Department for Transport

Future of Transport Regulatory Review: Future of Flight

Government Response

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1.1 Executive summary

The Future of Transport Regulatory Review was launched to ask fundamental questions about how transport is regulated and to achieve a flexible, forward-looking regulatory framework that is fit for the future.

The Future of Flight chapter of the Regulatory Review ran between 28 September and 22 November 2021. The questions focused on the areas of:

- New and novel aircraft
- Safety (including alcohol limits and insurance)
- Security
- Unified Traffic Management and its integration with Air Traffic Management (ATM) systems
- Airspace
- Noise
- Infrastructure and digital infrastructure
- Equalities and future plans

The responses represent a fairly broad range of interests across the current aviation (including airports and airlines) and future of flight sector (including advanced air mobility (AAM) and unmanned aircraft systems (UAS) manufacturers and operators, and Unified Traffic Management Service Providers), however, the relatively small number of responses (60) means that this document should be read with caution as it is based on a small sample of predominantly qualitative information. In taking forward next steps we will use evidence from the consultation in conjunction with other sources such as: industry roadmaps, stakeholder engagement, research and working groups.

Readers will observe that there are numerous themes which consistently cut across all of the areas consulted on. We have decided to include all of the themes that were raised in each question to ensure that we do not lose any nuance in illustrating themes that arose, rather than grouping the themes across different questions. However, in progressing next steps we will bring together relevant themes where appropriate, such as ensuring that there is a consistent standard setting process that includes all of the relevant stakeholders in the future of flight ecosystem.

The Government is grateful for the thoughtful responses given and values all of the views expressed. We greatly appreciate the time respondents have taken to respond to the consultation.

1.2 Key findings and next steps

Key findings and next steps in each area are summarised below. They are presented more fully in the relevant sections for each area of this document and also in the ‘Next Steps’ section (section 11).

A key finding from the consultation was the desire for more strategic leadership from Government to support the introduction of new and novel aircraft. In response to this, and as announced in the Flightpath to the Future, we will publish a Future of Flight Plan that will set out the strategic direction for the UK future aviation industry and have created a Government / Industry Group called the Future of Flight Industry Group (FFIG) to develop the Plan. Many of the next steps outlined in this response document will be taken forward in the FFIG. Alongside this, the Government has worked with the Drone Industry Action Group to develop and publish a joint Drones Ambition Statement for the future of the commercial drones sector.

New and Novel Aircraft

Nearly all of the new or novel aircraft identified in consultation responses do fit within current aviation regulation. Of those identified, only Wing-in-ground (WiG) may require some changes to secondary legislation, subject to parliamentary time.

Next Steps: As further new or novel aircraft emerge, the Department, alongside the CAA, will continue to explore the extent of any changes required to regulation and legislation, to ensure that they remain fit for purpose.

Safety

Safety regulation will need to evolve as technology develops.

There was no consensus on the proposed alcohol limits for the operation of unmanned aircraft systems (UAS), although most respondents agreed that limits should be set.

Respondents indicated that insurance requirements for new or novel aircraft should be based on the overall risk of the flight operation and take into account the level of injury or damage an aircraft could do, the size and maximum take-off mass of the aircraft, the flight path and complexity of the operation.

Next Steps: When Parliamentary time allows, the Department will take forward legislative changes to ensure limits for alcohol consumption when operating a UAS and legislation for insurance requirements for UAS.

Security

Respondents suggested a number of areas for legislation or regulation that may need to be amended to limit the potential misuse of new or novel aircraft.

Remote ID was strongly supported by respondents.

Next Steps: Security requirements will continue to be reviewed as new technology is developed to ensure that security standards are sufficient. The Department will work with the CAA to develop and implement a strategy for remote ID in the UK.

Airspace and Unified Traffic Management

The majority of respondents agreed that the CAA should be responsible for regulating Unified Traffic Management systems in the UK. A federated approach Unified Traffic Management was preferred.

Next Steps: The Department will consider the challenges of Unified Traffic Management and airspace integration as part of the FFIG and will support representation of Unified Traffic Management considerations within the Airspace Modernisation Strategy and Working Groups.

Noise

Most respondents believed that noise limits for new and novel aircraft should be a mixture of standards attached to the aircraft themselves and locally enforced aircraft noise limits.

Next Steps: The Department will work with industry and the CAA to collate further data on the noise profile for new and novel aircraft through the duration of flight.

Infrastructure

Respondents identified a large number of physical and digital infrastructure changes that will need to be considered to enable new and novel aircraft to be introduced safely.

Next Steps: The Department will work with industry, and local and regional planning teams to consider the steps needed to integrate any new physical and digital infrastructure required to facilitate the operation of new and novel aircraft.

Future plans

Respondents provided a variety of use cases for new and novel aircraft, with many responses focussing on freight, regional and remote connectivity, medical and emergency deliveries and surveillance and inspection.

Next Steps: The key milestones described by respondents will be used to help structure the Future of Flight Plan. The issues raised will be considered by the FFIG and the actions will be collaboratively taken forward by the relevant stakeholders.

2. Introduction

2.1 Overview of respondents

There were 27 responses received via the consultation online survey, and a further 33 via correspondence to the Department for Transport. The total number of responses was 60.

Of those who responded:

2 represented individuals

26 represented businesses

32 represented other organisations

All respondents

A broad range of stakeholders across the current aviation and Future of Flight sector are represented amongst respondents. We categorised all 60 respondents into 'organisation type' as below:

Businesses

12 represented aerospace and / or air transport organisations

4 represented airports

10 represented 'other businesses'

Other types of organisations

6 represented research institutes

9 represented regulators / public bodies

12 represented membership organisations

2 represented trade unions

3 represented public / private partnerships

2 represented individuals

The above categorisations were not self-reported but inferred from respondent information. We acknowledge that some organisations may cut across multiple sectors, so in these instances we have used our own judgement to categorise respondents.

Respondents were from a diverse range of locations across the East Midlands, East of England, London, North West, South East, South West, West Midlands, Yorkshire and the Humber, and outside the United Kingdom.

Respondents from businesses included sole proprietors, as well as small (0 to 49 employees), medium (50-249 employees) and large (250 or more employees) businesses. Size also varied across respondents from other types of organisations such as research institutes, regulators, or public bodies for example, with small, medium, and large organisations represented.

All responses to this public consultation have been considered. As well as considering the full written response to questions, we have drawn out the common themes that have emerged in order to obtain an indication of the most frequently expressed points of view. We have also included high-level summary tables for the quantitative questions to show the range of opinions expressed.

Each of the areas outlined in the 'Executive summary' were under consultation and are considered in this document. For each area, the responses are summarised, and themes drawn out, and Government's response is laid out in the 'next steps' section at the end of this document.

2.2 Structure of this document

Each area consulted on has been split into two sections which includes the background of the area and a summary of the responses for each question. The next steps for all the areas are covered at the end of the document. Questions 1-9 in the consultation were used to gather data about respondents.

Drones will be referred to as unmanned aircraft systems (UAS). We will use the term 'new or novel aircraft' to refer to any aircraft, crewed or unmanned, that performs a function not currently covered in legislation or regulation, this includes, but is not limited to:

- AAM (Advanced Air Mobility) aircraft including where they may provide sub-regional and regional routes performing a journey between places underserved or not served by aircraft;

- Unmanned Aircraft, defined in legislation as any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board, including unmanned aircraft flying Beyond Visual Line of Sight (BVLOS);

- Autonomous and other non-piloted aircraft;

- Other vehicles using airspace serving a function not currently covered by regulation or legislation.

3. New and Novel Aircraft

3.1 Background

We want to ensure that new forms of aviation fall within existing regulation for the safety of other airspace users and other parties such as people and property on the ground. Government is committed to working with industry and the regulator to bring all new types of aviation technology within UK regulation.

3.2 Questions

Question 9
In your view are there any new or novel forms of flight that use UK airspace that may, as it currently stands, not fall within aviation regulation?

	Number	% of Question Respondents	% of Total
Yes	27	64%	45%
No	11	26%	18%
Don't know	4	10%	7%
No response	18	N/A	30%
Total	60	100%	100%

Question 10
What are these new and novel aircraft and how can we best ensure that they are within scope of our current aviation regulation?

What are these new and novel aircraft?

Unmanned Aircraft Systems (UAS)

There were a significant number of respondents who suggested that UAS are not covered by current aviation regulation. Specifically, UAS Beyond Visual Line of Sight (BVLOS) operations and autonomous drones were pulled out as a theme. BVLOS operations have primarily only been authorised for use in segregated airspace (airspace dedicated for use by the UAS) following a time-limited authorisation by the CAA. Routine BVLOS operations outside of segregated airspace is generally only possible once a Detect and Avoid capability is available for UAS - to prevent collisions with other aircraft. A couple of respondents suggested that the use of UAS for logistics operations are not included in current aviation regulation. It was mentioned that sub-250g micro UAS are not subject to regulation.

Electric vertical take-off and landing (eVTOL)

An equally significant number of respondents suggested that they did not believe Advanced Air Mobility (AAM) and eVTOL aircraft fall within existing regulation.

Autonomy

Several respondents pulled out autonomy specifically for BVLOS UAS and eVTOL. It was mentioned that there are currently no standards or certified technology for Detect and Avoid technology as well as Unified Traffic Management.

Different energy systems

A handful of respondents suggested that new aircraft with different energy systems, particularly hydrogen, do not fit within existing regulation. It was mentioned that in 2020 the world's first hydrogen fuel cell powered flight of a commercial grade aircraft took place in the UK.

Other types of flight

Some rarer types of new flight technology were also mentioned such as Electric Paragliding, Airships, Innovative Personal Flight and High Altitude Platform Systems (HAPS). A couple of respondents suggested that 'wing-in-ground' effect aircraft were not included in current aviation regulation.

How can we best ensure that they are within the scope of our current aviation regulation?

New or amended regulation changes

The dominant theme that emerged when considering how to ensure new and novel aircraft are within scope of current aviation regulation were new or amended regulation changes. The majority of respondents mentioned regulation and standards without mentioning specific pieces of legislation that need to change. The responses focused on vehicle airworthiness and operations regulations. The common principle was that regulation should be appropriate for Future of Flight technologies.

Standards

The development of standards was another significant theme raised by respondents. It was acknowledged by a couple of respondents that technical standards are still in development. It was noted that existing aviation legislation was not developed with Future of Flight considerations in mind. The types of standards for development that were mentioned included aircraft airworthiness, the training and licensing of personnel, noise and environmental impacts, primary propulsion batteries and airspace (separation, surveillance and performance) standards. It was mentioned that these standards should be based on existing aerospace and aviation practices.

Airspace changes

Although the question focused on aircraft, a common theme that emerged was the need for airspace changes. It was suggested that re-organisation of airspace will be as

important as new and emerging aircraft technology, and that the aviation ecosystem should be considered as a whole. It was mentioned that protecting take-off and landing zones and airspace designated for specific flight corridors may be needed. It was also mentioned that consideration needs to be given to robust segregation of the airspace to ensure safe separation is maintained from other traffic. It was suggested that current airspace users should also be able to benefit from technological advances.

An iterative regulatory process

Another common theme was that respondents suggested that a dynamic, iterative regulatory process will be needed which will future proof the industry. It was suggested by a couple of respondents that regulation could be overtaken by rapidly evolving technology, and that regulatory processes should reflect that earlier solutions may not work for later problems. It was mentioned that any new regulation should build from existing aviation regulation. It was also suggested that there is a need to consider regulatory fairness to ensure legislation is not overburdensome and does not hinder innovation.

Electronic conspicuity

Linked to airspace, a minor theme was that electronic conspicuity needs to be included in regulation. Respondents suggested that if all aircraft had electronic conspicuity then this would enable Detect and Avoid capability, which would enable UAS BVLOS operations and integration into airspace with other aircraft. It was mentioned that a separate back up power supply and beacon for detection purposes would be useful.

New ground infrastructure

Another minor theme were the changes needed for associated new ground infrastructure. It was suggested aerodrome safeguarding legislation will need to be expanded to include new types of aerodromes. It was mentioned that there will be land use planning implications for the new ground infrastructure.

Alignment with international standards

A handful of respondents suggested that current regulation should align with international standards. It was suggested there is an opportunity for the UK to influence and shape global regulatory work groups as the scope of aviation regulation changes. It was mentioned that any new regulation should be consistent with the principles and strategies set forth in the Chicago convention.

CAA regulatory sandboxes

A couple of respondents highlighted that the CAA regulatory sandboxes have been useful at providing information and learnings about the regulatory needs of the industry, and that Government should increase the use of regulatory sandboxes to drive innovation. It was also mentioned that CAA capacity could be a potential constraint in providing regulatory advice to innovators.

4. Safety

4.1 Background

The safety of crew, passengers and the general public remains the priority of government and the regulator when considering the introduction of any new or novel aircraft in the UK. Accordingly, it is important that any new or novel aircraft are introduced in a safe way.

Safety and risk management processes are well-established in the aviation sector, but new and novel aircraft may require a new approach. Recognising core principles of aviation regulation, new or novel aircraft will need to meet the highest levels of safety.

We want to ensure any vehicle operating in UK airspace is subject to an appropriate aviation safety framework. To support innovation and ensure these new vehicles can be operated safely and securely, we are considering what amendments to UK legislation may be necessary.

Safety includes a broad range of areas from initial and continuing airworthiness of aircraft, their maintenance, safe operation and integration with other airspace users, through to air traffic management, pilot licensing and training.

4.2 Safety Questions

Question 11
In your view, are the existing legal and regulatory frameworks sufficient to introduce new and novel aircraft in a safe way?

	Number	% of Question Respondents	% of Total
Yes, both frameworks are sufficient.	4	8%	7%
No, the legal framework requires changes.	3	6%	5%
No, the regulatory framework requires changes.	14	27%	23%
No, both frameworks require changes.	27	53%	45%
Don't know	3	6%	5%
No response	9	N/A	15%
Total	60	100%	100%

Question 12
Why do you think the existing legal framework is insufficient and what changes are required?

Only a small number of responses were received for this question as most respondents felt that both legal and regulatory frameworks need changing. It was mentioned by a couple of respondents that there is a lack of clarity around electronic conspicuity, how current regulation applies to AAM and where responsibility would lie in an autonomous BVLOS operation.

Question 13
Why do you think the existing regulatory framework is insufficient and what changes are required?

Regulation will need to evolve as technology develops

The dominant theme was that regulation will need to evolve as the technology it applies to develops. Having a flexible regulatory framework was a related theme that was brought out in the responses, as was the suggestion of starting with the regulations that are currently in place. It was mentioned that the regulatory framework needs to develop at a faster rate to enable the advancement of this sector. A couple of respondents mentioned that the existing regulatory framework is insufficient for the potential use cases of new and novel aircraft.

Global presence of the UK

A strong theme highlighted by respondents was that the UK could increase its presence on the global stage if its regulatory framework was changed. It was mentioned that the UK could leverage the reputation and expertise of the CAA.

Certification

The development of certification rules for new and novel aircraft was a minor theme that was present across responses. It was mentioned that the certification of new types of aircraft must be equivalent to the standard for commercial manned aviation. It was also suggested that there is sufficient novelty for new aircraft that new certification rules need to be developed.

Examples of why the regulatory framework needs to change

A number of examples were suggested for why the regulatory regime needs to change. A minor theme concerned the rules for pilot licensing for new and novel aircraft. It was also mentioned that a capable and well-resourced regulator is needed for new and novel aircraft. The importance of having standards and aligning with international standards was also highlighted by responses. It was suggested that changes to the regulatory framework are needed to enable the safe transportation of dangerous goods by UAS. It was also mentioned that the regulatory framework may need to change to ensure airspace safety.

Question 14
Why do you think the existing legal and regulatory frameworks are insufficient and what changes are required?

The answers to this question should be read in conjunction with the previous two questions to understand how the legal and regulatory frameworks were seen to be insufficient.

Why do you think the existing legal and regulatory frameworks are insufficient?

Airspace

Regulation of current airspace was the most dominant theme expressed by respondents. It was mentioned that UAS operations are largely constrained to operating in segregated airspace with restrictions imposed either by height, use of specific zones or remote airspace. A couple of respondents suggested that one of the challenges of airspace involved its development in line with the expected increase in scale of new flight technologies.

Range of new and novel aircraft

The broad range of potential new and novel aircraft was another theme for why current frameworks are not sufficient, and the autonomous nature of some operations was also mentioned.

New types of environment

A couple of respondents suggested that the urban environment in which many new and novel aircraft will be operating is another reason why existing frameworks are insufficient.

The regulator

A couple of respondents suggested the regulator was an issue, specifically the technical expertise of the current regulator and the possible need for multiple regulators.

Public acceptance

Public acceptance was also mentioned by a small number of respondents for why change is required, particularly relating to attitudes regarding safety.

What changes are required?

Airspace

The most significant theme mentioned by respondents was airspace. A sub-theme of airspace was ensuring the integration of new and novel aircraft into the same airspace as conventional manned aircraft in a safe way. Fair and equal access to airspace was also mentioned. It was suggested that Electronic Conspicuity should be legislated and mandated for all airspace users. Separation between aircraft was another sub-theme, as was BVLOS operations becoming more routine. Standards for airspace was mentioned by a couple of respondents as a way of implementing the changes.

Insurance and liability

Insurance and liability emerged as a strong theme, particularly for how insurance will function amidst increasing reliance upon artificial intelligence for autonomous operations. A sub-theme was the need to consider where the responsibility should lie should an incident resulting in injury or damage to property occur without the involvement of a pilot of any kind.

Vertiports

Another strong theme was that changes are required to enable AAM and the vertiports needed for its operation. For example, vertiports may often be located in high density areas off-limits to conventional aircraft. It was mentioned by a couple of respondents that amendments to existing frameworks will be needed to enable vertiport licensing.

Certification

Certification of new and novel aircraft was a common theme expressed by respondents, for example, with regards to ensuring that new flight technologies can be compliant with existing standards. Personnel training and aircraft licensing was mentioned by a couple of respondents.

Question 15
In your view, do new or novel aircraft require a different approach for managing risk?

	Number	% of Question Respondents	% of Total
Yes	21	57%	35%
No	10	27%	17%
Don't know	6	16%	10%
No response	23	N/A	38%
Total	60	100%	100%

Question 16
What might risk management for new and or novel aircraft look like?

Specific risk management for Future of Flight

There was consensus that a specific approach to risk management for Future of Flight is needed due to the differences between current aircraft and new and novel aircraft. As well as structural differences, the current manned aviation risk management would not be appropriate as it would not be cost effective, proportionate to the risk level, would not account for new failure modes, and would not take into account potential new methods of hazard identification.

Responses suggested the main differentiator to existing manned aviation is that new flight technologies are more reliant on an aircraft system rather than systems primarily contained within aircraft itself, they also place more importance on a ground component and potentially have several data links. This is partly due to the trend towards Unified

Traffic Management. The difference in the role of data for new flight technologies was a strong theme and it relates to new and novel aircraft's need for interoperable data and mitigating the risks associated with potential cybersecurity breaches.

Respondents also mentioned that new flight technology structures will also differ as the combination of eVTOLs and UAS will result in increased traffic density. This new aircraft density will be higher than that accounted for by frameworks for traditional aviation risk management and therefore a new approach will be required.

One of the challenges expressed by respondents was in developing an accurate risk picture when there is so much uncertainty due to new flight technologies being relatively untested, and hence there could be a gap between current simulations and real-world testing.

Adapted licensing scheme / certification

Linked to having a specific risk management for Future of Flight, was the sub theme of an adapted licensing scheme and certification. Those who mentioned this theme suggested there is a need for testing and the award of an airworthiness certificate, as well as certified solutions for managing risk in the air that include Unified Traffic Management and Detect and Avoid technology. A risk that was mentioned was that new UAS systems have opened the market to anyone, and some new operators may have no prior knowledge of the aviation industry.

Risk management will need to consider more than the aircraft

A strong theme that emerged was that it is important that risk management considers more than the aircraft. The different aspects mentioned included the individual aircraft, interactions with other airspace users, air traffic management, ground risk such as low flying UAS, flight restrictions such as limitations around built up residential areas, the sharing of risk information, changing airport infrastructure and pilot licensing.

Different approaches for different types of aircraft

A smaller theme that emerged was the need for different risk management systems appropriate for the different types of new aircraft and operation. Explicitly different risk profiles may be due to numerous factors such as autonomous aircraft without a human in the loop, use cases such as remote island operations, varying types and configurations of aircraft and any differing capabilities that new aircraft present.

Dynamic

A small number of respondents highlighted that risk management should be dynamic and agile in order to be able to adapt to any future regulatory challenges. Working with industry to co-develop innovation approaches was also suggested, as was providing flexibility to not constrain new aircraft by today's standards.

Autonomy

A smaller theme suggested autonomy needs to be considered as human decision making is replaced. It was mentioned that the question of whether existing levels of hardware and software assurance for safety critical systems are adequate with no human in the loop will need to be considered. It was also mentioned that due to autonomy, a greater emphasis

must be placed on cyber security and that whilst the rudimentary beginnings for a potentially autonomous system currently exist, there could be risks from non-cooperative aircraft.

Question 17
In your view, do any systems related to new or novel aircraft require a different approach for managing risk to support the safe introduction of new or novel aircraft?

	Number	% of Question Respondents	% of Total
Yes	25	66%	42%
No	6	16%	10%
Don't know	7	18%	12%
No response	22	N/A	37%
Total	60	100%	100%

Question 18
Which related systems would need a new approach to risk management and what might that look like?

Which related systems would need a new approach to risk management?

Overall, the responses to this question suggested that Future of Flight safety needs to be re-considered in order to maintain robustness in the face of industry development and change.

Airspace

The dominant theme was that a new approach to risk management is needed for airspace. Operating in more complex and new classes of airspace will increase demands on safety management.

The increasing complexity of airspace environments will need to be considered as flights will take place in more congested airspace and over densely populated urban areas. Another commonly expressed reason for airspace needing a new approach was the transition towards a Unified Traffic Management framework.

There were numerous respondents who stressed that the change in environment under the flight path needs to be considered. Specific concerns included the lack of safe emergency landing areas within urban areas, and risks to persons and property on the ground such as the potential for flying debris.

Respondents also felt that the changes in the broader airspace environment were significant. For example, flying in close proximity to tall buildings may cause extreme localised weather occurrences. In order to combat this, a couple of respondents suggested

that aircraft need to be able to detect wind shear, turbulence and the wake vortices of other aircraft.

Scale

A unifying theme across the respondents was the need for risk management to adapt to the expected increased scale of new and novel aircraft. Reasons for this included the intensity of operations in congested airspace, the strain placed on the current surveillance system and the increased risk of UAS colliding with or disrupting manned aircraft operations.

Energy Systems

A minor theme that emerged concerned energy systems on the aircraft and on the ground, such as battery charging, energy management, temperature regulation and emergency procedures. It was mentioned that a review and risk assessment will especially be needed as small groups of passengers will likely be in close proximity to aircraft that are charging or connected to high voltage systems.

Aircraft systems

Aircraft systems also emerged as a minor theme. Specifically, geospatial, topographical, aeronautical information management systems, Detect and Avoid systems and communication systems were pulled out by the respondents. It was mentioned that type certification should be adaptive and proportionate to the risk of operations so that aircraft deployed in low risk operations should go through a less complex certification process.

Associated infrastructure

It was mentioned that vertiports and UAS port infrastructure should be considered, as well as the availability of safe emergency landing sites within urban areas.

Insurance

It was mentioned that consideration should be given to insurance and liability regimes, and that clarity on a more specific regime will assist all respondents in the Future of Flight ecosystem including insurers and manufacturers.

What might a new approach to risk management of related systems look like?

Airspace management

The dominant theme concerned airspace management. Some respondents suggested that existing air traffic management systems will need to be integrated with the development of Unified Traffic Management. Others suggested that new aircraft will need more advanced flight management systems both on the aircraft such as Detect and Avoid, as well as general flight system processes such as separation standards from other air and ground systems and other airspace users, as well as controlled flight close to buildings.

A handful of respondents suggested that aircraft will need to be adapted to operate in future airspace environments, such as through the introduction of Electric Conspicuity on aircraft, sensors, actuation and system control. A couple of respondents suggested that

systems such as Electric Conspicuity and autonomy de-conflicting systems need to be mandated.

Standardisation and certification

The next most common theme was the suggestion of standardisation. Specific suggestions included using guidance from international standards such as The International Civil Aviation Organisation (ICAO) guidance, increased digitalisation leading to operators working in a standardised way, certifying safety systems and licensing staff using existing qualifications.

Risk assessment for the whole industry

Another common view was the need for risk assessment for the whole Future of Flight industry. Specific suggestions included reviewing risk assessment for energy management, mitigating single sources of failure such as overreliance on GPS, and assessing risk for new issues such as UAS collisions with manned aircraft and the increased risk to persons and property on the ground.

A small number of suggestions were made including type certifying operations as proportionate to the risk of an operation and re-training all stakeholders to understand the risks associated with any new updated operation.

Stakeholder collaboration

It was mentioned that risk management should involve collaboration with all stakeholders in the industry, and should be developed by consulting stakeholders, risk assessments and conducting trials.

4.3 Alcohol Limits

The consultation proposed the following specific limits regarding the proportion of alcohol in the breath, blood or urine of a remote pilot immediately before, whilst or immediately after flying in each category of UAS operation:

Category of operation	Prescribed limits: breath (microgrammes / 100 millilitres)	Prescribed limits: blood (milligrammes / 100 millilitres)	Prescribed limits: urine (milligrammes / 100 millilitres)
Open category	13	29	39
Specific category	9	20	27
Certified category	9	20	27

The above limits that were proposed for the specific and certified categories are the same as those that currently apply to a pilot of an aircraft. The limits that were proposed for the open category are slightly higher than those proposed for the specific and certified categories to reflect the fact that the operations that take place in that category pose less of a risk.

However, the limits that were proposed for all three categories are relatively low (lower than those that apply to driving a motor vehicle) as UAS have the potential to cause substantial harm to those on the ground or to other forms of aviation, regardless of the category of operation in which the flight occurs.

Question 19
Do you agree or disagree with the alcohol limits proposed for the different categories of operation of unmanned aircraft?

	Number	% of Question Respondents	% of Total
Agree	12	32%	20%
Disagree	13	35%	22%
Don't know	12	32%	20%
No response	23	N/A	38%
Total	60	100%	100%

Question 20
What limits would you propose for each category and why?

The majority of respondents who disagreed with the proposed limits were of the view that the limits that apply to manned aviation should apply to all UAS categories. A common theme was that the open category should not have a less stringent limit. Some responses pointed to the fact that this category is the least regulated and others highlighted the risk of causing confusion by having different limits for different categories.

Of those who disagreed with the proposed limits, some suggested that the limit should be reduced to zero – either for all three categories or just for commercial or public service pilots. On the other hand, some believed that the limits that exist for alcohol consumption when driving a motor vehicle would be more appropriate for the open and specific categories. They suggested that flying a UAS is less risky than driving a vehicle and that the current proposals for the open and specific categories are therefore too stringent.

Question 21
Supply any supporting evidence or comments you have on these alcohol limits.

Respondents pointed out that limits for manned aviation are already in place and have been found to be effective, so it makes sense to apply them to at least the specific and certified categories, if not also the open category. Others pointed out that any object in the air, even a small one, could cause harm.

It was mentioned that there is a lack of data and evidence on the risk that UAS pose, the proposed alcohol limits and the effect that alcohol has on those flying a UAS. It was queried how the limits will be policed or enforced.

4.4 Insurance

Question 22
What factors, if any, do you think the Secretary of State should be required to consider when deciding on the necessity of and the appropriate level of insurance for new or novel aircraft, including unmanned aircraft?

Risk and characteristics

An especially dominant view was that insurance should be based on the overall risk of the flight operation, by accounting for the characteristics of the operation. Respondents suggested this should include the level of injury or damage an aircraft could do to a member of the public or property, the size and maximum take-off-mass of the aircraft, the flight path and the complexity of the operation (including weather conditions and airspace congestion).

It was noted that retained legislation sets out rules and procedures for flights involving unmanned aircraft based on risk, categorising flights into either the 'open', 'specific' or 'certified' category[1]; and basing insurance requirements on the purpose of the flight contradicts this approach, introducing a second framework only used for defining insurance requirements, might be confusing. It also introduces an additional level of complexity that may reduce adoption and acceptance, as well as putting constraints on enforcement.

There were some views that indicated insurance should also be determined by competency and / or experience of the remote pilot for UAS, the reliability of the aircraft's track record, the value of any cargo being carried or if the flight is carrying passengers. It was also suggested that any fail-safe features on the aircraft should be considered, such as ballistic parachutes, redundancy of lift or propulsion devices.

It was a well-supported view that insurance requirements should apply to the certified category of operation.

It was mentioned that the appropriate insurance requirements for unmanned systems are addressed in ISO21384-3.

Liabilities

Some respondents suggested that liability regimes should drive the insurance requirements and that greater clarity about the type of insurance, and its level, can be better understood if it is clear where liability will fall in the event of loss of control in a Future of Flight system. It was suggested that Government reviews where liabilities may fall and clearly defines this in legislation.

It was suggested that a liability regime should cover liability and insurance arrangements for injured persons and damaged properties in the event of illegal or malicious use of UAS

[1] The open category is for the lowest risk operations, the specific category is for higher risk operations and the certified category is for the highest risk operations.

or new or novel aircraft, and in the event of untraced or uninsured remote pilots / responsible parties.

The Consumer Protection Act 1987 was mentioned; it does not currently define a specific product liability regime for UAS, but respondents suggested it could be used as a legislative vehicle in future. It was stated that liability for ground damage is currently attributed to the owner of the UAS under the Civil Aviation Act 1982, while liability for a mid-air collision (and injuries to passengers onboard another aircraft) will be assessed by principles of negligence, or may be channelled through the operator of the aircraft carrying passengers under the Montreal Convention or other statutory provisions.

Third parties

It was a well-supported view that insurance should cover third parties including individuals on the ground and at sea, and that it should be appropriate to the level of risk.

Insurance equivalent to commercial aircraft

A common view amongst respondents was that insurance should be set equivalent to commercial aircraft, as set out in the retained regulation on aviation insurance. Reasons for support included new and novel aircraft not gaining an undue cost advantage over conventional aircraft and to ensure equivalent safety procedures are followed for new and novel aircraft.

Types of UAS

There was a recurring theme that all UAS should have insurance, including third party liability for smaller, more leisure based UAS, or at least the UAS that require registration (>250g) should require insurance. Reasons for this support included those flying for 'work' purposes are more likely to operate within a well-structed process and be better trained than leisure UAS users. Excluding recreational pilots from needing insurance will potentially leave some of the theoretically most risky segments of pilots exposed. A negative effect on the uptake of UAS by industry and damage to public perception of UAS integration were mentioned as possible risks to not mandating insurance for all types of UAS.

A few respondents opposed this view, saying that they do not support a blanket requirement of all UAS being required to have insurance, nor a “one-size fits all” approach, as it is excessive and disproportionate and other activities that also pose a risk to third parties, such as cycling and horse riding, do not require insurance. It was suggested that parties should have the option to opt into insurance if not mandated by law. It was also suggested that industry should set the insurance requirements / standards.

Funding

Suggested funding models included the operator of a UAS either self-funding or insuring liabilities covering third parties or damage. It was suggested that operators should be required to demonstrate proof of financial capacity as part of their operational approval or provide evidence of adequate insurance.

It was also suggested that a Government fund be set up, similar to the Motor Insurance Bureau, whereby a percentage of all insurance premiums are paid to an appropriate body, providing a mechanism for the UK to compensate those affected by untraceable or

uninsured remote pilots. An alternative suggestion to create a Government fund was to use the CAA's Drone and Model Aircraft Education System (DMARES) registration fee towards paying out in instances where an operator was untraceable or uninsured.

Evidence and data

A handful of responses cautioned that a good evidence base is needed to generate the confidence required for the setting of informed, proportionate insurance regulations which effectively manages risk. Some suggested working with insurance industry experts to help develop a better understanding of risk. Alternative suggestions included using aircraft testing or certification data to better understand reliability and risk, and using historic operational flight data to monitor compliance and calculate premiums.

It was suggested that to help reduce premiums, insurance companies could adopt a similar approach to telematic 'boxes' used in the car insurance domain, and an example use could be adherence to a published flight plan. It was suggested this could lead to a reduction in premiums as track records are established and reliable operators become recognised as such.

5. Security

5.1 Background

The UK will need to be responsible for the physical and cyber security of individuals, businesses and the UK as a whole. This will ensure that the development of new technology markets are protected. Security includes both national security and ensuring individuals, communities and businesses are protected from abuse, malicious actors or unlawful interference.

The police will need to have appropriate powers to address misuse of new flight technologies. This will include ensuring powers, restrictions and offences are available and clearly defined and considering how the UK can ensure that new technology is operated appropriately for the benefit of society.

Measures will also be needed to ensure the security of related systems that enable this new technology such as Unified Traffic Management.

5.2 Questions

Question 23(i)
Are there, in your view, areas of legislation or regulation, including those relating to police powers and criminal offences, that need to be amended to limit the potential misuse of new or novel aircraft?

	Number	% of Question Respondents	% of Total
Yes	14	39%	23%
No	7	19%	12%
Don't know	15	42%	25%
No response	24	N/A	40%
Total	60	100%	100%

Question 23(ii)
Are there areas of legislation or regulation that need to be amended to ensure the security of new and novel aircraft and related systems?

	Number	% of Question Respondents	% of Total
Yes	20	56%	33%
No	4	11%	7%
Don't know	12	33%	20%

No response	24	N/A	40%
Total	60	100%	100%

Question 23(iii)
Are there areas of legislation or regulation that need to be amended to ensure the security of other individuals, businesses, and national security to allow for the introduction of new and novel aircraft and related systems?

	Number	% of Question Respondents	% of Total
Yes	18	50%	30%
No	5	14%	8%
Don't know	13	36%	22%
No response	24	N/A	40%
Total	60	100%	100%

Elaboration of answers provided

A small number of respondents expanded on their responses to Question 23 and discussed the following:

Existing Legislation and review

Some respondents indicated that the current civil aviation regulatory security landscape is robust, and that the Air Traffic Management and Unmanned Aircraft Act 2021 addressed security concerns. It was suggested that as the Act applies nationally, it should be adjusted to consider the global implications.

Other regulations that it was suggested should be reviewed included the Air Navigation Order (ANO) 2016, the Aviation Security Act 1982, retained EU legislation and Aerodrome Safeguarding Circulars. There was support for the Secretary of State's aviation security powers to be updated to enable the CAA to optimise development, implementation, and oversight of security arrangements.

Some respondents were critical of the Regulation of Investigatory Powers Act (RIPA) 2000, which governs covert surveillance, for its lack of safeguards concerning surveillance, including how data is retained and used.

The Network and Information Systems (NIS) Regulations 2018 (review upcoming) and the Computer Misuse Act (CMA) 1990 were also referenced for review, to ensure they remain fit for purpose. It was stated that at present, the NIS regulations for the aviation sector only apply to passenger services and once an organisation has exceeded a certain size.

It was suggested to align regulation, particularly for UAS and critical systems that are not currently certified, with other legislative and regulatory frameworks that are being established for other sectors or connected devices, such as the forthcoming Product Security and Telecommunications Infrastructure Bill and the EU Cybersecurity Act.

It was noted that ICAO Section 17 Security (if operating internationally) did not reference or have in-depth detail referencing of "new or novel aircraft" or their operation.

New legislation

There was strong encouragement for remote ID (or a transponder) and Electronic Conspicuity to be mandated for all airspace users. Specifically, it was cautioned how the challenges of autonomous operations place additional demands on identifying and enforcing penalties on rogue operators, as ‘file and forget’ type flights may be conducted without operatives being in situ. There was a minor theme that stressed identification means needed to be secure. Additionally, there was a minor theme of support for minimum cyber security requirements for all unmanned and manned aircraft, regardless of size, with the aim of ensuring interference in any way is near impossible, including resistance to spoofing and jamming. It was mentioned that it would be preferred for there to be continued consultation on remote ID whilst a national position is formed.

It was requested that technology and information relating to remote ID is easily and cheaply integrated into UAS and counter UAS, without the need to purchase further sensors or receivers. It was suggested to use existing communications systems, such as using the existing mobile phone tower network. In contrast, it was stated there is a risk in the assumption that the current suite of sensors on both UAS and on the ground are sufficient for the management of low-level airspace (described further in response to Question 25).

It was suggested that creating regulatory frameworks that establish the core principles in law, and allowing detailed requirements to be established through secondary legislation or guidance, is the most suitable model for passing flexible regulation that can easily adapt to the evolving market.

Support was also shown for legislation seeking to:

- Address the vulnerability of Global Navigation Satellite Systems / Global Positioning Systems which play an important role in reliable situational awareness by having resilient Position, Navigation and Timing (PNT). Reference was made to the National Timing Centre, run by the National Physical Laboratory, which is developing the capability to provide resilient time signals, which underpin PNT.
- Take interconnectivity into account, define how these interconnections between aircraft and systems will be considered, and where risk ownership belongs.
- Mandate drone manufacturers to build in appropriate safety, environmental and privacy measures to their products.
- Provide secure and resilient communications.
- Provide data standards: ensuring consistency in interoperability and confidence in data being used.
- Give sensor assurance.
- Provide reliable simulations.
- Provide a network of testing capabilities, including virtual testing, linked by common data standards and test methodologies.

Police powers

In circumstances similar to the incident at Heathrow in December 2019 or for protection of Critical National Infrastructure (CNI), additional police powers were suggested to cover disrupting a UAS or control system through jamming, spoofing and taking over a UAS or control system. It was suggested that all relevant authorities have access to Unified Traffic Management and remote ID systems for investigative purposes and that any powers that specific authorities have should reflect the potential commensurate risk posed.

There was also support for the police having immediate powers to enforce offences such as not having mandatory Electronic Conspicuity, Unified Traffic Management or Detect and Avoid capabilities. There was support for new requirements for registration of electronic ID to help with enforcement. Police powers around privacy were recommended in order to adequately protect the public, especially in densely populate areas, and sources were given identifying privacy as a key concern in relation to the use of UAS.[2]

Technical standards

Some respondents indicated support for remaining aligned with international standards, including those developed by the Joint Authorities for Rulemaking on Unmanned Systems (JARUS), ICAO, Remotely Piloted Aircraft System's (RPAS) working group, and the European Union Aviation Safety Agency (EASA).

Question 24
Are you aware of any technological requirements necessary to introduce new and novel aircraft in a secure way?

	Number	% of Question Respondents	% of Total
Yes	21	55%	35%
No	8	21%	13%
Don't know	9	24%	15%
No response	22	N/A	37%
Total	60	100%	100%

Question 25
What are these technological requirements and what factors do you think should be considered when regulating their use?

There were several key themes identified in response to this question. Security was highly mentioned amongst respondents, along strong support for communications infrastructure. Legislative options and considerations were discussed by a handful of respondents.

Cyber security

[2] NESTA Flying High 2018 report (page 20) and Institution of Mechanical Engineers' Public Perceptions: Drones 2019 report (page 7)

A key theme raised by respondents was having a resilient cyber security system. There was some encouragement to engage early with security stakeholders. It was mentioned that the protection should not only cover individuals, communities and businesses, but also assets and infrastructure.

The need for a high level of security for communications was emphasised, especially for AAM carrying passengers. It was mentioned that some airborne signals, such as ADS-B, are at a significant risk of hoaxing.

The current use of serial command and control on most UAS was criticised for its vulnerability to hacking as it does not have appropriate security, encryption or technology in place to ensure protection against denial of service attacks[3] and redirection of AAM or UAS.

Physical security measures

For AAM, it was suggested that physical security measures, such as passenger screening and authentication technology for pilots and passengers, are required to prevent tampering and to ensure the safety of the flight.

Physical protection for a UAS itself was mentioned. It was suggested that in some circumstances additional measures may also be required for antenna arrays and launch and recovery systems. Terminal security was also discussed in detail by a handful of respondents, noting it will require study and evaluation in order to consider whether passenger aircraft should be treated similarly to buses, trains and taxis, or like manned passenger aircraft. Biometric identification systems were mentioned as a possibility for pilots and passengers for both AAM and UAS operations in busy airspace or over urban areas.

Communications Infrastructure

A key theme that emerged was having a solid communications infrastructure in place and a better communication and notification process between airports, Air Traffic Controllers (ATC) and UAS flights, guaranteeing separation in all circumstances to ensure safety. The current use of radio frequency for local operations was criticised as it does not prevent spoofing and individual counter-drone measures were described as too expensive. There was preference for an infrastructure that mandates the sharing of data between multiple technologies. It was suggested that expansion and investment in mobile telecommunications cellular networks and satellite communications would be beneficial for BVLOS operations.

Remote ID was strongly supported as it can help investigate accidents, respond to threats, and help the police better enforce the law. Some support was shown for a system that is flexible and not a one-size-fits-all approach, for example, UAS operators being able to choose whether they identify through real time Unified Traffic Management data (network remote ID) or through an onboard beacon (broadcast remote ID), to support a diverse range of airspace users. There was concern that a one-size fits all approach may limit access to the airspace for many users. It was noted that remote ID via a Unified Traffic

[3] In computing, a **denial-of-service attack** (DoS attack) is a cyber-attack in which the perpetrator seeks to make a machine or network resource unavailable to its intended users by temporarily or indefinitely disrupting services of a host connected to the Internet.

Management system would help limit access to data concerning UAS flights and limit its use for illegitimate purposes.

Other technologies mentioned included collision avoidance with obstacles and other aircraft, and geofencing to prevent access to restricted airspace.

6. Unified Traffic Management

6.1 Background

As the numbers of new and novel aircraft increase there is likely to be a corresponding increase in the overall number of aircraft in the sky which will require new approaches to air traffic management to ensure the safe operation of airspace users.

The UK's approach to a Unified Traffic Management framework needs to be developed, whether that is more of a centralised or federated system. Unified Traffic Management refers to a holistic policy, regulatory and legal perspective to traffic management, encompassing both unmanned and manned traffic systems.

There is a need to ensure that the CAA has the necessary powers to regulate and license Unified Traffic Management systems to ensure their introduction is safe and their use is secure and sustainable.

6.2 Questions

Question 26
Do you agree or disagree that the CAA should be able to regulate Unified Traffic Management systems in the UK?

	Number	% of Question Respondents	% of Total
Strongly agree	20	51%	33%
Agree	12	31%	20%
Neither agree nor disagree	3	8%	5%
Disagree	1	3%	2%
Strongly disagree	0	0%	0%
Don't know	3	8%	5%
No response	21	N/A	35%
Total	60	100%	100%

Question 27
Why do you think the CAA should not be responsible for regulating Unified Traffic Management and what alternative approach to regulation do you propose?

Only one respondent did not think that the CAA should be responsible for regulating Unified Traffic Management. The respondent suggested that the remit should be larger

than the UK and that ideally a global approach would be used, and if not, then at least a significant area approach that was larger than just the UK.

Question 28
What, if any, powers do the CAA need and what factors should the CAA have to or be able to take into account when discharging those powers?

What powers do the CAA need?

CAA remit

A dominant theme was that the CAA should have the power to license and monitor Unified Traffic Management providers. A small number of respondents suggested that the CAA will simply be extending its current remit from Air Traffic Management (ATM), Air Traffic Control Officers (ATCOs) and Air Navigation Service Providers (ANSPs) to Unified Traffic Management. Specifically, it was mentioned that the CAA should have ongoing oversight and monitoring of service providers including setting operating standards and identifying and addressing system or service provider defects.

Safety and Certification

Another significant theme was that the CAA needs the power to oversee safety and certification. Several respondents suggested that in order to oversee certification the CAA needs the power to establish a testing and approval process for prospective Unified Traffic Management providers, and the power to intervene in the interest of aviation and public safety. A couple of respondents suggested that the CAA should work with industry to provide the relevant standards needed for certification.

CAA involvement in all aspects of novel aircraft

Another strong view amongst respondents was for the CAA to be involved in all aspects of novel aircraft. This includes the whole operation as well as aircraft design. It was suggested that the CAA should have responsibility to ensure that aircraft design and services are in accordance with the necessary regulation.

New and novel aircraft operations

A small number of respondents suggested that the current regulation in place for current aviation operations should also be put in place for new and novel aircraft operations.

What factors should the CAA have to take into account when discharging powers?

Consistent standards

The dominant theme that emerged is that the CAA should make sure to include consistent standards, especially in the situation of a federated Unified Traffic Management system. It was mentioned that Unified Traffic Management systems should meet specific performance, reliability and resilience requirements before being introduced in the UK. It was also mentioned that industry should work with the CAA to introduce standards that could include strategic and tactical airspace management tools, supplementary services and cyber resilience. It was suggested that it may be necessary to establish ‘levels of service’ for different operational complexities.

International standards

Several respondents suggested that these standards should align with international standards, including the ICAO iPack 'Establishing a Regulatory Framework for Unmanned Aircraft Systems (RPAS)', and the emerging International Organisation for Standardisation's standards.

Safety and Security

A couple of respondents highlighted that the CAA could consider both physical and digital safety and security. It was mentioned that safety and security should be underpinned by performance of technical capability, and the reliability of internal functions and resilience when faced with external challenges.

It was mentioned that Unified Traffic Management providers could be licensed if they are providing Clearance and Assured Situational Awareness for both manned and unmanned communication. This was linked to the theme of the CAA helping to shape the necessary standards.

It was mentioned that digital safety will involve the privacy of users. It was mentioned that cyber security resilience will be needed to guard against attempts at system interference.

Rollout and timing

Several respondents highlighted that the rollout of Unified Traffic Management will be important. A couple of respondents suggested that the CAA should focus on the enablement of operations rather impeding technology development. It was mentioned that the CAA could enable the development of 'vulnerable' new technology in relatively low risk areas first. It was suggested that priority could be given to state or emergency flights such as police, military and search and rescue operations.

Enforcement

A minor theme was that the CAA should have the power to enforce regulations and hold airspace users accountable. It was mentioned enforcement may be particularly needed where there is a risk to the safety of other airspace users and third parties on the ground.

The implications of increased air traffic

A small number of respondents drew attention to the issue of increase use of airspace and its potential implications. It was mentioned the CAA should consider: a potential need for investment in new technology and infrastructure, growth in the skills and training for available air traffic controllers, and whether current air traffic management systems will be able to cope with the increase in volume.

Question 29
Do you support: A centralised approach to Unified Traffic Management; a federated approach to Unified Traffic Management with multiple providers of Unified Traffic Management services competing for UAS operator customers; a hybrid approach; another approach to Unified Traffic Management?

	Number	% of Question Respondents	% of Total

A centralised approach to Unified Traffic Management?	9	28%	15%
A federated approach to Unified Traffic Management with multiple providers of Unified Traffic Management services competing for RPAS operator customers?	17	53%	28%
Hybrid approach	6	19%	10%
Another approach to Unified Traffic Management?	0	0%	0%
No response	28	N/A	47%
Total	60	100%	100%

Question 30
What do you see as the advantages or disadvantages of your preferred approach?

Respondents generally highlighted the benefits of their preferred approach significantly more than the disadvantages, so there were fewer explicit disadvantages of each system provided by respondents. However, many respondents viewed the advantages / disadvantages of federated and centralised approaches to be opposing i.e. the advantages of a federated system were the disadvantages of a centralised system. This was not the case for safety and scalability, where different respondents suggested their preferred type of system would be safer.

	Federated	Centralised
Advantages	Adaptability / flexibility / agility Speed Scalability Competition Safety	Safety Simplicity Efficiency Holistic provision
Disadvantages	Difficulty of integration Safety	Costly Less flexible Less innovative More vulnerable

Federated approach

Advantages

Adaptability

The most common advantage expressed by respondents was that a federated approach would be more adaptable, which includes the system being more flexible and agile. A couple of respondents highlighted that a federated system would allow for long term investment in differentiated Unified Traffic Management Service Providers providing an appropriate response to localised issues, and specific airspace challenges, such as around an airport, city, or remote areas. It was also suggested that a decentralised approach would enable Unified Traffic Management Service Providers to adapt their services to the needs of new and novel aircraft. It was suggested that a federated system will give more flexibility for charging mechanisms and allow for more adaptability as requirements continue to develop.

Speed

A handful of respondents suggested that a federated approach would be faster than a centralised approach. A couple of respondents suggested this would be because providers may be able to respond more quickly in their operational area. It was mentioned that a federated system could accelerate deployment by adopting technologies and standards from other sectors.

Scalability

Related to speed, several respondents thought a federated approach would better enable the scaling of airspace use by new or novel aircraft.

Competition

Many respondents included competition as a benefit, suggesting a decentralised approach would enable a competitive market. The benefits of a competitive market that were highlighted include: market growth, better quality of service in relation to customer demand, facilitation of innovation, reduced costs, affordability, accessibility and the continuation of investment in new Unified Traffic Management technology.

A couple of respondents also cited equitable and fair access to airspace as better under a federated approach.

Safety

A couple of respondents suggested a federated system would improve safety. It was mentioned that a federated system could also increase resilience by reducing reliance on individual companies.

Disadvantages

The disadvantages of a federated system only included a small number of answers.

Difficulty of integration

A couple of respondents suggested a federated approach risked a lack of integration and that if there are multiple Unified Traffic Management systems providing deconfliction services it will be more technically difficult to implement. It was mentioned that there may be a need to prevent multiple Unified Traffic Management operators controlling the same airspace and that models of data exchange should be open and interoperable at airspace boundaries.

Safety

It was also suggested that a federated approach may have a greater chance of variability in safety performance and process. However, it was also mentioned that this could be mitigated by standardised requirements and robust centralised oversight.

Centralised Approach

Advantages

Safety

For a centralised system the strongest advantage that emerged was safety. This is because a centralised system was seen as more consistent, particularly in terms of standards and data sharing. It would also enable the continuity of operations without any gaps, making it simpler and easier to navigate and improving overall confidence in the system. It was mentioned that a centralised approach might be needed in urban areas.

Simplicity

A couple of respondents suggested that a centralised approach would be simpler. It was mentioned that due to its simplicity all data points will reliably be in one place. It would also be possible to use different software systems integrated together.

Efficiency

A couple of respondents suggested that a centralised system would be more efficient. It was mentioned that the national unified approach used in other countries is more efficient that the privatised fragmented approach in the UK. It was also mentioned that a centralised approach may be more economically efficient.

Holistic provision

It was mentioned that a centralised charging function has the potential to subsidise less 'popular' areas that may not be serviced in a completely competitive market.

Disadvantages

There were also comparatively few disadvantages listed for a centralised system.

Costly

A couple of respondents suggested that a centralised system would be more costly. It was mentioned that a centralised system can be costly to build and maintain.

Less flexible

It was mentioned that a centralised approach may be less flexible.

Less innovative

A couple of respondents suggested that a centralised system may be less innovative. It was mentioned that a centralised approach may lead to a rigid system that lacks the capability to innovate and keep up with market developments.

More vulnerable

It was mentioned that a centralised approach may be vulnerable to failure, spoofing or attack.

Hybrid Approach

Respondents suggested that a hybrid approach would mix the advantages of federated and centralised aspects, enabling Unified Traffic Management service providers to be supported by a strong set of core services to ensure a coordinated approach for the UK. Several respondents suggested this was sensible as it mirrors the current approach to

ATM, including NATS as a central body. A couple of respondents suggested that Unified Traffic Management providers should fulfil and comply with the basic set of standards from the CAA and / or the ICAO. Another suggestion was for a hybrid market operated as a competitive market where regulation, oversight and enforcement are centralised with the CAA.

Specific advantages and disadvantages concerned with a hybrid system can be partially inferred from the advantages and disadvantages mentioned in the earlier sections.

Advantages

Balance

Advantages focus on the enabling structure of having central aspects where relevant such as core services and federated aspects in other areas. For example, it was mentioned that a hybrid model would provide practical flexibility but certainty at the uppermost regulatory level. It was also mentioned that a hybrid approach could involve core services that are centrally governed while most services are federated, and the federated services could be determined by the market, geographies, or categories of service. It was suggested that specific urban environments have centralised systems.

System evolution

It was mentioned that a hybrid system could mean the right approach at the right time if a more federated system evolves out of a centralised system.

Disadvantages

Missed opportunity

It was mentioned that although common approaches can be developed at an early stage there is a risk that some opportunities for innovation could be missed.

7. Airspace

7.1 Background

The Airspace Modernisation Strategy has created a clear framework for modernising airspace to keep the UK moving and making journeys quicker, quieter and cleaner. It is recognised as a critical enabler for new and novel aircraft and it is important that new and novel aircraft are integrated into airspace in a safe, secure and sustainable way that reflects the UK's aims for airspace.

7.2 Questions

Question 31
Are there challenges around the integration of new and novel aircraft into UK airspace that are not reflected in the Airspace Modernisation Strategy?

	Number	% of Question Respondents	% of Total
Yes	16	44%	27%
No	8	22%	13%
Don't know	12	33%	20%
No response	24	N/A	40%
Total	60	100%	100%

Question 32
What are the challenges that are not being addressed through the Airspace Modernisation Strategy and how should we address these issues?

The need to accommodate new and unmanned aircraft

The dominant theme was that existing airspace needs to accommodate new aircraft and existing UAS. Specifically, respondents suggested that this could involve a new class of airspace to enable new and novel aircraft or incorporate them in non-segregated airspace. To accommodate new and novel aircraft in existing airspace, a couple of respondents noted that the requirement of Electronic Conspicuity for both existing manned aircraft and new and novel aircraft will be necessary.

The setting of standards

Another common issue was that there are still a number of standards that need to be agreed for new and novel aircraft. Examples of these standards include communication, navigation and surveillance systems, common altitude or elevation references, sensor and algorithm performance, data quality and exchange, and environmental impacts (e.g.

ecosystems effect and noise). It was mentioned that there could be a system-wide approach, with national measurement infrastructure and access to data requirements that would enable a common national approach.

Safety

Some respondents felt that safety was a key challenge that can be addressed through a combination of flexible routings, mandated Electronic Conspicuity, safe separation between aircraft and systems that identify and resolves potential conflicts dynamically.

Speed of reform

A handful of respondents highlighted that the speed of reform could be a challenge in developing airspace. It was mentioned that airspace modernisation is still dependent on the airspace change process, which means that the airspace design cannot easily be modified without going through a lengthy change process that can take up to two years to complete.

Regular iteration

Going forward, it was noted by some respondents that it is important to ensure that the airspace modernisation strategy is regularly reviewed. This is to ensure that it reflects the current and future use of airspace in the UK, and that it meets the requirements of new entrants.

8. Noise

8.1 Background

We will need to ensure that any new and novel aircraft produces a level of noise acceptable to the general public and local authorities. If the level or type of noise is untenable then there is a risk of harming public attitudes towards new and novel aircrafts' widespread adoption.

As the frequency of new and novel aircraft flights increase, we need to have a robust approach to measuring noise and setting related standards. We need to understand the best way to test for noise and implement an acceptable framework.

8.2 Questions

Question 33
Is your preferred approach to regulating new and novel aircraft noise: standards attached to the aircraft themselves or setting locally enforced aircraft noise limits?

	Number	% of Question Respondents	% of Total
Setting locally enforced aircraft noise limits?	8	24%	13%
Standards attached to the aircrafts themselves?	11	33%	18%
Both	14	42%	23%
Another approach?	0	0%	0%
No response	27	N/A	45%
Total	60	100%	100%

Vary the level of noise in different areas

The most dominant theme was the need to vary the level of noise in different areas. For example, additional noise for the area around an airport will have a particular effect. The effect of noise will also likely differ depending on the topography of a local area, the time of day and the density of the local population.

Use of global standards

A smaller theme suggested making use of global standards by adopting the ICAO Balanced Approach. The main overarching ICAO policy on aircraft noise it its 'Balanced approach to Aircraft Noise Management'. This approach consists of identifying the noise problem at a specific airport and then explore the following measures to reduce it: reduction of noise at source, land-use planning and management, noise abatement operational procedures and operating restrictions.

Accounting for differences between new and traditional aircraft

Another smaller theme suggested that new flight technologies have significant differences to current aircraft use including where they may be operated, where they fly and where they land. This will likely have an effect on their noise profiles.

Use of data

It was suggested that the level of noise should be determined by data.

Question 34(i)
Should we gather noise data on new and novel aircraft at take-off?

	Number	% of Question Respondents	% of Total
Yes	24	73%	40%
No	9	27%	15%
No response	27	N/A	45%
Total	60	100%	100%

Question 34(ii)
Should we gather noise data on new and novel aircraft at flyover?

The majority of respondents suggested that we should gather noise data at flyover.

	Number	% of Question Respondents	% of Total
Yes	24	71%	40%
No	10	29%	17%
No response	26	N/A	43%
Total	60	100%	100%

Question 34(iii)
Should we gather noise data on new and novel aircraft at landing?

The majority of respondents suggested that we should gather noise data at landing.

	Number	% of Question Respondents	% of Total
Yes	24	73%	40%
No	9	27%	15%
No response	27	N/A	45%
Total	60	100%	100%

Question 34(iv)
Should we gather noise data on new and novel aircraft when hovering?

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	Number	% of Question Respondents	% of Total
Yes	22	67%	37%
No	11	33%	18%
No response	27	N/A	45%
Total	60	100%	100%

Question 34(v)
Should we gather noise data on new and novel aircraft at another time period?

	Number	% of Question Respondents	% of Total
Yes	6	23%	10%
No	20	77%	33%
No response	34	N/A	57%
Total	60	100%	100%

Generally, question respondents were consistent with their responses. If they felt that noise data should be collected from one of the journey points, then they generally suggested that noise data should be collected at all the journey points. Similarly, respondents who did not suggest data should be gathered from one of the journey points did not suggest any of the other specified points. Overall, there was a general theme that collecting more noise data was supported by the respondents.

Question 34(vi)
Explain your reasoning?

Whole flight phase needs to be considered

The strongest theme that emerged from question respondents was that the whole flight phase needs to be considered and not just the specific flight areas pulled out by the question. However, this was in contrast to the overall view that the four specific flight points are sufficient in the in Question 34(v). Respondents suggested that noise is likely to impact people at all phases of the flight path and that the noise profile can vary significantly between phases of flight. Respondents also highlighted that collecting data during all flight phases will also help to move away from assumptions that new or novel aircraft will be noisy during fly-over like traditional aviation. Furthermore, a couple of respondents suggested that the level of noise for people does not just depend on the flight phase, but also the environment.

Noise is specific to the type of aircraft

The next most significant theme was that noise will likely depend on the specific aircraft, which is different to commercial aircraft, and likely to vary amongst different new and novel aircraft. It was highlighted that new aircraft may generate noise at different stages of flight with different propulsion systems. Therefore, regulation needs to be flexible and not use a one-size-fits-all policy. It should be more closely aligned with the individual aircraft or type of aircraft. The noise impact will also vary by location and function. For example, it was mentioned that a drone used for construction inspection may spend hours hovering in a specific location which could cause a type of noise nuisance specific to that use case. Meanwhile, an eVTOL aircraft may visit a specific area less frequently but could have a greater impact on the local population due to its size and related noise.

Testing and data

Another key theme was that more testing and data were needed to further investigate the effect of noise. Data is needed to help define and understand possible issues and different acceptance levels. The need for data was linked to the specific difference of new flight technologies to traditional aviation. There was no consensus on the best way to obtain that data.

Public perception

There were numerous respondents who suggested that public perception will likely play a role in the consideration of noise levels. Perceptions may be influenced by media coverage and the perceived potential social value of the new technology. The collection of noise data will help to determine the level of noise deemed acceptable to the public. It was mentioned that noise criteria used to set standards should be accessible to the public, so that for transparency the public is able to understand how those levels that have been set and why.

The nature of Future of Flight operations

Numerous respondents suggested that the nature of Future of Flight operations will likely affect noise considerations. Whereas in traditional commercial aviation take-off and landing are particularly disruptive, new and novel aircraft will often have more frequent low altitude flying, meaning that all flight phases will be important. Low altitude flying means that the flyover part of journeys will likely affect the largest population, although this is also dependent on geography and location. The other main consideration was that air traffic movements will be more concentrated than traditional aircraft operations. The effect of the combination of potentially more flights in the sky flying at a lower altitude is that the quantity of noise events will need to be taken into consideration when assessing appropriate noise controls in a given area.

9.Infrastructure

9.1 Background

We need to ensure that the infrastructure requirements for new and novel aircraft have been considered and ensure that there is the ability to develop the necessary infrastructure through the regulatory and planning system.

New and novel aircraft have specific requirements for aerodromes, airports and airfield infrastructure. There are also new forms of physical infrastructure that do not currently exist such as Vertiports.

Digital infrastructure will be a key enabler for new forms of air traffic management that are necessary for the development of the industry.

9.2 Questions

Digital Infrastructure

Question 35
Are you aware of any digital infrastructure needs for new or novel aircraft?

	Number	% of Question Respondents	% of Total
Yes	35	80%	58%
No	2	5%	3%
Don't know	7	16%	12%
No response	16	N/A	27%
Total	60	100%	100%

Question 36
What digital infrastructure needs are you aware of and is existing regulation sufficient to meet these needs?

	Number	% of Question Respondents	% of Total
Yes	27	61%	45%
No	8	18%	13%
Don't know	9	20%	15%
No response	16	N/A	27%
Total	60	100%	100%

Most comments were in relation to the various areas where digital infrastructure will need to change or be improved to support new or novel aircraft. Specific regulation for these infrastructure needs was rarely commented on, although a couple of respondents commented on the sufficiency of existing regulation. Most responses outlined the digital infrastructure needs that are required for air traffic management and associated infrastructure for detecting/seeing, communicating with, and avoiding other aircraft

Communication with other aircraft

The dominant theme concerned the need for infrastructure that supports communication and integration between new and novel aircraft, existing aircraft and operators, and aerodromes on the ground. Several respondents mentioned that this communication will be important for situational awareness and for Detect and Avoid purposes. Respondents commented on the need to future proof traditional communication, navigation and surveillance systems.

Telemetry and other data needs

Another significant theme was the need for systems to provide telemetry data and sensors for PNT (Position, Navigation and Timing), weather and topography. It was also mentioned by a handful of respondents that these systems would need significant assurance and testing.

Bandwidth/5G

One area where regulatory development was commented on was telecoms. Some respondents highlighted that current mobile communications regulations would be insufficient. Others also reflected that current gaps in existing aircraft communications (e.g. at low level, urban or rural settings), or issues with current capacity or bandwidth would also need to be addressed. As reflected in previous questions, a number of respondents suggested that Electronic Conspicuity would need to be mandated.

Redundancy

A few respondents commented on the need to ensure sufficient redundancy in positioning and navigation systems, and communication channels.

Question 37
Are you aware of any other infrastructure needs for new or novel aircraft?

	Number	% of Question Respondents	% of Total
Yes	27	61%	45%
No	8	18%	13%
Don't know	9	20%	15%
No response	16	N/A	27%
Total	60	100%	100%

Question 38
What non-digital infrastructure needs are you aware of and is existing regulation sufficient to meet these needs?

Many respondents did not answer the question in relation to existing regulation, although several commented on the sufficiency of the planning process. Regulation and guidance were mentioned as being important for further capital investment.

Several respondents mentioned that existing aerodrome and heliport infrastructure could be used and/or adapted in a number of use cases, but there were also a number of responses that mentioned the need for possible new infrastructure. The factors determining the siting of infrastructure were mentioned as a key consideration in this context.

Physical infrastructure

Power supply – electricity/fuel/batteries

The most common theme were considerations about power supply. It was suggested that the increasing use of new and novel aircraft would change the demand for different types of power supplies, whether that is electricity or another type of fuel.

There were also several respondents who commented on the management of batteries, specifically being able to access charging points, the speed of charging, and the management of batteries over their lifetime (maintenance and replacement).

Ground infrastructure/vertiports

Most respondents agreed that new dedicated infrastructure would be needed for UAS and AAM technologies and the establishment of vertiports was highlighted. Respondents commented on the wide range of options for where these sites could be located (adjacent to or separate from current airfields), and in particular the possibility for them to be sited at multi-modal transport hubs. Some commented on the need for these sites to have guidance developed and standards set for the safety and security of aircraft and passengers.

However, there were some respondents who believed that their technology could easily be integrated into existing sites with minimal or no need for changes.

Some respondents also mentioned the need to ensure surface access to any new or existing landing sites. A handful of respondents suggested that new landing sites situated close to multi-modal connectivity would provide the greatest benefits.

A small number of respondents mentioned the need for passenger and cargo handling facilities with associated physical security requirements.

Other physical infrastructure requirements mentioned included fire prevention and management equipment, emergency landing zones and counter UAS equipment.

Fees

One participant suggested that new operators should pay for new infrastructure costs, and it was suggested that Government should pay for any infrastructure that contributes to Net Zero.

10. Future Plans and Equalities

10.1 Background

We are interested in views on the main use cases for new and novel aircraft and the milestones needed to deliver them over the next 5 years. We also wish to ensure that the whole Future of Flight area develops such a way that the whole UK population will benefit.

10.2 Questions Question 39
What do you think are the main 'use cases' for new and novel aircraft?

Overall it was suggested that potential use cases will continue to grow as technology develops and the industry continues to innovate. It was generally acknowledged that the use of UAS and novel aircraft will increase significantly in coming years and further developments across use cases are likely to similarly increase quickly.

Freight

A dominant use case that emerged was the movement of cargo regionally and nationally including last-mile and middle-mile delivery. Autonomous or remotely piloted cargo transportation with reference to time-sensitive, high value deliveries and the delivery of mail and parcels to remote areas were mentioned. A couple of respondents emphasised that drones could provide a more sustainable and a less-accident prone alternative to road vehicles. Ship-to-shore movements between offshore vessels and onshore facilities were also mentioned.

Regional travel and remote connectivity

AAM was also a dominant use case, with respondents referring to inter and intra-city travel and improving the connectivity of the existing aviation network. A couple of respondents mentioned the use of either fully or semi-autonomous aircraft to increase regional air mobility. It was also suggested that regional travel could support a modal shift from helicopters. It was mentioned that integration with the wider transport network across rail, air and maritime was required to ensure accessibility.

It was mentioned that in the early stages of the AAM industry the number of sites and the operational tempo will need to be in line with today’s regulatory system. Over time, and as the technology successfully scales, this will create the ability to permit and fly from more sites at an increased volume.

Medical and emergency services

Medical and emergency deliveries were a commonly expressed use case with several respondents mentioning NHS blood transport and the delivery of medical supplies to remote areas with shorter door-to-door journey times than other transport modes. It was mentioned that operating new and novel aircraft in various stages of the medical supply chain could improve efficiency and capability. Emergency services use cases such as search and rescue were also mentioned by several respondents with disaster relief. The

use of new flight technologies in environments that are hazardous to human health was also mentioned.

Surveillance and inspection

The remote monitoring, data capture and inspection of infrastructure such as railway, power lines and wind turbines was mentioned by a number of respondents. Surveillance and law enforcement, environmental monitoring and use in traffic surveyance were also commonly mentioned. It was suggested that the specific use of drones by airport operations teams could bring efficiency benefits in terms of speed and accuracy for runway inspections, airport infrastructure maintenance inspections, aerodrome surveys and remote monitoring. A couple of respondents suggested a wide range of agricultural use cases such as the spraying of fields, monitoring livestock in remote areas and habitat management.

Minor themes included:

Reduction of CO2 emissions

Reponses indicated that zero emission aircraft will clearly be a key component of the move to decarbonise aviation in the UK and beyond. The whole life carbon cost, including infrastructure, should be included in this assessment.

Adaption of current uses

A couple of participants mentioned factors that would affect adoption of current use cases. It was mentioned that regional air mobility is likely to be more appropriately served by conventional take-off and landing aircraft with new technologies using traditional airport infrastructure. The potential for the utilisation of new aircraft on Public Service Obligation (PSO) routes that used existing infrastructure was suggested.

Skills and resources requirements

It was mentioned that there is a need to ensure that the sufficient skills, resources, and personnel required are in place to facilitate Future of Flight air traffic control and the right regulatory environment. It was also suggested that work is needed to explore new forms of flight in real-world environments. This will have an effect on value proposition and investment which will be critical for the UK to gain an early mover advantage, and provide considerable opportunity to develop the economy and increase skills.

Spaceflight

Spaceflight was also mentioned, with a specific use case being the operation of private spacecraft to carry spaceflight tourist passengers. Another suggestion was provision of network communication by high altitude platforms and space launches.

Future Demand

Respondents suggested that the Government should refer to published reports on the potential market for different use cases, as well as conduct demand modelling on the potential of the impact of new or novel aircraft. It was mentioned that the commercial viability of new flight technologies should be explored.

Question 40
In your opinion what are the milestones for achieving these 'use cases' in the next 5 years?

The development of regulation was a dominant milestone with many respondents suggesting that regulation needs to be flexible and overly onerous. It was noted that there are a considerable number of technical, regulatory and market milestones and challenges to be overcome. An agreed UK regulatory framework that includes the definition of new services, roles, and responsibilities was suggested.

Aircraft and user certification standards were a dominant theme, particularly relating to proving airworthiness and operator competency across eVTOL and UAS. Standardising the certification process was specifically highlighted. It was suggested that use cases are needed to demonstrate capability across the sector to provide benchmarking.

Regulatory provision that enables wider use of BVLOS operations was another common milestone, with BVLOS operations identified as critical to deriving value from UAS in the UK. It was suggested that existing regulations could provide BVLOS opportunities through the use of segregated airspace or under appropriate Detect and Avoid systems. It was mentioned by a couple of respondents that an Electronic Conspicuity mandate for all airspace users would help to enable BVLOS operations.

The need to consider environmental regulations across areas such as carbon emissions and noise was also mentioned. The need for mandated levels of insurance coverage to ensure safety was also suggested.

Airspace Integration

Airspace integration was a key milestone identified. It was suggested that initial operations will likely take place in highly regulated, controlled environments. To allow operations in less segregated airspace, surveillance and self-separation technologies were identified to underpin future traffic management systems. The integration of routine and autonomous BVLOS operations into shared airspace was highlighted as important by a couple of respondents. A regional Unified Traffic Management system was identified as a way of supporting routine BVLOS operations.

A review of existing Airspace Change guidance CAP1616 was suggested to ensure the UK has the capability to support new airspace technologies. An Air Traffic Management - Unified Traffic Management integration roadmap was also suggested to plot a course toward convergence.

Demonstrations at Scale

Flight demonstrations at scale were another major theme. BVLOS, inter-city and regional demonstrations in particular were suggested to allow the exploration of new forms of technology in real world environments. It was suggested that demonstrations and testing need to focus on integration within the wider airspace and on the effectiveness of ground infrastructure. Standardised metrics for measuring sensor performance within test environments were suggested, with a view to providing data that measures system capability and works towards the end goal of effective airspace management.

The further development of regulatory sandboxes was also suggested, which should be in close collaboration with the CAA, and other stakeholders such as UKRI through the Future Flight Challenge. These sandboxes provide an opportunity to develop innovation, solve new problems and advance the regulatory environment.

Infrastructure

Infrastructure requirements were identified as a key milestone. Vertiport design, licensing arrangements and construction were mentioned, as was integration with local planning developments. The construction of communications, navigation and surveillance infrastructure was also mentioned to benefit existing aircraft and new airspace operators. Integration with the existing and the future transport network through the construction of multi-modal mobility hubs was mentioned by a couple of respondents.

Privacy, Safety and Security

The importance of privacy protection regarding low altitude flights over private property was mentioned. It was suggested that there is a need for assurance regarding safe integration of new and novel aircraft with the existing aviation system. The establishment of a safety record was identified as a key milestone if new and novel aircraft are to be allowed to over urban areas.

Skills and Resources

Ensuring adequate levels of skills and resource across the sector was also identified as an important milestone. It was suggested that CAA funding should be significantly increased to speed up airworthiness, organisational and operational approvals processes.

It was suggested that a skills programme is required to cope with higher levels of pilot demand that Advanced Air Mobility could bring in the future. In particular, a pilot training and licensing regime based on existing Commercial Pilot Licence (CPL) or Airline Transport Pilot License (ATPL) requirements was suggested. It was also mentioned that beyond pilots, capacity will need to be developed for air traffic controllers, engineers, and operators, with skills in areas such as data security, communications and digital media. Engagement with manufacturers and operators of new and existing aircraft was suggested to establish training requirements.

Public Perception

The understanding of issues regarding public perception and social acceptance was a commonly mentioned milestone. It was suggested that Government should support initiatives that can close the knowledge gap between industry and the public to improve general support. It was also suggested that consultations with local residents about specific schemes could help improve understanding of public sentiment.

Environment

Establishing that new and novel aircraft are sustainable modes of transport that can help achieve carbon neutral targets was mentioned as an important milestone. It was suggested that the whole Carbon life cycle must be included in environmental assessments as well as other factors such as noise and wildlife impact.

Technological Development

Technological development was also identified as an important milestone. In particular, the importance of understanding battery energy density and storage requirements was highlighted by a couple of respondents. Resilience to deal with incidents such as the loss of a command-and-control link was also highlighted, as well as adequate Detect and Avoid technology and resilience to localised weather conditions.

Question 41
Supply any data or evidence you have about any of the proposals discussed that you think would positively or negatively impact on individuals with protected characteristics.

A few respondents suggested that any new infrastructure, aircraft or associated regulation must consider accessibility for all, particularly for those with physical disabilities. Another couple of respondents suggested they are already considering accessibility needs in their vehicle designs.

A few respondents said emerging aviation technologies could positively impact people with physical disabilities. For example, UAS and eVTOL could improve passenger and cargo connectivity e.g. for point to point transport or delivery of medicine and food.

11. Next steps

11.1 Overview

The consultation responses have shown a clear desire for further strategic leadership from Government to support the introduction and integration of Future of Flight technologies into UK aviation. The Government's vision is to maximise UK benefits of Future of Flight technologies – for the economy and for communities – whilst ensuring their emergence is both safe and secure, positioning the UK as a global leader. Throughout the consultation, respondents called on Government to take a more strategic leadership role in the development of the industry. In response to this, and as announced in the Flightpath to the Future we will publish a Future of Flight Plan that will set out the strategic direction for the UK Future of Flight Industry and outline the steps required to enable its realisation. We have created a joint Government / Industry Group called the Future of Flight Industry Group (FFIG) to develop the Plan. The FFIG will seek to resolve issues and remove blockers in development of the industry. Responses supplied in this consultation will be one of the pieces of evidence used to inform the Plan.

Additionally, Government has worked with the Drone Industry Action Group to develop and publish a joint Statement for the future of the commercial drone sector: Advancing Airborne Autonomy. Its aim is to increase the use of drones in society in a safe and beneficial way. Government has also responded to the recommendations from the Regulatory Horizons Council: the regulation of drones report.

In addition to the establishment of the FFIG, there are some specific measures that we will take forward at the earliest opportunity:

- We have provided additional funding to the CAA to optimise / improve their regulatory framework and approvals process, working with innovators.
- We will help to support the safety message of the industry through our engagement with the industry and CAA.
- The Future of Flight Plan will bring together the industry to develop the sector standards needed for the development of the industry.
- We will be working with the CAA to ensure international coordination on common approaches.
- Introduce legislative changes to ensure limits for alcohol consumption when operating a UAS.
- Introduce legislation for insurance requirements for new and novel aircraft.

Government will continue to monitor new aircraft developments as well as associated ground infrastructure, airspace, operations and communication developments.

11.2 New and novel aircraft

Legislation

Responses to this question indicated that there was confusion over what and how certain new and novel aircraft fall within current legislation, in particular in relation to eVTOL and UAS. However, the Department has formed the view that new and novel aircraft, insofar as they are capable of being identified at this time, do fit within current primary legislation. Contrary to some responses in the consultation, we consider that most new and novel aircraft currently in the market or about to come to market (including eVTOL and UAS), do fit within the current definition of an aircraft and therefore do fall within current legislation.

Of the known new and novel aircraft entering the market, it was concluded that some Wing-in-Ground (WiG) effect craft may require changes to legislation. The Department, alongside the CAA, will continue to explore the extent of any changes required and whether these WiG craft fall into the remit of the aviation or maritime regulator. If a more permanent regulatory solution is necessary for jet packs then they will also result in a need for changes to secondary legislation.

Regulations and standards

The CAA is co-creating international standards with a number of other regulators and industry bodies and will continue to do so, it will also take into account relevant international standards where appropriate.

The Department is also currently investigating with the CAA how autonomous aircraft may be regulated.

Hydrogen

Some responses also mentioned hydrogen. The Government recognises the growing interest in the use of hydrogen in commercial aviation, complemented by the Aerospace Technology Institute's FlyZero project and the Connected Places Catapult's Zero Emission Flight Infrastructure programme. In April 2022 we announced the establishment of a Zero Emission Flight Delivery Group of the Jet Zero Council which will include a Regulatory sub-group to consider the regulatory issues surrounding the use of hydrogen in aviation. This work complements work on Advanced Air Mobility that will be taken forward by the FFIG.

11.3 Safety

In a similar way to traditional commercial aviation, safety is Government’s primary objective for Future of Flight and it is crucial that the industry develops in a way that reflects this.

The CAA will work with industry to enable the identification of future safety challenges and ensure that the right forum exists to work through them. The CAA will aim to ensure that Future of Flight integrates with current aviation in a safe way and seek to incrementally build upon the UK’s existing aviation safety frameworks where appropriate. We are supportive of the CAA's eVTOL safety leadership group and their upcoming RPAS safety leadership group.

Responses to the consultation strongly supported introducing alcohol limits for operating a UAS, and the Department will therefore be legislating for this when parliamentary time allows. After reviewing the responses that were received to this consultation and following further engagement with stakeholders, the Department will be legislating for the same limits that apply to pilots of manned aircraft to apply to all three operational categories for UAS:

Category of operation	Applicable to	Prescribed limits: breath (microgrammes / 100 millilitres)	Prescribed limits: blood (milligrammes / 100 millilitres)	Prescribed limits: urine (milligrammes / 100 millilitres)
Open category	UK	9	20	27
Specific category	UK	9	20	27
Certified category	UK	9	20	27

This will ensure consistency for all UAS users, aiding understanding and compliance, and will also help to ensure these limits are simple to enforce. This approach also reflects the range of operations that can take place in each category and the fact that many types of UAS can pose a risk to other airspace users and people and property on the ground. As well as making it an offence for someone who is piloting or performing another safety critical function with a UAS to exceed these limits, we will also make it an offence for such a person to be under the influence of or impaired by alcohol or drugs.

Respondents indicated that insurance requirements for new or novel aircraft should be based on the overall risk of the flight operation, and take into account the level of injury or damage an aircraft could do, the size and maximum take-off mass of the aircraft, the flight path and complexity of the operation. To be able to set the requirements for insurance, when parliamentary time allows, the Department will bring forward legislation to enable the Secretary of State to make regulations with regards to insurance for UAS. The details of what the requirements will be, will be discussed further as part of the FFIG.

11.4 Security

The majority of respondents suggested they were aware of areas of legislation or regulation that need to be amended for the security of new and novel aircraft. The majority of respondents suggested they were aware of new technical requirements to introduce new and novel aircraft in a secure way.

It was suggested that some legislation needs to be clarified and strengthened. We will work with other Government departments to review these pieces of legislation to ensure they remain fit for purpose.

Remote ID for UAS was highly supported and the Department is currently working with the CAA to develop and implement a strategy for remote identification in the UK following our exit from the EU.

Cyber security was a recurring theme in this section, in response to this the Department will continue to reach out to relevant organisations within the cyber community to ensure that the Future of Flight ecosystem develops as robustly as possible.

Many cyber security and physical security aspects were mentioned, including Global Navigation Satellite Systems / Global Positioning Systems, sensor requirements and bird strike evasion technology, and these, amongst others, will be investigated further by Government and considered in the Future of Flight Plan.

11.5 Airspace and Unified Traffic Management

The Department will use the consultation responses to work with the CAA on its review of the Airspace Modernisation Strategy (AMS) and its delivery elements, to ensure that relevant considerations are included in its review.

The vast majority of respondents agreed that the CAA should regulate Unified Traffic Management systems in the UK. Following the consultation, we have worked closely with the CAA to review the current overall air traffic management legislative framework and it is expected that it will be suitable for Unified Traffic Management. We will continue to review the detailed regulations, and the requirements for Unified Traffic Management systems, and adapt them as the industry develops. The CAA AMS has proposed that ATM and Unified Traffic Management provisions will be combined and regulated via the continued establishment and oversight of Air Navigation Service Providers. Associated safety, economic and cybersecurity regulation are likely to be needed.

The information provided in this consultation will be used by the Department, in conjunction with the relevant stakeholder forums and the CAA to devise a strategy towards the realisation of Unified Traffic Management which will be included in the Future of Flight Plan. This will build on the Connected Place Catapult report 'Implementing an Open-Access UTM framework for the UK'.

11.6 Noise

In responses, the most popular view was that noise limits should be a mixture of standards attached to the aircraft themselves and locally enforced aircraft noise limits. The Department will start to consider how these can be applied working with relevant parties including local authorities. To ensure consistency we will seek to input into ICAO where possible and then use the ICAO Balanced Approach to Aircraft Noise Management to guide our regulation.

Following respondents' suggestions, we will work with industry and the CAA on ensuring noise data is gathered at multiple points across the whole of the flight path. We will ensure that the necessary level of noise data is captured during Future of Flight trials.

11.7 Infrastructure

Most question respondents suggested they were aware of digital infrastructure needs for new and novel aircraft, with a smaller majority suggesting that they are aware of other infrastructure needs. The development of digital and physical infrastructure will be included in the Future of Flight Plan.

Responses particularly highlighted the need for clarity over the planning process for vertiports and the adaptations needed for aerodromes to enable new and novel aircraft to use them. Government will work with industry, and local and regional planning teams to outline the steps needed to develop and integrate this vital infrastructure.

Respondents highlighted the importance of standardisation of physical and digital infrastructure to ensure that it can be accessed by different types of new and novel aircraft. The Department will work with industry on standardised approaches.

Responses indicated that in areas such as telecoms (bandwidth / 5G), current regulation may be insufficient. This will be investigated further by the CAA and Ofcom.

11.8 Future Plans and Equalities

In response to this consultation, the most commonly referenced use cases were freight, regional and remote connectivity, medical and emergency deliveries and surveillance and inspection. We will continue to engage with stakeholders across the variety of use cases.

The milestones described by respondents will be used to help create the Future of Flight Plan. These issues will be considered by the Future of Flight Industry Group and the actions taken forward by the relevant stakeholders.

The work of the Future Flight Industry Group will take due regard of the Equality Act 2010.