USE) How do you feel about them being used for this?
	
	 [IF NOT RAISED SPONTANEOUSLY, CLAIRFY THAT DRONES CAN BE MUCH LARGER AND HEAVIER THAN PERSONAL-USE DRONES, AND THAT THEY CAN BE USED FOR COMMERCIAL AND CIVIL USE]
	
	 • What questions does the possibility of drones in the future raise for you?
	
	 Next, <u>air taxis </u>(or 'advanced air mobility') are electrical vertical take-off vehicles (like a helicopter) that provide short journeys for up to 10 people.
	 • Before today, how much, if anything, had you heard about flying taxis?
	 • How would you feel if you saw one of these out of your window?
	 • What questions does the possibility of air taxis raise for you?
	
	 Finally, <u>air shuttles</u> (or 'regional air mobility') are electric, hydrogen or hybrid air vehicles which can hold over ten people and provide short to medium range hops between fixed locations. These need to use a runway like standard smaller planes in regional airports.
	 • Before today, how much, if anything, had you heard about planes using new types of fuel?
	 • How would you feel if you saw one of these in the sky?
	 • What questions does about the possibility of air shuttles raise for you?

15 mins	***Hopes and fears*** MODERATOR NOTE: NOTE DOWN ANSWERS TO THESE QUESTIONS IN ORDER TO REFER TO THEM LATER.

Timings	Questions

	Next, I want you to think and imagine about how these new types of air vehicle might affect your everyday life, where you live, how you work, and how you spend the rest of your time; as well as the potential impact on [insert issue – e.g. privacy, access, humanitarian conflict etc.]
	
	 What are your hopes and fears about this in relation to your life/work?
	 • *(IF NEEDED) PROMPT USING ANSWERS FROM ABOVE*:
	   ○ [Their personal 10-year predictions]
	
	 Where do you think the balance lies – do the benefits outweigh the harms at present, or do the harms outweigh the benefits?
	
	 [ALLOW OPEN RESPONSE, AND ONLY PROMPT USING THE BELOW IF NEEDED, OR IF INTERVIEWEE ONLY FOCUSES ON BENEFITS/HARMS]
	
	 • (*IF NEEDED)* Some people have highlighted…[SEE LIST BELOW] as a potential benefit/harm. How do you think that might affect you personally? What about wider society?
	 • Benefits:
	   ○ Affordability
	   ○ Convenience
	   ○ Connectivity
	   ○ Sustainability
	   ○ Speed
	   ○ Decarbonization
	
	 • Harms:
	   ○ Collisions, crashes or accidents
	   ○ Intrusion / reduced privacy / surveillance
	   ○ Job loss / displacement
	   ○ Personal safety
	   ○ Potential for criminal misuse
	   ○ Potential for commercial misuse
	   ○ Potential for state/government misuse
	   ○ Social inequality

10mins	***Conditions, governance and regulation***
	
	 Thank you for sharing your hopes, fears and reflections on these technologies. How do you think some of these future of flight technologies should be governed and overseen, to ensure that they work well?
	
	 [ALLOW OPEN RESPONSE BEFORE MOVING TO HOPES/FEARS PROBES BELOW]
	
	 One of your hopes was that [HOPE FROM ABOVE]. **What would you like to see in place to make this future happen?**
	
	 One of your fears was that [FEAR FROM ABOVE]. **What would you like to see in place to try and avoid that future from happening?**
	
	 • (PROMPTS FOR ABOVE, IF NEEDED, FOCUSING ON THOSE MOST RELEVANT TO INTERVIEWEE)
	   ○ Accessibility
	   ○ Regulation / frameworks / guidance

Timings	Questions
	o Flight paths / segregated airspace o Location of take-off and landing sites o Flying height / altitude o Governance of rules (local / national / international) o Noise o Pilot training / licensing o Priority for certain uses / air vehicles o Views / landscape / visual pollution / amenity o Wildlife
5 minutes	**Interview close** **Thank you for your time today, we've come to the end of my questions!** **Before we finish, I had one final thing to ask. If there was one thing that you would like the Future Flight Challenge Team to consider in the development of these technologies, what would it be?** THANKS AND CLOSE

Workshop 1 – Discussion guide

N.B. For The Liminal Space's accompanying stimuli materials, please see https://www.the-liminal-space.com/future-flight-workshop-toolkit.

Time	Activity	Questions and materials
17.30 - 17.50	**Set-up: Facilitators check-in** **25 mins**	• Test link, mic and camera. • Test who has the host/co-host function and ensure it is allocated to the right team member(s) for recording breakout rooms. Make all moderators Co-hosts. • [Change screen name to NAME – Org – Chair/Moderator. • Check everyone is on the WhatsApp group for facilitation team to be able to ask questions, etc.] • Meanwhile tech support is assigning participants who are in the waiting room, notetakers, moderators, experts and observers to break-out rooms.
17.50 - 18.00	**Participant check-in** **5 mins**	**Participants log into the online session** • Participants encouraged to join the zoom session early to check-in and check their video/mic. • Participants encouraged to get a pen and paper, and have their participant pack with them. • Register as people join and change screen names as necessary to first name and first initial of surname (i.e. John H).
18.00 - 18.10	**Introduction and scene setting** **Plenary 1** **10 mins**	**Ipsos Chair to give a warm welcome to the first of four online workshop (10 mins):** • Chair to explain who is here: people from rural areas / towns / cities across the United Kingdom, Ipsos moderators, any observers. • Explain that this is event 1 of 2, give a reminder of date and time of the next workshop which will have all 72 participants, and explain that they'll receive an invite for the online community after this workshop. • Chair also to cover housekeeping```

Time	Activity	Questions and materials
		o Please don't open the envelopes yet, we'll let you know when you can
		o Don't zoom and multitask.
		o Homes – don't worry if your family/ pet comes into view, we're all in the same boat
		o Keep your video on unless your internet connection becomes unstable
		o We will be going into breakout rooms - we've set these up so you don't need to do anything – just let it happen
		o If we lose connection to you at any point in the session [INSERT NAME] will call you to see if we can help bring you back in again
		o We'll be recording for our own notes
		o Confidentiality: we are interested in what you say, not who said what. Your comments will not be attributed back to you in our report. Refer to the printed materials
		o We have shared materials with you, but please respect that these have been designed for the purpose of this exercise, and please don't post photos or content from these on social media or share otherwise
		o Show ground rules and nod to a few:
		▪ There are no silly questions/ comments. We're here to hear what you think
		▪ You may not all agree with what you are hearing but please do respect each other's views and experience
		• Chair to remind participants why we are here – to find out what people across the UK think about new flight technologies and their potential role in the future (if any), how these might affect your day-to-day lives, what controls and safeguards you feel need to be in place, and what more dialogue and research needs to be done on this topic.
		• **Emphasise:** These different technologies don't exist in our skies yet, and we don't know how (or if!) they will. This is a real opportunity to hear what you, members of the public, feel is the right way for these technologies to develop, if you think they should at all.
18.10 - 18.30	**Participant introductions and 'back of an envelope'** **Break-out 1** **20 mins**	**Introductions** • *Facilitator introduces themselves and the group's notetaker, and thanks everyone for joining this evening.* • *Introductions – let's go round the zoom.* • *Tell us something about yourself (where you live in the UK, what the weather is like where you are, and whether/what you can currently see out of your window – if one is nearby!)* • *Facilitator to join in to demonstrate how to do this.* **'Back of an envelope'** • 'In the webinar last week you heard lots about new flight technologies and how these might look out in the real world. Before we open up this envelope with the number one (*facilitator holds up own copy of envelope to demonstrate*) I want you to take five minutes to **draw your vision of future flight.** This is what you expect the future to look like with (or

Time	Activity	Questions and materials
		without) these new flight technologies. We're not going to mark you on how pretty it looks, so just draw the first things you think of! If you'd rather not draw just grab a piece of paper and jot down whatever comes to mind' *Facilitator gives them five minutes, giving them a one minute warning four minutes in.* • Thanks everyone. Let's go around and hear what people have drawn. If you feel confident showing yours to the screen, please do, but otherwise you can just describe what you've scribbled down. *Facilitator gives each participant a close-to-equal amount time to talk through their drawing.*
18.30-19.00	**Household Materials** **Break-out 2** **30 mins**	**Opening the envelopes** **Facilitator to clarify – Inside these envelopes are imaginary scenarios from the future. They are to help us imagine different versions of the future of flight technologies, and what impact they might have on our lives, if any, and any issues they might raise.** • Okay. Now it's time to open your envelopes! When you do, I want you to have a very quick read over the different items. In a couple of minutes, I'll count down from three and I want you to hold up the item that you want to talk about first. *Facilitator lets participants open envelopes and look over items for two minutes.* • Three…two…one…hold up an item! *Facilitator acknowledges the items people have held up. If one item was held up more than others, go to the relevant section below. Otherwise, choose one of the participants' choices at random. Try and cover 2-3 items in this first breakout, but avoid shutting down open/lively discussion just for the sake of covering more stimulus materials* **Vertiport Brochure & Discount Card ('Make your day move with AirRide')** *Facilitator makes sure everyone has the correct material selected.* • Before we talk about this together, have a read over everything and try to imagine how you may feel about this service if it were in place today. Feel free to note down any thoughts as you go if that's helpful for you. *Facilitator gives participants a couple of minutes to read over. Remind them this is fictional. Participants give a thumbs up to the camera when they are done.*

Time	Activity	Questions and materials
		• What did this flyer make you think? • What were you excited/concerned about? *Facilitator – get every participant's spontaneous answers before prompting on any details below.* *You do not need to use ALL/ANY of these prompts – **prioritise spontaneous discussion**.* • How do you feel about the discount for people near one of their Sky Ranks? • How do you feel about this being run by 'Transport for UK'? (*if needed, facilitator to clarify that this is a government/taxpayer-funded organisation*) • Which existing vertiports sound useful or not useful to you personally? ○ School Street ▪ How would you feel about children and young people using this service? ○ Alto's Supermarket Car park (*if needed, facilitator to clarify that this is an affordable supermarket*) ▪ How useful do you think this service would be? For who? ○ St Carter's Train Station ▪ How would you feel about people switching between this service and a National Rail service? • How would you feel if there was a Vertiport near where you live or work? ○ What would the benefits be? ○ What would the disadvantages/disbenefits be? • What do you think about the distance you can travel? ○ Would 1 mile be the right minimum distance? Why/why not? ○ Would 20 miles be far enough for the journeys you'd need to take? Why/why not? • How would you feel about the autonomous AirRides that are 'coming soon'? ○ What would be the benefits of this over manned air vehicles? ○ What would be the disadvantages/disbenefits of this compared to manned air vehicles? *Before moving on to the next item*: • After everything we've discussed, how do you feel now about this service? The same? Differently? Why? • What else/other issues does this bring to mind? • What do you think might be the benefits or disadvantages of a service like this? **Council Letter ('Castlebury Council…Dear Resident…')** *Facilitator makes sure everyone has the correct material selected.*

Time	Activity	Questions and materials
		• Before we talk about this together, take a minute to have a read over the letter. *Facilitator reads the letter out, give participants a moment to consider it. Remind them this is fictional. Participants give a thumbs up to the camera when they are done.* • What did this letter make you think? • How would you feel if you got this through your post box? • What were you excited / concerned about? *Facilitator – get every participant's spontaneous answers before prompting on any details below. You do not need to use ALL/ANY of these prompts – **prioritise spontaneous discussion*** • What do you think about where sky routes may go? Who would it avoid and who would it fly over? • What considerations do you think there should be about using routes for waste collection and schools? • What stands out to you from this letter? o How do you feel about Castlebury Council meeting their net zero carbon targets? o What do you think it would be like to work as one of those thirty pilots? o How do you think it would affect traffic on the roads? • What else would you expect to know about a service like this? *Before moving on to the next item*: • After everything we've discussed, how do you feel now about this service? The same? Differently? Why? • What else/other issues does this bring to mind? • What do you think might be the benefits or disadvantages of a service like this? **Transit Ticket ('CloudLine Connect')** *Facilitator makes sure everyone has the correct material selected.* • Before we talk about this together, take a minute to have a read over the item. If it wasn't already clear, this is a screenshot from an app on a mobile phone. *Facilitator gives participants a minute to read over. Remind them this is fictional. Participants give a thumbs up to the camera when they are done.* • What did this app make you think? • How would you feel if you saw or heard that this app was available in your area? • What were you excited / concerned about?

Time	Activity	Questions and materials
		*Facilitator – get every participant's spontaneous answers before prompting on any details below. You do not need to use ALL/ANY of these prompts – **prioritise spontaneous discussion*** • What stands out to you from the App? • IF NOT MENTIONED SPONTANEOUSLY: o What do you think about the price? o How would you feel about using flying taxi to access an ancient monument? o What do you think about the travel time? • Is there any other information you'd want to know before using this service? *Before moving on to the next item*: • After everything we've discussed, how do you feel now about this service? The same? Differently? Why? • What else/other issues does this bring to mind? • What do you think might be the benefits or disadvantages of a service like this? **No Fly Zone Protest Badge ('Keep our skies clear!')** *Facilitator makes sure everyone has the correct material selected.* • Before we talk about this together, take a minute to have a read over the badge. *Facilitator gives participants a minute to read over. Remind them this is fictional. Participants give a thumbs up to the camera when they are done.* • What does this badge make you think about? • What would you think if you heard about this campaign taking place in your area? • What were you excited / concerned about? *Facilitator – get every participant's spontaneous answers before prompting on any details below. You do not need to use ALL/ANY of these prompts – **prioritise spontaneous discussion*** • Why do you think over 250,000 people would campaign to keep the skies clear? • What does the idea of no fly zones raise for you? • Where do you think the four 'no fly zones' might be? • What else would you want to know about the 'no fly zones'? *Before moving on to the next item*: • After everything we've discussed, how do you feel now about this campaign, and the idea of 'no fly zones'? The same? Differently? Why?

Time	Activity	Questions and materials
		• What else/other issues does this bring to mind? • What do you think might be the benefits or disadvantages of 'no fly zones' might be? **Drone Drop Service Form ('Direct Drone Drop, A premium drone delivery service…')** • Before we talk about this together, have a read over the card and think about which options, if any, you would be interested in. Circle the ones you would choose, and draw crosses over the ones you would not be interested in. *Facilitator gives participants a couple of minutes to read over and consider the option. Remind them this is fictional. Participants give a thumbs up to the camera when they are done.* • What did this card make you think? • How would you feel if you saw or heard that this service was available in your area? • What were you excited / concerned about? • Which option(s) would you be likely to use (if any)? Why? • Would you avoid any of these options? Why? *Facilitator – get every participant's spontaneous answers before prompting on any details below.* *You do not need to use ALL/ANY of these prompts – **prioritise spontaneous discussion*** • How close or far from your home would you want a drone to drop off a delivery? Why? o What would the benefits be having a drone drop near your home? o What would the disadvantages/disbenefits be having a drone drop near your home? • What else stands out to you from the card? o How do you feel about biometric data authentication? (*if needed, clarify that this could mean fingerprints or retina scans)* o What do you think about the time the delivery would take? o How do you feel about the delivery being live video recorded? o Would you expect the whole journey, or just the drop-off to be recorded? o What do you think about this company donating free deliveries to local 'families in need'? Why do you think this donation may be needed? Is this the right solution to issues of access/inequality? o What do you think of when you read that the service is part of the 'delivery carbon scheme? • Is there anything missing from this card? What? *Before moving on to the next item*:

Time	Activity	Questions and materials
		- After everything we've discussed, how do you feel now about this service? The same? Differently? Why? - What else/other issues does this bring to mind? - What do you think might be the benefits or disadvantages of a service like this? **Supermarket Promotional Magnet ('My green supermarket is flying high...Using Sky Haul')** *Facilitator makes sure everyone has the correct material selected.* - Before we talk about this together, take a minute to have a read over the magnet and card. *Facilitator gives participants a minute to read over. Remind that it is fictional. Participants give a thumbs up to the camera when they are done.* - What would you think if your local supermarket handed you one of these? - What did this card/magnet make you think? - What were you excited / concerned about? *Facilitator – get every participant's spontaneous answers before prompting on any details below. You do not need to use ALL/ANY of these prompts – **prioritise spontaneous discussion*** - What stands out to you from the card? - What do you think about the amount of HGV journeys being taken off the road? - How important would your supermarket's energy efficiency be to you? - How do you feel about the reduction in animal road deaths? - Is there anything missing from this card? What? *Before moving on to the next item*: - After everything we've discussed, how do you feel now about this service? The same? Differently? Why? - What else/other issues does this bring to mind? - What do you think might be the benefits or disadvantages of a service like this? *Facilitator announces break and asks them to be back by 19.10. Tells them to stay in the breakout but that they can turn their camera and audio off.*
19.00-19.10	**Comfort break (10 mins)**	
19.10-19.40	**Household Materials (continued)**	*Cover as many of the remaining items not yet discussed as you can, **prioritising spontaneous discussion**, using the prompts if*

Time	Activity	Questions and materials
	Break-out 3 **30 mins**	*necessary, and avoiding shutting down open/lively discussion just for the sake of covering more stimulus materials*
19.40-19.50	**Presentation of audio-visual stimuli** **Plenary 2** **10 mins**	**Chair welcomes everyone back to plenary and introduces the three audio-visual materials, and asks participants to jot down their initial thoughts on each one to share with their breakout groups** *Tech support to check that everyone can see and hear the materials.* • News bulletin about major flooding • *Pause to allow participants time to make notes* • 'The House that Drones Built' TV documentary advert • *Pause to allow participants time to make notes* • 'AA' vehicle recovery service radio broadcast • *Pause to allow participants time to make notes* **[N.B. See scripts for these videos below]**

19.50-20.10	**Discussion of audio-visual stimuli**
	
	Break-out 4
	
	20 mins
		• What stood out to you from what you've just seen and heard? Why?
		
		*Facilitator to focus on the audio-visual material that participants mention first (from below), before focusing on **<u>one other example</u>** as per the circulation guide sent to you by the chair which outlines.*
		
		News bulletin abut major flooding
		
		Show slide with screenshots from the news bulletin. Refer to script in moderator pack if needed.
		
		• How did you feel when you heard about the response to Storm Charlotte?
		
		Wait for spontaneous responses and only prompt with the below if needed.
		
		• Would you feel more reassured or more concerned about the way the emergency services responded? Why?
		• What might the benefits or disadvantages of this be?
		
		• How do you think this compares with how we deal with floods right now…?
		   o …how about drones surveying damage?
		   o …how about drones for transporting supplies
		   o …how about air taxis for moving emergency services and personnel ?
		   o …how about air-shuttles replacing obstructed road transport?
		• How much would you trust these services to help you in a crisis like this?

Time	Activity	Questions and materials
		• How do you think the benefits/disadvantages weigh up for using new air vehicles in emergency situations? Is it worth it? Why/why not?
		'The House that Drones Built' TV documentary advert
		Show slide with screenshots from the TV documentary advert. Refer to script in moderator pack if needed. • What came to mind when you saw this TV advert?
		Wait for spontaneous responses and only prompt with the below if needed.
		• How would you feel about a house being built in this way? • What might the benefits or disadvantages/disbenefits of this be? • What do you think this sort of automation would mean for the construction industry? ○ PROBE IF NOT MENTIONED SPONTANEOUSLY : What might the impact be on construction jobs? • What might be the benefits or disadvantages of this? ○ Who do you think this kind of service would benefit/disadvantage? ○ Should remote areas have housing like this? Why/why not? ○ How do you feel about the reduced number of staff on site? ○ What do you think about the carbon efficiency of this type of construction? ○ Is there any key information missing from this news bulletin? • Is there any key information missing from this TV advert? • What do you think is the balance here between the benefits and disadvantages of new air vehicles working to transport materials to remote locations?
		'AA' vehicle recovery service radio broadcast
		Show slide with a photo of a Satnav. Refer to script in moderator pack if needed. • What came to mind when you heard this radio broadcast?
		Wait for spontaneous responses and only prompt with the below if needed.
		• How would you feel if you heard about an air vehicle collision on a journey you take regularly? • How do you think this compares with transport accidents that happen now…? ○ …how do you think this collision might have happened?

Time	Activity	Questions and materials
		o …how do you feel about drones surveying damage? o …how do you feel about drones monitoring traffic? • Is there any key information missing from this radio broadcast? • How does this radio broadcast leave you feeling about the balance between the benefits and harms of new air vehicles? *Facilitator announces break and asks them to be back by 20.20. Tells them to stay in the breakout but that they can turn their camera and audio off.*
20.10 – 20.20	**Comfort break** **10 mins**	
20.20-20.55	**'Out of the Window' and Final Reflections** **Break-out 5** **35 mins**	• In your pack you should find three views out of a window. Once you find these, I want you to choose the view that you think best fits where you live. *Give participants a minute to find these in the pack, choose their view, and hold this up to the camera.* • If you look on the bottom-left of the window you can see a 'key' that lists some different types of air vehicles. Does anyone have any questions about these? *Clarify that 'delivery' and 'large cargo' are drones of different sizes (not carrying people) with vertical take-off, 'Air Taxi' and 'Emergency' would carry up to around 10 people short journeys with vertical take-off, 'Air Shuttle' would carry more than 10 people, making regional trips within the UK using a short runway for take-off.* • You should also be able to see some stickers in your pack which match the key we've just looked at. You've got different sizes of the same stickers too. These aren't different-sized air vehicles, but the same air vehicles closer and further away from your window. *Check that everyone has found their stickers.* • Finally, you should also have some coloured pencils. *Check that everyone has them too.* • Now that we've got everything we need, we're about to get a bit creative. I want you all to imagine what the view out of your window might look like with or without these new air vehicles. This view out of the window could be what you hope for, or what you fear. • You can use these stickers to show how far or close they might fly to where you live, and you can use any pencils or pens of your own to show the directions their flight paths might take. It could be full of these new air vehicles, or with none of them at all. The most important thing that we will

Time	Activity	Questions and materials
		discuss after is **why** you feel this way. Any questions before you start?
		Check that they are clear on the exercise, and clarify that we are not asking them to predict the most likely future but illustrate what they hope for or fear based on what they have heard and discussed so far.
		• Okay, I'm going to give you ten minutes. You can work away silently on your windows during that time, but if you do have any technical questions don't hesitate to ask.
		Time 10 minutes. 5 minutes in let them know that they are halfway through, and give them a 1 minute warning before the end.
		• Let's see what everyone's done! If you can, hold your window up the camera and talk us through your picture and the issues that you were considering in doing so. E.g. why did you choose those stickers and the flight paths? What issues did you consider when you were doing this activity?
		Circle through every participant, using the prompts below IF NECESSARY. Aim for 2-3 mins per participant, to keep time for group discussion afterwards.
		• How did you choose which air vehicles to include or not include? • How did you choose which air vehicles would be close, and which would be far away? • I notice you have quite a few [air vehicle] out your window, why is that? • I notice that there aren't any [air vehicles] visible from your window, why is that? • [Air vehicle] and [air vehicle] look like they'd fly quite close to each other, how do you think that might work? • How would your view vary if you lived somewhere more urban/rural?
		Once you have let everyone present:
		• Now that we've see everyone's views out of the window, does anyone have any new thoughts or ideas?
		Allow for any new general reflections before moving on.
		• Keep your window views out, but please try and also find the envelope drawing you did earlier.
		Give participants a minute to find this until they give a thumb's up on the screen.
		• Have a look at your envelope drawing and your view out of the window side by side. What's similar? What's different?
		Prompts below IF NECESSARY:

Time	Activity	Questions and materials
		• What hopes and fears have stood firm for you throughout today? • Have any new hopes and fears come to your mind today? • Have any of the materials we looked at today made you think about things differently? • Is there anything that other participants have said that you hadn't thought of before? *Before closing the final breakout, thank all participants for their engaged participation and say that it was lovely to meet them all.*
20.55-21.00	**Thank and close** **Plenary 3** 5 mins	Chair thanks participants for taking part and being so engaged. Chair tells them that they'll get their first payment sent over in a few working days, before reminding them about the next steps. They will be sent logins for the online community will be sent by email, and chair encourages them to engage with the materials and listen to other people's perspectives, interviews we've done with people who may be affected by new technologies and the 70+ participants from all three workshops across the UK. Also remind participants the date and time for the second workshop.

Workshop 1 – Scripts from audio-visual stimuli

News bulletin about major flooding

And now, an update from the floods in the northern region after Storm Charlotte.

Drones surveying the area have been monitoring the electricity pylons that are out of action, and are searching flooded woodland for farm animals in distress.

A pop-up vertiport is arriving on site as we speak, allowing emergency services and volunteers to fly in and maxi-cargo drones to deliver sandbags, flood barriers, and temporary accommodation in anticipation of further heavy rainfall overnight and tomorrow.

A temporary eco-plane air shuttle service has been established to keep commuters travelling from Hullerpool to Manchdon and Glasblin, after the motorway and rail services have been disrupted. This service is likely to be operating until the end of the week.

And one woman, who was cut off in her car for 48 hours, had insulin delivered by drone drop, saving her life ahead of the emergency services arriving.

More on this as it comes in, back to you in the studio.

'The House that Drones Built' TV documentary advert

What does building a cutting edge house in one of the most remote parts of the UK involve?

Go inside to find out how drones, e-cargo and the latest innovation in flight supported the design and delivery of the most ambitious build in the UK for the last decade.

"Using this technology, we can now build homes more cheaply and more carbon efficiently for families across the UK, without having to take over large sites. Drones can help us reach even the most remote and wild places where there are no roads"

"We delivered materials and builders between the site's pop-up vertiport and our depot on the same day. This is revolutionary"

"As an architect, I've never been able to see buildings come to life in this way before – the surveillance across the site is the most detailed I've seen, meaning this is one of the safest ways I've worked"

"These are jobs that didn't exist seven years ago - they have crafted these houses through air technology, and as a result we haven't needed lorries, on the ground surveyors or the same number of builders on site as before"

Could this state of the art housing complex built by drones be a blueprint for the house of your future?

[Graphic says Thursday at 9pm]

'AA' vehicle recovery service radio broadcast

Jingle comes in

Coming in with reports of a drone/e-flight collision with a railway bridge [alexa voice as if it's tailored to you says: Five Miles ahead of you] heading north on the motorway.

We understand that situational awareness aircraft are already on scene and relaying to the emergency services. Survey drones are checking the structure of the bridge for damage, so we will be able to confirm when it will reopen, shortly.

Highways drone services are monitoring and regulating southbound traffic.

They have also identified your alternative route suggestion is to [alexa voice: take next exit and follow the A road 3 miles east, and take the ring road to follow the dual carriage way north]

Jingle comes in

Workshop 2 – Discussion guide

Time	Activity	Questions and materials
9.30 - 9.50	Set-up: Facilitators check-in 25 mins	• Test link, mic and camera. • Test who has the host/co-host function and ensure it is allocated to the right team member(s) for recording breakout rooms. Make all moderators Co-hosts. • Change screen name to NAME – Org – Chair/Moderator. • Check everyone is on the WhatsApp group for facilitation team to be able to ask questions, etc. • Meanwhile tech support is assigning participants who are in the waiting room, notetakers, moderators, experts and observers to break-out rooms.
9.50 - 10.00	Participant check-in 5 mins	**Participants log into the online session** • Participants encouraged to join the zoom session early to check-in and check their video/mic.

Time	Activity	Questions and materials
		• Participants encouraged to get a pen and paper, and have their participant pack with them. • Register as people join and change screen names as necessary to first name and first initial of surname (i.e. John H).

10.00 -10.10	**Recap of workshop 1 and online community**
	
	Plenary 1
	
	(10 min)
		Ipsos Chair to welcome everybody back, and give a summary of what was discussed during the first workshop and the online community (5 mins):
		• *[specific notes to be added when these details are known, this will bring attention to convergences and differences across different groups in terms of their views on the technologies]*
		• Clarify who is in attendance, including that all participants are here [*show map of UK with locations participants have been drawn from*]
		
		Chair to remind of ground rules (5 mins):
		    ○ Don't zoom and multitask.
		    ○ Homes – don't worry if your family/ pet comes into view, we're all in the same boat
		    ○ Keep your video on unless your internet connection becomes unstable
		    ○ We will be going into breakout rooms - we've set these up so you don't need to do anything – just let it happen
		    ○ If we lose connection to you at any point in the session [INSERT NAME] will call you to see if we can help bring you back in again
		    ○ We'll be recording for our own notes
		    ○ Confidentiality: we are interested in what you say, not who said what. Your comments will not be attributed back to you in our report. Refer to the printed materials
		    ○ We have shared materials with you, but please respect that these have been designed for the purpose of this exercise, and please don't post photos or content from these on social media or share otherwise
		    ○ Show ground rules and nod to a few:
		        ▪ There are no silly questions/ comments. We're here to hear what you think
		        ▪ You may not all agree with what you are hearing but please do respect each other's views and experience
		
		Chair to remind participants why we are here – to find out what people across the UK think about new flight technologies, how these might affect your day-to-day lives, what controls and safeguards need to be in place, and what more dialogue and research needs to be done on this topic.
		• **Emphasise:** These different technologies don't exist in our skies yet, and we don't know how (or if!) they will. This is a real opportunity to hear what you, members of the public, feel is the right way for these technologies to develop, if you think they should at all.
		
		We will go into breakout rooms now, where you will do activities in groups of around 6.

10.10- 10.45	**Skyways game: Part 1** **Breakout 1**	**Introductions (5 mins)** • *Facilitator introduces themselves and the groups notetaker, and thanks everyone for joining this evening.*

Time	Activity	Questions and materials
	(35 mins)	• *Introductions – let's go round the zoom.* • *Tell us something about yourself (where you live in the UK, what can you usually hear out the window where you live?)* • *Facilitator to join in to demonstrate how to do this.* **Choosing 'Player Cards' (5 <u>mins</u>)** • Over the first workshop and the online community, you have all thought about the future of flight from your own perspectives, and in your own areas. Now we are going to spend some time considering the key topics from other perspectives. • [show Player cards on screen] You should all have these player cards in your packs, but I'll read through them quickly now. Have a think about how important you think each of these characters' views might be to the topic. • Each of you are going to represent one of these characters, so I'm going to ask you all in a random order who you would like to be. *Facilitator <u>quickly</u> reads through each character. Then asks participants in a random order who they will be and why e.g. they identify with them, they think their perspective is important/relevant]* • So the characters we are not using are [POINT OUT THE UNCHOSEN PLAYER CARDS]. • **Do you feel any of these are really important/does anyone want to swap?** **Introduce the map (<u>5 mins</u>)** • Point out the different areas (Cities, towns, rural, mountains, warehouses, port, Isle) • If you would like a zoomed in view of City B, or Town A, you can see them on the back of the board. • Explain the key, and direct participants to find the matching stickers in their pack. **Individual mapping activity (<u>10 mins</u>)** • Now, looking at your 'Player Card', have a think about where your character may prefer the No Fly Zone(s), and Landing Zones, or where they may be completely against them. It's also fine if you think your character may be completely against any of these changes! • Think about how the character may (or may not) want to use services provided by future flight technologies, and whether they will be able to use or access these services. With that in mind, you can place down yellow stickers to create routes between the different places on the map. • Feel free to write down any big concerns/priorities you think your character might have if they can't be expressed with stickers! • **Now have a go on your own. We have about 7 minutes, and I'll give you a warning when you have a couple of minutes left.** **Group discussion on maps (<u>10 mins</u>)** • Go around group and ask them to hold their map up and <u>briefly</u> explain the most important decision they made and what issues came to mind as you were thinking about how it might impact on the lives of their character/player card (average 2-3 mins per participant)

Time	Activity	Questions and materials
		Facilitator comments on any similar decisions or conflicts between characters' priorities. *Go to break.*
10.45-10.55	**Comfort break (10 mins)**	
10.55-11.25	**Skyways game: Part 2** **Breakout 2** **(30 mins)**	**Wildcards (10 mins per Wildcard, <u>30 mins total</u>)** • Now we have three wildcards in our packs, can anybody pick a colour to start with – Red, Blue or Green? • *Facilitator reads out chosen Wildcard, probes the following:* o What issues does this raise for you about the use of future flight technologies? o Does it raise for you additional opportunities/ concerns of future flight services? Which areas on the map might be most affected o Who may be most affected? (Can be 'Player Card' characters or other groups) • Facilitator asks the key question on the wildcard, aim to hear from all participants. *Repeat for remaining two Wildcards*
11.25-11.40	**Summarising maps** **Breakout 2 cont.** **(15 mins)**	**Summarising maps (<u>15 mins</u>)** *Facilitator opens the digital version of the map and recaps the discussion so far, checking that participants agree with the summary of the group discussion:* o Use phrasing such as: … "What I heard was that there was some agreement that…" "There were some real questions about …" • Probe if needed: o Have I missed any important points? o Have you had any new thoughts listening to this recap? o Anything to add about concerns/hopes? *Go to break*
11.40 – 11.50	**Comfort break** **10 mins**	
11.50-12.15	**Skyway code** **Break out 3** **(25 mins)**	**Welcome back and introduce session (<u>5 mins</u>)** *Facilitator shows 'Skyways Code' sheet on screen* • We have now looked at how different groups may view decisions about routes and zones. • With this in mind, as well as how these decisions may affect you , your friends and family or society more broadly, we are going to look at drawing up an imaginary 'Skyway Code' • The Skyway Code will be a set of rules that we think future flight technology should have to abide by, and how decisions about routes

Time	Activity	Questions and materials

		and locations should be made. Think about what controls and safeguards need to be in place.
		
		Skyway Code group discussion (20 mins):
		
		Throughout the following probes, the facilitator should type new rules agreed by participants onto the Skyway Code slide as you go. Reassure participants that they do not have to agree on everything. Where there is contention about any of the rules, just note this in brackets next to the rule so that all views are reflected.
		
		• One of the things some of you felt was important was [INSERT A SHARED PRINCIPLE MENTIONED IN EARLIER DISCUSSIONS]. We could start by adding a rule about this to the code?
		
		Show slide [tbc] showing delivery drones, air taxi, emergency, air shuttle, large cargo vehicles.
		• Do you think there should be different rules for these different types of services? Why?
		• What should these be?
		    o Probe e.g.: routes, heights, time of day, noise levels, cost, public/private ownership, accessibility, standards, regulatory bodies/enforcement, safety, access to/funding and maintenance of infrastructure
		
		Show digital map (if helpful)
		• Do you think there should be different rules for different areas? E.g., rural, urban, town?
		• What should these be?
		    o Probe e.g.: routes, heights, time of day, noise levels, cost, public/private ownership, accessibility, standards, regulatory bodies/enforcement, safety, access to/funding and maintenance of infrastructure
		    o Probe on the area they live in, if not already mentioned – remind them of the windows activity
		
		Show 'Player Cards'
		• Are there any rules that you think your character would add, that you agree is important?
		
		Show 'Wild Cards'
		• Thinking back to the wildcards, are there any other rules we should add?
		• If helpful – remind them of the key point they made during the wildcard activity

12.15-12.40	**Reflections on the way forward** **Breakout 3 cont.** **(25 mins)**	**Reflections sheet individual activity (10 mins)** *Facilitator show the reflections sheet on screen and populate on screen* • You should all have a copy of this in your pack. Before we discuss this as a group, I'll ask you to have a think about this and note any thoughts down on your own for a few minutes. • Before we do this, I'll quickly run through what we are looking for in each of these boxes:

Time	Activity	Questions and materials
		• <u>'We need more info on…':</u> ○ *What further research should be done to inform decision making about new flight tech?* • <u>'We need to resolve…'</u> ○ *What conflicts and trade-offs need to be resolved?* ○ *E.g., conflicts between different priorities and needs? Facilitators refer back to the 'Player Cards' or any contentious Skyway codes if helpful* • <u>'We need to hear from…'</u> ○ *Whose voices need to be heard to make sure their priorities are considered?* ○ *Refer to the player cards and any topics of concern* • <u>'We need to involve…'</u> ○ *Who should be a part of decision making, design, and setting rules?* ○ *Probe: individuals, organisations, special interest groups, experts, the public* *Facilitator gives participants 5 mins to write down ideas on their own.* **Reflections group discussions (<u>15 mins</u>)** • Go round the group one box at a time to hear participant thoughts • Ask other participants to discuss each other's suggestions
12.40 -12.55	**Feedback from breakouts** **Plenary** **(15 mins)**	**Lead facilitator welcomes everyone back (5 mins)** • Reassure we will be ending on time, thank for hard work in breakout groups • Time to listen back now, so please do stay on mute. • If you had extra thoughts to add to the reflections sheet, please feel free to note them down and send a picture of it to [email/number TBC]. **Breakout room feedback (10 mins)** • Each breakout room lead shares ONE Skyway Code rule their group came up with (one that hasn't already been shared by another group), and the general appetite/level of acceptability for this technology in the group. • <u>Keep very brief to ensure all groups are heard from.</u> Reassure that rules that haven't been read out have still been captured and will form the findings of this research.
12.55-13.00	**Thank and close** **Plenary** 5 mins	**Lead facilitator thanks participants and shares next steps for the research.** Chair thanks participants for taking part and being so engaged. The notes from all of your discussions will be thoroughly analysed and underpin our report about the priorities, concerns and hopes that the public have about future flying technology. This is likely to be published in July and we will send a copy of this to you by email. Chair tells them that they'll get their final payment sent over in a few working days.

Online Community – Questions and guide

Post 1	Welcome blog

Purpose	Welcome participants to the online community, remind them why they are there, and let them know what to expect.
Format and settings	• A short summary blog post that stays at the top of the homepage.
Copy	**Welcome to the Future of the Skies online community!** Thank you for all of your contributions at the first workshop. Over the next week, we have a few short tasks for you to do on here. For some of these tasks you need some bits and pieces from the pack we sent you, but for others everything you need is on here. You can space out these tasks over the week, or do them all at once – whatever best suits you schedule! For some of these tasks you can see what other people have said, and it would be great if you can reply to them so you get to know each other better. Other tasks are private, and we've made it clear which is which.

Post 2	**Audio Interviews (20 mins)**
Purpose	Participants hear a range of perspectives from the lived experience interviews.
Description.	Edited audio with cover image, presents quotes from the 12 interviews to demonstrate a range of perspectives.
Format and settings	• Participants play audio clip then answer open text questions about them • All participants can see each other's answers and like/comment on them
Copy	**Task 1 - Word on the street** Alongside the workshops, we've also been talking to people whose lives might be affected by new flight technologies, from freight drivers to wildlife crime detectives. Have a listen to some clips from the interviews we've done. • When you hear about these people's views, what sorts of issues come to mind about how future flight technologies might affect them (positively or negatively)? • How do these clips confirm or challenge what you thought before? Post you answers in the box below, have a look at what other people have said, and reply to them if you like. [OPEN TEXT BOX]

Post 3	**Guess the height (10 mins)**
Purpose	Setting the context and reminding participants about workshop 1 learnings about airspace
Description.	Using the Liminal Space height scale, participants will be asked to guess how high several different types of vehicles/wildlife fly, and then think about at which height they think new air vehicles should fly.
Format and settings	• An image of the height scale will display throughout • Single select questions will ask them to guess the height bracket at which different vehicles / animals tend to fly at • This is followed by an open text question asking them to think about the height at which new air vehicles should fly at (if at all). • Participants can only see their own response– this is so that participants can make their own guesses without influencing others.
Copy	**Task 2 – Higher or lower?**

It's time for a quick quiz! (this task is private, so you **can't** see what other people have said) How high do the following fly?

[SINGLE RESPONSE QUESTIONS]

- How high does a commercial plane fly (not including take-off or landing)?
  - 25,000-46,000 feet / 7,600-14,000 metres
  - 13,000-24,999 feet / 3,960-7,600 metres
  - 5,000-12,999 feet / 1,500-3,900 metres
- How high does a helicopter fly?
  - 13,000-17,000 feet / 3,960-5,180 metres
  - 8,000-12,999 feet / 2,430-3,960 metres
  - 3,000-7,999 feet / 920-2,430 metres
- How high on average does a buzzard (bird of prey) fly?
  - 1,300-2,000 feet / 400-600 metres
  - 1,000-1,299 feet / 300-400 metres
  - 500-999 feet / 150-300 metres
- How tall is an electricity pylon?
  - 200-300 feet / 60-90 metres
  - 100-199 feet / 30-60 metres
  - 50-99 feet / 15-30 metres
- How tall is the Shard in London?
  - 1000-1500 feet / 300-450 metres
  - 850-999 feet / 260-300 metres
  - 800-849 feet / 240-260 metres

And how high or low do you think drones, flying taxis and ecoplanes should fly (if at all)?

[OPEN TEXT BOX]

Post 4	Out of Other People's Windows (15 mins)
Purpose	Imagining the impact of FF tech for other people/locations.
Description.	Replicating the out of the window activity, with the two other locations that are not their own - inspired by what they have heard on the audio.
Format and settings	- Participants follow the prompts on screen, while using the physical materials from their pack to place stickers on the other two windows. - They take a picture of their windows and upload them (for those unable to do so they can just describe what they did). - They then answer a couple of open text questions - All participants can see each other's answers
Copy	**Task 3 – A change of scenery** Remember filling out a view from your window in the first workshop? Now it's time to have a go at the other two windows in your pack, which show places that look more urban or rural than where you live or work. Using your leftover stickers, and any pencils/pens of your own, we want you to imagine what the view out of these windows might look like with or without these new air vehicles. This could be what you hope, or what you fear. Once you're done, take a picture with your webcam or phone and upload the photo below.

<table>
<tr>
<td></td>
<td>Tell us in a couple of sentences why the views out of the windows look the way they do. Does it look different from the window you did in the workshop? If so, why?
How do you think residents in this environment might feel about this view?
How would you feel if you lived there?

Have a look at what other people's views look like too!

If you have any technical issues uploading your photos, please get in touch with [Ipsos colleague's contact details redacted]

[OPEN TEXT BOX WITH IMAGE ATTACHMENTS ENABLED]</td>
</tr>
</table>

Post 5	Photo prompts (15 mins)
Purpose	Imagining their immediate area, in the context of FF implications and opportunities.
Description.	Participants are invited to take pictures from their daily environment (at home, on journeys, at work etc) that reflect their response to this future world.
Format and settings	- Participants are shown a series of prompts and asked to take pictures of their area/space, for instance, the road outside, a balcony if they have one, a garden if they have one, a car park if they have one, to upload as a response, alongside a couple of sentences explaining their reasons. - Participants will have the option to only answer with words to ensure accessibility for those who can't or would rather not use photos. - Participants then response to some prompt questions with open text responses - Participants can only see their own response – this is so that participants do not feel nervous about sharing picture of their home/life
Copy	**Task 4 – Photos from the future** In your pack, you should be able to find three cardboard tokens with the following written on them: - Show a place that represents a journey that you think could change with new types of air travel, or that shows how you feel about future air travel. - Show a location in your life that you think a vertiport could be, or that shows how you feel about them (remember these could be for different services, including flying taxis, emergency services and delivery drones). - Show an object, routine or service in your life that you think could change with future flight, or that shows how you feel about use of new types of air vehicles to complete tasks across the UK. Follow the instructions on these tokens, and upload your response below. This task is private, so you **<u>can't</u>** see what other people have said.

Appendix D - Acknowledgments and attributions

Ipsos project team

- Reema Patel – Project Director

- Michelle Mackie – Deputy Project Director

- Matt Reynolds – Co Project Manager

- Jennifer Gisborne – Co Project Manager

- Edward Camilleri – Project Executive

The Liminal Space

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- Professor Fern Elsdon-Baker, Future Flight Challenge Social Science Research Director, (University of Birmingham)

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- Gary Cutts, UKRI Future Flight Challenge Director

- Dr Will Mason Wilkes, Future Flight Challenge Social Science Research Fellow (University of Birmingham)

Sciencewise

- Suzannah Lansdell, Dialogue and Engagement Specialist

- Diane Beddoes, Senior Dialogue and Engagement Specialist, Lead Evaluator

- Philippa Lang, Public Engagement Programme Manager

In addition the Challenge Board for the dialogue critically reviewed and provided light touch input to the design and development of the dialogue activities and stimulus materials:

- Professor Lucy Budd, De Montfort University

- Dr Melissa Mendez, Cardiff University

- Professor Jack Stilgoe, UCL

Our standards and accreditations

Ipsos' standards and accreditations provide our clients with the peace of mind that they can always depend on us to deliver reliable, sustainable findings. Our focus on quality and continuous improvement means we have embedded a "right first time" approach throughout our organisation.

ISO 20252

This is the international market research specific standard that supersedes BS 7911/MRQSA and incorporates IQCS (Interviewer Quality Control Scheme). It covers the five stages of a Market Research project. Ipsos was the first company in the world to gain this accreditation.

Market Research Society (MRS) Company Partnership

By being an MRS Company Partner, Ipsos endorses and supports the core MRS brand values of professionalism, research excellence and business effectiveness, and commits to comply with the MRS Code of Conduct throughout the organisation. We were the first company to sign up to the requirements and self-regulation of the MRS Code. More than 350 companies have followed our lead.

ISO 9001

This is the international general company standard with a focus on continual improvement through quality management systems. In 1994, we became one of the early adopters of the ISO 9001 business standard.

ISO 27001

This is the international standard for information security, designed to ensure the selection of adequate and proportionate security controls. Ipsos was the first research company in the UK to be awarded this in August 2008.

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This is a government-backed scheme and a key deliverable of the UK's National Cyber Security Programme. Ipsos was assessment-validated for Cyber Essentials certification in 2016. Cyber Essentials defines a set of controls which, when properly implemented, provide organisations with basic protection from the most prevalent forms of threat coming from the internet.

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