Climate Change Adaptation Report

CAP 1363
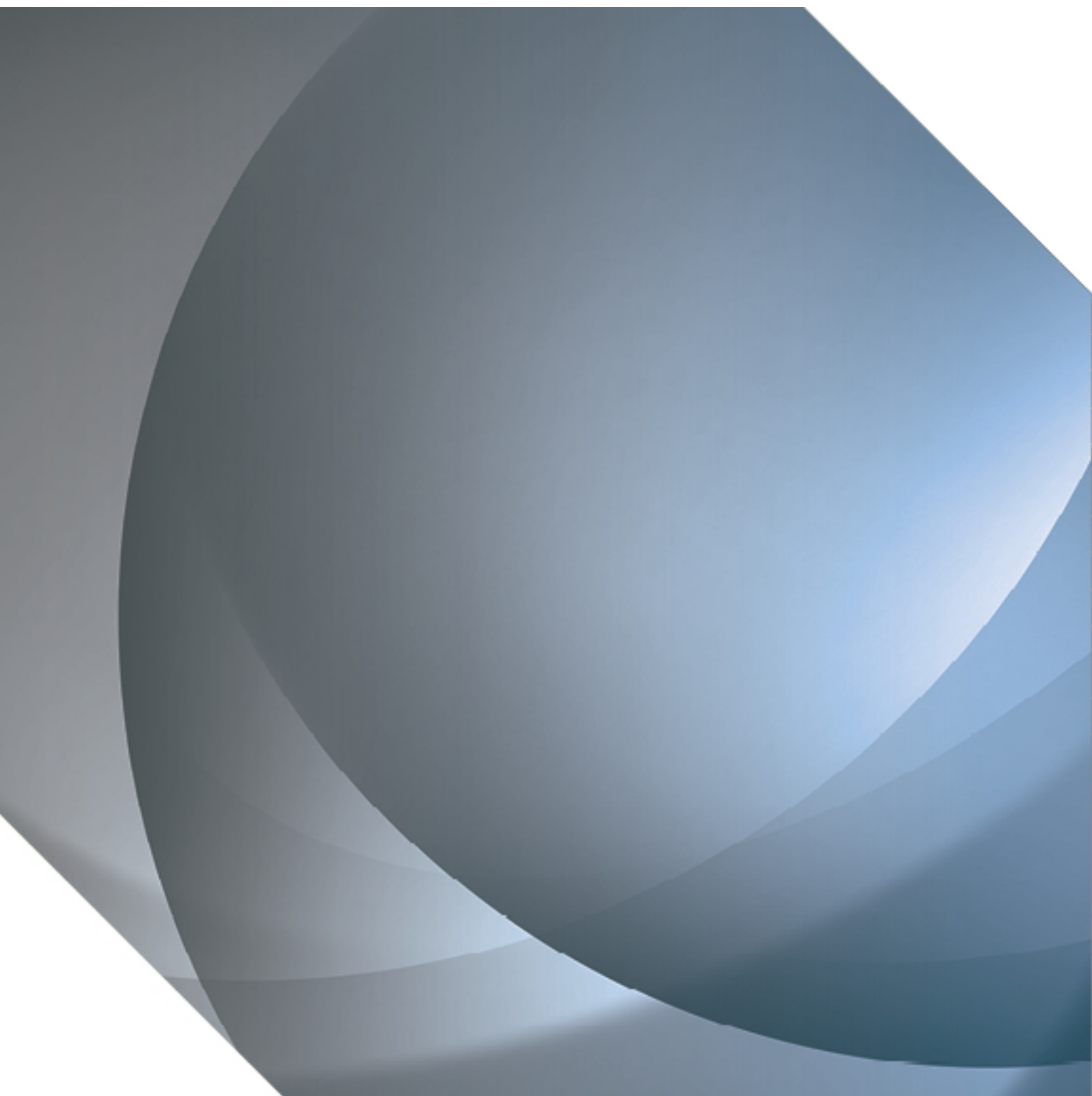
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Introduction: setting the scene

1.   The Climate Change Act 2008 introduced a new power for the Secretary of State to direct reporting authorities (ie companies with functions of a public nature) to prepare reports on how they assess and act on the risks and opportunities from a changing climate. The power represents the primary legislative lever available to the government to ensure climate change impacts are considered by key sectors.

2.   The government coordinates its adaptation work through the National Adaptation Programme (NAP), which works with all sectors to enable society to adapt successfully to the changes in climate that we are facing.

3.   The first round of reporting ended in 2012. In the second round the government is using a voluntary approach to reporting to ensure the process is flexible, responsive and proportionate to the needs of reporting authorities.

4.   It is particularly important that organisations that are responsible for essential services and infrastructure produce an appropriate risk assessment of climate change impacts and make the necessary plans as part of their risk management process.

5.   The Civil Aviation Authority (CAA) is the UK's specialist aviation regulator. Aviation plays an important role in the national economic and social fabric of the UK and the fixed infrastructure that allows aircraft to operate safely and efficiently is one of the more critical aspects that benefit from robust adaptation plans, considering aviation's susceptibility to climate change.

6.   The CAA published its first Climate Change Risk Assessment in October 2011. That document outlined:

   - the functions of the CAA and how we operate;

   - risks to our organisation from climate change;

   - how we would address these risks moving forward;

   - the uncertainties, barriers and interdependencies associated with adaptation;

   - some observations of the impacts of climate change to the aviation industry.

7.   The government has now asked for reporting organisations to voluntarily provide updated climate change adaptation reports. This report is, therefore, based on progress made, aims to illustrate what has changed within the CAA and the external environment, and focuses on what we have learned.

8.   This report reviews the information provided in the 2011 document, as follows:

Chapter 1 provides an update on existing actions from the 2011 report, new commitments and progress going forward.

Chapter 2 analyses how the CAA identifies and assesses risk (including climate risks) with its new risk management framework and what climate risks impact the aviation industry.

Chapter 3 discusses adaptation across the regulated airports.

Chapter 4 concludes the report by considering uncertainties, barriers and opportunities.

Annex A includes a summary of existing and new actions with progress.

Chapter 1
Progress and actions

The adaptation picture in the 2011 report

1.1   In 2011 we reported that we were an organisation that:

- Managed the climate risks that could affect the satisfactory delivery of our strategic objectives through our corporate risk management and business continuity procedures.

- Assumed that, in the short term, climate change impacts would have the potential to cause disruption to business through more exceptional weather events such as high temperatures, heavy rainfall leading to flooding and more storms caused by extensive deep depressions and convective weather.

- Reflected on longer term projections (using the UK Climate Projections 2009) but took investment and infrastructure decisions based on the shorter term (up to 10 years).

- Was unlikely to be seriously affected by climate change in the short term given that much of our work is office-based and less than half requires travel off site to stakeholder locations. The wider aviation industry is likely to be more affected when undertaking aviation operations.

- Did not assess the specific climate change risks of those we regulate nor required them to put in place measures to adapt.

- Recognised that the key barriers to implementing adaptive action were economic and business uncertainty, scientific uncertainty and political uncertainty. Funding was also likely to be a key barrier to taking up action.

- Was developing initiatives such as Greening the CAA and implementing the Future Airspace Strategy (FAS) to complement adaptation measures, both within the CAA and more broadly across the aviation sector.

- Was waiting to see the outcome of new powers granted to us through the Civil Aviation Act 2012.

What still stands

Risk management

1.2   Corporate risk management still plays a central role in driving the work of the organisation. We have been reviewing and updating our risk management

framework, with an improved 5x5 matrix, a new risk rating methodology and a clearer oversight structure.

1.3   The new framework will help us to use risk and opportunity management techniques to implement strategic and planning activities that underpin our purpose and will inform better decision-making. Our risk management framework is discussed in more detail in Chapter 2.

Future accommodation

1.4   We currently lease office space in Kingsway, London, where the consumer, policy and legal groups are situated, together with the aviation security department, a small portion of the safety and airspace regulation group and some of our corporate functions. We also own a building and freehold at Gatwick, which houses the safety and airspace regulation group and the remaining corporate functions.

1.5   The lease for the London building will come to an end in December 2019. The future of the Gatwick building is dependent on whether Gatwick airport will build an additional runway, in which case, Aviation House will have to be demolished to make way for the new structure. Either way, the need to investigate future accommodation options is now more urgent and we plan shortly to develop an accommodation strategy for the period beyond 2019.

1.6   When planning any future office moves, we take into account in any decision environmental specifications: for example by assessing whether any buildings shortlisted have a BREEAM[1] standard of 'good' or better and that the DEC[2] improves from the current 'below G' rating for CAA House and 'F' rating for Aviation House. These measures highlight the need for suitable engineering design, both in terms of minimising carbon dioxide emissions and energy consumption, as well as being able to withstand the changes in weather that might be expected as a result of climate change, for example, more extreme temperatures and higher rain fall rates.

Business continuity and crisis management

1.7   We have a comprehensive crisis management plan, which is designed to provide our colleagues with the information required to manage the effects of any crisis that needs a response from the Authority.

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[1]   Building Research Establishment Environmental Assessment Methodology. This sets the standard for best practice in sustainable building design, construction and operation, and has become one of the most comprehensive and widely recognised measures of a building's environmental performance.

[2]   Display Energy Certificate, which shows the energy performance of a building based on actual energy consumption as recorded annually over periods up to the last three years. DECs need to be updated each year.

1.8   Our pre-agreed strategy for responding to and recovering from an unplanned disruption affecting our operations in London or Gatwick is to "*use existing CAA locations as business continuity sites for others*".

1.9   Therefore, in the event of an incident affecting Aviation House, a number of London-based staff from CAA House will be displaced from their normal offices and their desks will be made available for key business critical staff from Gatwick. Similarly, if an incident affects CAA House, non-critical colleagues based at Aviation House will be sent home to make way for key business critical staff displaced from London. Regional offices will provide back-up cover for each other and, where appropriate, will provide supplementary accommodation for colleagues normally based at Aviation House or CAA House.

1.10   An example of good practice during a crisis event, when contingency planning at the CAA was tested in a live situation, is given in Chapter 4.

1.11   The crisis management plan works in conjunction with other measures, such as flexible working arrangements, working from home and the ability of stakeholders to access information and carry out transactions online. All of these contribute to making our business more resilient and better able to cope in the event of a crisis, weather-related or not.

What has changed

1.12   There have been some major developments both within the CAA and to our external regulatory environment since we first reported, which are summarised below.

Structure of the organisation

1.13   Since 2011, as part of our Transformation Programme, we have undergone a number of changes to our structure. The merger of the Safety Regulation Group (SRG) with the Directorate of Airspace Policy (DAP) to establish the Safety and Airspace Regulation Group (SARG) is one of the most notable changes. Another was the creation of the Shared Service Centre, responsible for customer-facing activities, such as licensing, aeromedical support, passenger complaints handling and examinations.

1.14   The latter is particularly significant because it has changed the way we interact with our stakeholders through the development of a range of online services, such as e-exams and licence renewals. The availability of web-based forms has been instrumental in making the CAA both more accessible and more resilient.

Our Transformation Programme

1.15   Our Transformation Programme is now over half of the way through and has changed the way that we regulate the aviation sector. Consisting of nine projects, the programme has been designed to make us a more effective and efficient organisation. It has also contributed to rendering us more resilient and able to adapt more quickly to external factors.

1.16   A flagship project within the programme is performance-based regulation (PBR), a risk-based approach which prioritises regulatory effort where it has the greatest impact on safety and helps industry understand and effectively manage its own safety risks. PBR will put us in a better position to highlight and take action against any movements within the risk picture which climate change could bring and which could affect the public.

Flexible working arrangements

1.17   It is now our policy to offer flexible working arrangements, whilst maintaining the needs of the business. The changes may be to working hours, working pattern or may involve working from home on a set number of days per week or month. The advantages associated with flexible working are well documented – improved life/work balance and increased productivity for example. However, flexible working arrangements that facilitate an individual to work from home, for instance by providing a networked laptop, are also beneficial in case of weather events that are so severe as to disrupt transport links and prevent commuting to the office.

Greening the CAA

1.18   In early 2012 the CAA launched 'Greening the CAA' - our internal sustainability programme. It covered the period up to the end of March 2015 and set targets for a number of key areas:

Environmental targets (by Mar 2015)
Decrease energy usage by 15 percent (7 percent reduction to date)
Reduce office waste by 10 percent (no accurate data, being addressed)
Achieve a minimum office recycling rate of 70 percent (83 percent to date)
Reduce water consumption to less than $6.5m^3$ per full time employee (Aviation House $5.75m^3$ per FTE, CAA House and One Kemble Street $7.69m^3$ per FTE, an average therefore of $6.72m^3$ per FTE)
Reduce CO_2 generation from business travel by 10 percent (14 percent CO_2 reduction from car travel, but an additional 150t of CO_2 in air travel mainly due to CAA International business development programme)
Attain Level 1 of the Sustainable Procurement in Government, now

superseded by Government Buying Standards (in progress)

Base year: 2011/12

1.19   The programme is generally targeted at reducing our environmental impact rather than adapting to climate change, but it is important to reduce environmental impacts that cause climate change as well as adapting to its consequences. Phase 1 focused on improving the sustainability of the organisation by investing in its buildings and equipment, as well as engaging with colleagues to encourage a more positive environmental behaviour, for example by switching off IT devices, using video and tele-conferencing to reduce travel etc.

1.20   Prominent achievements include:

- installation of energy efficient air conditioning plant;

- better waste management procedures contributing to rises in recycling rates;

- investment in energy monitoring systems;

- installation of segregated waste bins;

- reduction of unnecessary jet washings of buildings;

- provision of video conferencing facilities;

- procurement of power efficient IT equipment;

- investment in multi-functional devices to reduce waste from unnecessary printing;

- development of a 'green offset' tool for colleagues;

- change to the landscaping contract of Aviation House to encourage more species, such as invertebrates and birds.

1.21   Phase 2 of Greening the CAA has now started: the new programme aims to work more collaboratively with the Estate Services department to address the targets in the key areas. It will continue to engage with colleagues and will attempt to influence our transformation by trying to factor in environmental considerations into new processes and systems.

The Environment Programme

1.22   In 2012 we launched CAA and the Environment - our environmental strategy that sets out the activities that contribute to making the aviation sector more sustainable. The strategy outlined how we would do this by:

- utilising regulatory levers;

- influencing and persuading;

- providing information and guidance;

- facilitating change.

1.23   We refreshed this strategy in 2014 and have further refined where we are best placed to operate, as part of the work that is taking place to produce the CAA's new strategic plan for 2016-2021. Again, there are no direct adaptation projects (beyond reporting to the Adaptation Power, Defra), as the focus is on mitigating environmental impacts. We have few formal powers in the environment area, with the policy direction set by government. Our ability to make a difference is limited by the international nature of the problem (eg greenhouse gases) or the potential solution (eg low emission engine design which is now largely driven by international standards).

1.24   Where we have expertise and regulatory power, and where we believe we can assist in the management of risk, is in the provision of information that is objective, accurate and timely. Relevant information about environmental impacts will help consumers compare services if they want to choose less carbon-intensive flight options and help the public understand how we, government and the aviation industry seek to manage noise and how residents can have a say in decisions that affect noise. It will also assist us in deciding whether intervention is necessary to help reduce environmental impacts or whether the industry is meeting targets of its own accord.

The Civil Aviation Act 2012

1.25   The Civil Aviation Act 2012 gave us a range of new powers, including the option of being able to take a more flexible approach to the economic regulation of airports and to request and publish environmental information.

Resilience at regulated airports

1.26   One new approach made available to us was to be able to include licence conditions in the two airports that we economically regulate (Heathrow and Gatwick). Noting the importance of service quality to passengers when disruption occurs, we requested that each airport submits to the CAA for scrutiny an operational resilience plan, starting from October 2014. The plans demonstrate how consumer welfare is protected and have a strong focus on how the airport collaborates with other partners, such as airlines, in achieving this.

1.27   The licence condition is relevant to disturbance from any event, from extreme weather to technical failures. There have been a number of instances of disruption at airports in recent years, caused by severe weather[3] and therefore

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[3]   Aviation activity can be seriously affected by weather events. For example, more turbulence when flying, impacts to the safe departure and arrival of aircraft from fog, snow and ice; or to the airfield operations from flooding.

by aiding airports in becoming more operationally resilient we are helping to assure they are able to adapt to the effects of climate change.

1.28   The limiting factor that we have with our economic regulatory power is that it only applies to two airports. In recognition of this we have worked with the Airport Operators Association (AOA) to produce good practice guidance[4] to help all airports deal with disruption. The guidance was published in November 2014 and, although voluntary, it will benefit airports that apply it because it should help them to better manage disruption if it occurs. More details on the guidance are available in Chapter 2.

1.29   We are also considering applying a resilience condition in the future licence of NATS[5] (the en-route provider of air traffic services in UK airspace). Again, this would be relevant to any cause of disruption.

Provision of information duties

1.30   Under Section 84 of the Civil Aviation Act, we have a duty to publish information or advice relating to the environmental effects of civil aviation, how human health and safety is or may be affected by such effects, and measures taken, or proposed to be taken, with a view to reducing, controlling or mitigating adverse environmental effects. This information duty could be applied in relation to information on climate change adaptation, should the CAA consider it necessary.

Future Airspace Strategy

1.31   In 2011 we published the Future Airspace Strategy (FAS), a cross sector commitment to undertaking work to modernise the airspace.

1.32   Airspace is a scarce resource and with increasing demand for aviation it has become even more congested. This means that if there are more extreme weather events that reduce the flow of aircraft (for safety reasons) the system struggles to cope to the detriment of consumers. By modernising the airspace there will be benefits from adapting to weather events when they occur. The London Airspace Management Programme (LAMP) is an example of this in action.

1.33   Part of the strategy is focused upon the introduction and integration of performance-based navigation (PBN). PBN uses modern positioning technology - and will replace more outdated use of ground navigational aids - so will help to improve how efficiently airspace is used and reduce the scarcity of the resource. This would enable the aviation sector to be more resilient when events caused by climate change occur.

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4   http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=6512

5   As recommended in the Independent Enquiry of NATS System Failure: http://www.caa.co.uk/docs/2942/Independent%20Enquiry%20Final%20Report%202.0.pdf

1.34   FAS, LAMP and PBN are discussed in more detail in Chapter 3.

New runway capacity

1.35   While FAS, LAMP and PBN address the issue of UK airspace, the
          recommendation to Government by the Airports Commission to build an
          additional runway at Heathrow airport is aimed at addressing the problem of
          capacity on the ground. A new runway would not only provide extra capacity, but
          it would also help to improve resilience in the South East of England, enabling
          the system to cope better against unpredictable weather conditions exacerbated
          by climate change.

1.36   Our role within FAS and the debate on capacity is to make regulatory decisions
          about airspace design, taking into account the requirements of all stakeholders,
          industry, consumers and those communities affected by aircraft noise.

Chapter 2
Understanding climate risks

Our risk management framework

2.1   The CAA Board is ultimately responsible for determining the nature and extent of the significant principal risks it is willing to take in achieving its strategic objectives, as well as ensuring we have sound risk management and internal control systems.

2.2   Our risk management framework has recently been updated and improved with enhanced guidance designed to ensure a coherent approach to assessing and managing risk that is transparent and takes place at the most appropriate level. It also enables everybody to understand the role they play in managing risk in order to contribute to achieving our purpose of making aviation better now and in the future.

2.3   As part of the process, responsibility for reviewing and maintaining risks is delegated to each group Director who, in turn, is expected to embed the practice of identifying and managing risks within their business area.

Table 1: Risk Management Oversight Structure
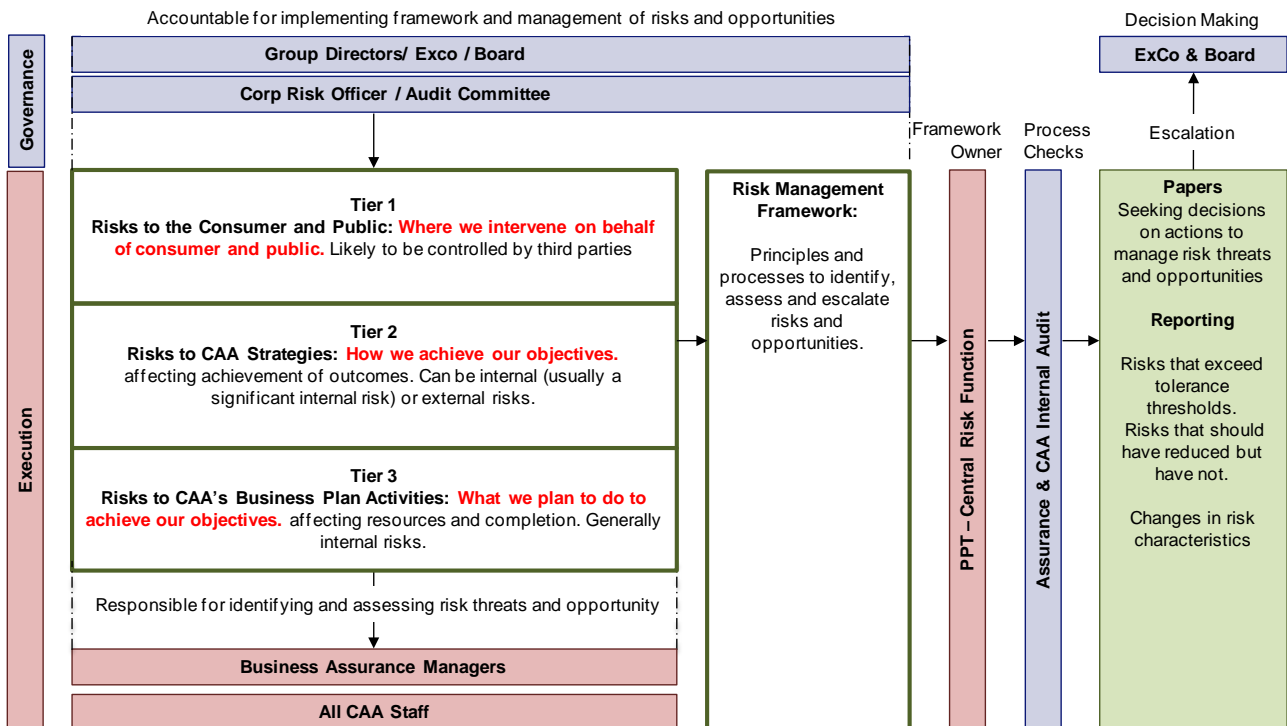
Source: CAA

2.4   Our approach to risk management is still based on three tiers, which reflect the way business is considered and which are categorised into:

- risks to the consumer, public and others, including: passengers consuming an aviation service (eg commercial airline passengers and future fliers, recreational aviation, space tourists), non-fliers consuming an aviation service (eg persons shipping cargo and spectators at air displays) and others (eg commercial pilots and crew, groundhandlers and airside personnel and those exposed to risks from aviation services, ie the over-flown).

- risks to our strategies, which are those affecting the achievement of the target outcomes that we set out in our strategic plan; and

- risks to our business, which impact on our capability and capacity to discharge our day-to-day responsibilities.

2.5   The three risk aspects outlined above are accompanied by five risk principles, which help us determine how we approach risks to the consumer and the public. These are:

Risk principle 1: We will seek to protect the consumer and the public from harm where there is a clear justification for CAA involvement.

Risk principle 2: We will be clear at all times about the risks for which we are accountable and only seek to be accountable for risks that we can manage or oversee.

Risk principle 3: We will seek to influence the management of risks for which we are not accountable but which materially impact on consumers and the public in a manner proportionate to the outcome.

Risk principle 4: We will actively monitor the risk landscape (horizon-scanning) to identify emerging risks and significant changes in risk levels.

Risk principle 5: We will take reputational risk into account when considering consumer risks in order to ensure that credibility is maintained in delivering the CAA's primary duties.

2.6   The revised guidance also includes a 5x5 matrix with new risk rating descriptors covering different risk tiers, both allowing for better understanding of tier 1, 2 and 3 risks and better prioritisation of our response to them. Tables 2 and 3 illustrate how this works.

Table 2: Tier 1 risks (draft and subject to change)

Exposure / impact	Consumer and public – Tier 1					
	Safety exposure			Security	CVFT	Environment
	To aircraft	To operation	To location	Clarification	Impacts	
5 - Very High	Majority/All of Fleet (eg all types, all operators)	Constant exposure where occurs multiple times during flight/process (eg Air Traffic Control (ATC) giving clearance/ instruction)	A very high density location (airport or surroundings); or all locations	As described in the Department for Transport (DfT)/CAA Memorandum of Understanding (MoU), the DfT retain the responsibility for aviation security policy including assessment of threats and the formulation of legislative responses to those threats. The Aviation Security Regulation team provide expert advice to the DfT and industry on the implementation of the required measures whilst the CAA's compliance team assure that the aviation industry is complying with the DfT's rules and regulations. As a result the CAA does not have a requirement to produce its own security risk rating criteria of risks at this level. The CAA is however responsible for ensuring that our Tier 2 and 3 risks are managed so that our security strategies and outcomes are delivered.	Would cause a significant number of consumers/members of the public serious loss or detriment. Would deter consumers from flying.	
4 - High	Manufacturer specific (eg Airbus or Rolls Royce engines, Traffic Collision Avoidance System (TCAS))	Common exposure of routine activity which occurs once a flight/process during critical phase of flight *(take-off, landing)* (eg take-off performance calculation, capture Instrument Landing System (ILS)) OR Limited/Infrequent exposure of an emergency activity or hard warning (eg TCAS Resolution Advisory (RA), hard Enhanced Ground Proximity Warning System (EGPWS) warning)	A high density location (airport or surroundings); or majority of locations		Would cause a significant number of consumers/members of the public high levels of loss or detriment. Likely to deter consumers from flying. Would prompt serious investigation throughout the industry.	
3 – Medium	Type specific (eg B777 only) - High/medium volume usage (eg B737) - High/medium pax volume (eg A380)	Common exposure of routine activity which occurs once a flight/process at non critical phase of flight *(taxi, pushback, on stand)* (eg aircraft loading)	A medium density location (airport or surroundings); or a significant number of locations		Would cause a significant number of consumers/members of the public moderate levels of loss or detriment. May deter consumers from flying. Would present challenging issues to manage in co-operation with industry stakeholders.	
2 – Low	Type specific (eg Citation 525 only) - Low volume usage (eg BBJ) - Low pax volume (eg PA28)	Limited exposure where the activity doesn't occur every flight but occurs more than once per annum (eg de-icing or refuelling)	A single medium density location (airport or surroundings); or multiple low density locations		Would affect some consumers/members of the public. Would present issues to manage in co-operation with industry stakeholders.	
1 - Very low	Individual aircraft only (eg specific modifications)	Infrequent exposure where the activity occurs less than once per annum (eg D Check (maintenance), Aerodrome ILS maintenance)	A single low density or remote location (airport or surroundings).		Few consumers/members of the public would be affected; low profile issues would need to be addressed by industry stakeholders.	

Source: CAA

Table 3: Tier 2 and 3 risks (draft and subject to change)

Impact	Strategic – Tier 2		Operational – Tier 3			Programme/project
	CAA strategies and consumer outcomes	Financial (CAA wide)	Regulatory/legal	Capability	Systems and security	Budget/time/outcomes
5 – Very high	Material safety and security outcomes unlikely to be realised. Unable to deliver CAA strategy or impact on dependant strategies. Credibility significantly damaged.	>£1.5m	Decision or severe breach which threatens continuity of CAA.	Very high impact on staff turnover rates, colleague engagement scores or employee relations.	Performance of organisation would be rendered dysfunctional. Very significant attack or data breach.	Major cost increase or schedule delay outweighing the benefits of the project or programme
4 – High	Significant underachievement of CAA strategy and consumer outcomes - Key Performance Indicator (KPI) or key milestone missed. Strategy highly disproportionate. Significant difficulties influencing outcomes where the CAA is not accountable. Significant differences in external perception of CAA's accountability and damage to credibility.	£0.75m - £1.5m	Significant failure which affects the ability of a particular Group to continue to run a business stream. Eg failure under EASA system/ infraction proceedings. Significant breach of contract, which could lead to significant damages or reputational impacts.	High impact on staff turnover rates, colleague engagement scores or employee relations.	Major impact on performance of the organisation. Long term effect. Severe attack or data breach.	Major cost increase (£200k) or schedule delay (three months) affecting key project outcomes. Not all essential requirements will be met. Significant impact on dependant projects.
3 – Medium	Underachievement of CAA strategy and consumer outcomes - KPI or significant milestone missed. Strategy disproportionate. Difficulties influencing outcomes where the CAA is not accountable. Likely to be differences in external perception of CAA's accountability and some damage to credibility.	£0.5m – 0.75m	Failure of a particular CAA obligation. Breach of contract, which could lead to damages or reputational impacts.	Medium impact on staff turnover rates, colleague engagement scores, employee relations.	Moderate impact on performance of the organisation. Significant attack or data breach.	Moderate cost increase (£50k) or schedule delay (one month) affecting a key project outcome. Some essential requirements may not be met. Likely to impact on dependant projects.
2 – Low	Insignificant underachievement of CAA strategy and consumer outcomes – KPI or significant milestone missed. Some difficulties influencing outcomes where the CAA is not accountable. May be differences in external perception of CAA's accountability.	£0.2m - £0.5m	Minor failure / breach involving little action to resolve.	Low impact on staff turnover rates, colleague engagement scores or employee relations.	Minor impact on performance of the organisation. Minor attack or data breach.	Low cost (£10k) or schedule delay (one month) affecting a key milestone or project outcome. Some desirable requirements may not be met.
1 - Very low	Short delay in delivering expected consumer outcomes. Will have a significant impact influencing outcomes where we are not accountable. Strategy very unlikely to result in disproportionate regulation.	<£0.2m	Minor failure/ breach involving no external action to resolve.	Very low impact on staff turnover rates, colleague engagement scores or employee relations.	Insignificant impact on performance of the organisation. Short term effect.	Small cost/schedule increases. Essential requirements will be met. Most desirable requirements will be met.

Source: CAA

2.7   In addition, an alternative approach to safety risk has been introduced, which replaces likelihood with effectiveness and severity with exposure. Control effectiveness is a well-established good practice which has evolved in recent years to better categorise safety risks and it is consistent with the 'bow-tie' methodology and performance-based regulation, both utilised by us.

Table 4: The risk assessment methodology

Descriptor	1 Very Effective	2 Effective	3 Limited	4 Minimal	5 Not Effective	
Control effectiveness	Multiple controls, all strong	Multiple controls, most strong	Multiple controls, majority weak OR Minimal controls, majority strong	Majority / All weak	Reliance on providence	Control effectiveness used to assess risks where upstream causes are assessed.

Descriptor	1 Rare	2 Unlikely	3 Possible	4 Likely	5 Almost certain	
Likelihood of occurrence	In rare circumstances	In exceptional circumstances	Possible at some time	Will probably occur at some time	Will almost certainly occur in most circumstances	Likelihood used to assess other risks where events and effects are assessed.
Indicator guidance	<10% chance of occurrence	10-30% chance of occurrence	30-50% chance of occurrence	50-90% chance of occurrence	>90% chance of occurrence	

Source: CAA

Our risks relating to climate change

2.8   In the 2011 adaptation report, we used the UK Climate Projections 2009[6] (UKCP09), published by the Department for Environment, Food and Rural Affairs (Defra) and the Department for Energy and Climate Change (DECC) in June 2009, to examine the key climate change risks in the UK. We then assessed how these would impact our regulatory services, commercial branch and customer-facing activities by addressing them as part of our corporate risk management and business continuity process. At the time, we said we would work on teasing out the threats and opportunities from the climate risks and eventually embed them with the organisation's risk management system.

2.9   During the second round report, we have again referred to the UKCP09 to review the climate risks highlighted in the previous report. Because we now have a better risk management framework, we were able to refine our analysis.

2.10   An important aspect of adapting to climate change is being able to ascertain how vulnerable an organisation is to it, so that projections with the correct parameters

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6   http://ukclimateprojections.metoffice.gov.uk/21678

are considered[7]. To do this, the climate risks were rated according to the CAA's new 5x5 matrix: because climate change is an unquestionable reality, the likelihood figure was set at '4 – likely'. However, the nature of the CAA's business is mainly office-based, which makes adaptation relatively straight-forward, providing risks are acknowledged and embedded in the corporate risk management. Because of this, and because there is an opportunity to improve adaptive measures with the CAA's future accommodation strategy, the severity of the impact was set at '2 – minor'. The total risk rating is therefore 8 out of 25 which indicates that an approach to treatment should be investigated with a view to enter into an action plan.

2.11   Following this assessment, an assumption was made to select UKCP09 projections based on a medium emission scenario and on a 50 percent probability level, as we estimated that higher parameters were unlikely to change the risk ratings or the mitigation actions. The projections are as follows:

- Greater warming and higher temperatures are to be expected, hitting an average of 3.6°C by the 2080s (based on UKCP09 projections on medium emissions).

- Winters will generally be wetter and summers drier by the 2080s, with summer rainfall decrease of between 11-27 percent.

- Sea levels will rise: the central estimate (taking into account land movement) highlights a rise in sea level in London by 36cm by the 2080s.

- Severe weather events and convective weather are likely to become more common, with an increase in storms, gales, rain, hail, lightning, and fog.

- A significant decrease in soil moisture content in summer is to be expected, as is water scarcity.

2.12   The day-to-day running of the organisation is unlikely to be greatly affected by climate change impacts in the short term: the majority of colleagues are desk-based and less than half travel and works at stakeholders' locations (eg aerodromes and airworthiness inspectors, CAA International training specialists etc.).

2.13   Furthermore, in the majority of cases adaptation is indirectly addressed through existing business review processes and included in risk assessments and business continuity plans, as already discussed in the previous chapter.

2.14   In the 2011 report, it was indicated that the process of adapting to the impacts of climate change would be better embedded in our risk and investment processes

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7   For example, where the emission scenario selected to run the climate modelling should be low, medium or high and whether the probability threshold should be 10, 33, 50, 77 or 90 percent.

as the transformation programme gained traction. Unfortunately, progress has been slow on this action, due to a number of issues, including finance. To give pace to this action we have initiated a piece of work aimed at rectifying this.

2.15   While scoping out the above and to support our analysis of climate risks, we also referred to the UK Climate Change Risk Assessment Evidence Report[8], published in January 2012. The report helped to tease out the potential impacts of the individual climate effects that are relevant to our business services, operations, people and premises. For example: an increase in the risk of flooding and greater pressure on drainage systems; increased summer cooling demands, which are a challenge to manage without increasing GHGs, health issues due to high temperature, outdoor workers being exposed to inclement weather etc. Table 5 provides early sighting of the initial risk mapping exercise so far, which has been carried out using our new risk management framework.

2.16   The work should begin to gather further pace once the new risk management framework is fully operational, the accommodation strategy starts in earnest and the business continuity plans are reviewed.

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[8]   https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report

Table 5: Climate change risks to our business activities

| Risk number | Inherent risk rating | | | Proximity | Business plan activity | RISK IDENTIFICATION | | | | | Actions |
	Likelihood	Severity	Total (L*S)			Cause (vulnerability)	RISK	Lead	Effect (of the risk) / primary impact of climate variable	Effect (of the risk) / impact on organisation and stakeholders	
1	4	2	8	Horizon scanning, 4+ years. Risk expected to extend through century. Action(s) should be planned for 2015-20.	Regulatory oversight; Commercial (CAA International); Customer-facing services; Other activities (eg corporate).	Climate change	Warming/higher temperature	Health & Safety, Estate Services	Health and wellbeing (of staff)	Higher energy costs for cooling. Challenge to cope with higher building temperature without adding to Greenhouse Gases (GHGs).	Consideration of climate change impact in future accommodation strategy in building design (BREEAM, DEC of D rating or above).
										Productivity decrease.	Revised occupational health procedures.
										Potential litigation and financial implications.	Monitoring of staff working outdoors in high temperatures.
2	4	2	8	Horizon scanning, 4+ years. Risk expected to extend through century. Action(s) should be planned for 2015-20.	Regulatory oversight; Commercial (CAA International); Customer-facing services; Other activities (eg corporate).	Climate change	Increased precipitations	Health & Safety, Estate Services	Flooding	Disruption to transport (staff unable to travel).	Long-term: consideration of climate change impact in Future Accommodation Strategy in building design (BREEAM, DEC of D or above). Short-term: business continuity/crisis management plan in place.
										Damage to building fabric and structure (eg wind, rain, storms and subsidence).	
										Disruption to utilities (electricity, water, sewage).	
										Inability to carry out business activities.	

Source: CAA

| Risk number | Inherent risk rating | | | Proximity | Business plan activity | RISK IDENTIFICATION | | | | | Actions |
	Likelihood	Severity	Total (L*S)			Cause (vulnerability)	RISK	Lead	Effect (of the risk) / primary impact of climate variable	Effect (of the risk) / impact on organisation and stakeholders	
3	4	2	8	Horizon scanning, 4 years plus. Risk expected to extend through century. Action(s) should be planned for 2015-20.	Regulatory oversight; Commercial (CAA International); Customer-facing services; Other activities (eg corporate).	Climate change	Increased storms, gales, high winds, snow and ice	Health & Safety, Estate Services	Flooding	Disruption to transport (staff unable to travel). Damage to building fabric and structure (eg wind, rain, storms and subsidence). Disruption to utilities (electricity, water, sewage). Inability to carry out business activities.	Long-term: consideration of climate change impact in future accommodation strategy in building design (BREEAM, DEC of D or above). Short-term: business continuity /crisis management plan in place.
4	4	2	8	Horizon scanning, 4+ years. Risk expected to extend through century. Action(s) should be planned for 2015-20.	Regulatory oversight; Customer-facing services.	Climate change	Increase in convective weather	Consumer and Markets Group	Turbulence, icing, heavy rain, snow, fog, hail, wind, lightning.	Short-term disruption to en-route and terminal (take-off/landing) phases of flight.	Time-based separation measures applied at terminal level. CAA complaints team and passenger assistance team (Tiger Team) in place.
	4	2	8	Horizon scanning, 4+ years. Risk expected to extend through century. Action(s) should be planned for 2015-50.	Regulatory oversight.			Safety and Airspace Regulation Group		Long-term effect on en-route and terminal (take-off/landing) phases of flight.	Airspace management / FAS / PBN / PBR.

Source: CAA

Note (1):   Risks 1, 2 and 3 are Tier 3 corporate business risks. Risk 4 is a Tier 1 (consumer/public) risk.

Note (2):   The Proximity Indicators are: Issue (now) and Horizon Scanning (4+ years).

Direct impacts of climate change on the aviation sector

2.17   There is widespread consensus and tangible evidence that climate change affects aviation. Air transport is a point-to-point connection, which is impacted by weather phenomena during the en-route phase of flight, bringing clean-air turbulence, ice and thunderstorms, but also during take-off and landing, which are more sensitive to fog, snow, heavy rain, hail, lightning and wind.

2.18   The following table illustrates some of the most common risks of severe weather to airports.

Table 4: climate impacts to airports

Climate impact	Impact area		
	En-route	**Airport operations**	**Airport infrastructure**
Precipitation change		Airfield flooding, ground subsidence, reduction in airport throughput.	Drainage system capacity, inundation of underground infrastructure (eg electrical) and of ground surface access.
Temperature change		Changes in performance and noise.	Heat damage to airport surface (runway, taxiways), increased heating and cooling requirements.
Sea-level rise	Impact on en-route capacity due to loss of ground capacity.	Loss of airport capacity.	Loss of airport infrastructure.
Wind changes	Convective weather, route extension jet stream, increase in turbulence.	Convective weather and local wind patterns, changes to distribution of noise patterns.	Damage to infrastructure.
Extreme weather	Disruption to operations and route extensions.	Disruption to operations.	Damage to infrastructure.

Source: Eurocontrol

2.19   The impact of weather on aviation is likely to escalate in the future. Meteorological and scientific research indicates that, by 2050, there will be an increase in convective weather, changes in wind speed and direction, increased precipitation and storm surges, higher temperature and sea level rise. It is highly likely that these will disrupt en-route and terminal operations, climb performance, noise patterns and capacity for airports, airlines and other sector providers to such an extent that they will force changes to infrastructure, runway configuration and airspace design.

2.20   Furthermore, the increasing demand for air transport will amplify the impacts of climate change to the aviation industry: growth and adaptation are a double challenge.

2.21   The aviation industry is addressing climate change in different ways already, for example with better engine technology, which reduces noise and emissions, by researching cleaner fuels and implementing cleaner operational procedures. These measures contribute to compensating for the emission increases from growth, making the industry more sustainable, which in turn reduces its impact to climate change. A well-documented consequence of climate change is more frequent and more extreme weather events. The aviation sector will need to focus on adapting to the disturbance caused, so that the cumulative impacts of disruption do not increase.

2.22   There are two main ways that airport and airline operators can follow to adapt: at local/regional level and at national level. The former works by improving resilience to disruption on the ground, the latter through a review of airspace design which can help support the resiliency measures put in place at ground level, but also improve the efficiency and effectiveness of air travel.

Local measures

2.23   Airports that already operate close to capacity are more vulnerable to severe weather events, as the recovery time that is available following disruption to operations is very small. High-density airports are often unable to absorb delays to flights: even transferring these to the next day is difficult, resulting in several cancelled flights, as the airport does not have the capacity to reduce accumulated queues during regular operations.

2.24   The potential government decision to build a new runway is a complex and contentious issue. Irrespective of any Government decision on new runway capacity, some technical and procedural changes could help mitigate the impact arising from climate change on busy infrastructure. These could include the following:

- identify risks and vulnerabilities at local, regional and network level and implement resilience measures;

- build resilience into the current infrastructure and operation planning so that it becomes a routine part of the operations and business planning;

- include 'no/least regrets' and soft measures, such as training;

- increase collaboration with the Met Office for weather forecasts.

2.25   With this in mind, in November 2014, we - jointly with the Airport Operators Association (AOA) - published guidance[9] for UK airports on how to address the risks and impacts of major disruption. The core principles are applicable to any airport – irrespective of size, density, passenger mix and infrastructure

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9   http://www.caa.co.uk/cap1244

availability – and focus on increasing the physical resilience to the causes of disruption, so that, when it happens, plans are in place to mitigate the impact and deal with the consequences. The guidelines were devised to apply to major disturbances, from power failures to flooding or snow. They focus on business continuity management and resilience which are universal requirements in effectively dealing with disruption.

2.26   The principles are as follows:

- collaborate;

- manage risks;

- plan and deploy contingencies;

- communicate with passengers;

- practice; and

- learn lessons.

2.27   The guidelines are designed to help airports ensure that existing processes operate in the most effective and constructive manner possible.

Global measures: FAS

2.28   The Future Airspace Strategy (FAS) was published by us in 2011 in response to a Transport Select Committee enquiry into airspace in 2008. The strategy is part of a European project designed to modernise the use of UK airspace, including the en-route airspace managed collectively by the UK and Ireland as a functional airspace block (FAB). It aims to enhance airspace infrastructure to deliver a more efficient use of airspace and enable environmental improvements, including fuel and CO_2 savings, by aircraft flying more direct routes and with continuous climbs and descents, reducing the impact on the overflown.

2.29   The London Airspace Management Programme (LAMP) is part of FAS: phase 1a of LAMP was recently approved[10]. This is a series of major airspace changes covering eastern and southern England. These were requested by NATS and approved by us and will enable aircraft to fly more efficiently, will help decrease the number of low-level flights and will reduce the environmental impact of aviation.

2.30   The synergy between FAS and the industry's adaptation measures discussed in this chapter lies in both the near-term and the long-term gains that the strategy aspires to deliver. The former concentrate on increasing the efficiency of existing runway and airspace capacity, the latter – beyond 2020 – on enhancing the aviation sector's ability to adapt to future airport developments. As previously

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[10]   http://www.caa.co.uk/application.aspx?catid=14&pagetype=65&appid=7&mode=detail&nid=2497

outlined, capacity is a major factor in how resilient an airport is in times of weather-related disruption. Therefore, by supporting FAS initiatives, airports can plan their adaptation measures in a more global and long-term way.

2.31   Some of the ways that FAS plans to improve how traffic is managed and moves in the network – affecting every phase of flight, from the en-route, terminal and runway environment - are also important factors in developing capacity and resilience, such as:

- implementing a fundamentally more efficient route network in the busy terminal environment;

- removing fixed structures in the upper airspace enabling more direct routes;

- sequencing arriving traffic through speed control and improving arrival punctuality to manage queuing and reduce stack holding;

- re-designing departure procedures to allow aircraft to climb continuously and increase runway throughput;

- connecting airports electronically into the network to share accurate information and better sequence departures and arrivals.

2.32   FAS can also facilitate a number of environmental improvements, including:

- fuel and CO_2 savings from more efficient vertical profiles and more direct routes;

- reduced stack-holding, better queue management at terminal level and enhanced route network;

- improved safety and resilience at airports.

2.33   A key enabler for many of the improvements described above is performance-based navigation (PBN). PBN is an advanced navigational capability that many aircraft already possess which allows navigation without the constraints of fixed, ground-based aids, instead, using a space-based navigation environment called GNSS (Global Navigational Satellite System).

2.34   PBN leads to flight efficiency and to optimisation of the airspace. From an airport and airspace perspective, the envisaged benefits of PBN include an increase in capacity (in controlled airspace), which, as previously discussed, is a key element of resilience. By providing more precise navigation and more predictable routings PBN can improve route efficiency and together with other airspace initiatives, such as increased transitional altitude (TA), enable the increased use of continuous climb operations (CCO) and continuous descent operations (CDO). These initiatives, in turn, play a part in reducing the amount of airspace needed for holding areas, in the rationalisation of airspace infrastructure and in more accurate path keeping for noise abatement.

2.35   As previously noted, our role in such cases is to make regulatory decisions about airspace design, ensuring that the requirements of all stakeholders, industry, consumers and those communities affected by aircraft noise are considered and included in the debate.

Chapter 3
Climate change adaptation across the regulated airports

Commentary on performance

Resilience at the regulated airports

3.1   The Civil Aviation Act 2012 granted us statutory powers to apply economic licence conditions to the two remaining regulated airports, Heathrow Airport Limited (HAL) and Gatwick Airport Limited (GAL). The most relevant licence condition to the purpose of this report is operational resilience. The connection between resilience and the ability of an organisation to counteract events of disruption has already been documented in the previous chapter.

3.2   The operational resilience licence condition "[…] requires HAL and GAL, so far as it is reasonably practicable, to secure the availability and continuity of airport operations service, particularly in times of disruption, to further the interests of passengers and cargo owners in accordance with best practice and in a timely, efficient and economical manner."[11]

3.3   We deemed it necessary to include the condition to formalise the need for a joined-up approach in preventing, mitigating, managing and dealing with the aftermath of disruption. Examples of severe weather events at airports, eg the snow events of 2009 and 2010, showed that operational resilience is a fundamental part of the wider industry framework for dealing with disruption.

3.4   Disruption is not only caused by climate change related effects, such as flooding or storms, but could be due to other factors, including fires, industrial action or security incidents. The licence condition is one aspect of a wider business structure in place to manage disruption, focusing on the principle that it is best addressed in a collaborative way.

3.5   A more coordinated approach is required, with the airport playing a central role in planning and orchestrating the industry's response according to plans put in place in advance, that set out roles and responsibilities, for airlines, groundhandlers and other service providers, accompanied by effective enforcement of denied boarding regulations.[12] The requirements of this licence

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[11]   'Economic Regulation at London Heathrow Airport for April 2014: Notice granting the licence', p. 43, http://www.caa.co.uk/docs/33/CAP1151.pdf.

[12]   Regulation (EC) 261/2004 of the European Parliament and of the Council of 11 February 2004 establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights.

condition enforce that HAL and GAL maintain these resilience plans and collaborate with industry to follow best practice on how to deal with disruption.

Review of HAL and GAL's operational resilience reports

3.6   HAL and GAL have recently submitted their updated operational resilience reports to us. The key points related to the operational resilience process and relevant to the purpose of this report include the following:

- It is important for the airport operator to have risk assessments for the infrastructure under its control and for all the services it offers at the airport, with clear management procedures and clear communication plans in place for remedying and dealing with the impact of the loss of infrastructure or service.

- The process should include dissemination of information to passengers and some provision of passenger welfare if the airlines are slow to organise this.

- All plans should be underpinned by robust business continuity models.

- Allocation of capacity during disruption should be given the utmost focus, in particular at high-density airports, such as Heathrow and Gatwick airport, where delays cannot be easily absorbed.

3.7   Managing capacity shortages is a complex and contentious issue: both airports are high-density and have measures in place to do this during events of disruption:

- Heathrow airport chairs the Heathrow Air Traffic Movement Demand and Capacity Balancing group (HADACAB), an industry forum attended by airlines and NATS to agree the necessary reduction in capacity during forecast disturbance.

- Gatwick airport lead on the Infrastructure Closure and Capacity Reduction Protocol (ICCRP): the document specifies the pre-agreed protocols for how flight delays and cancellations should be coordinated, in the event of total airport or single terminal closure. The process works on the principle that all available infrastructure assets will be rationed in proportion to each airline's normal volume and the amount of capacity available. To be included in the rationing, the airline must have on record an approved contingency plan for terminal switching and must have tested these plans to ensure core IT and passenger systems are transferrable.

3.8   Both the HADACAB and the ICCRP are being developed further in collaboration with the industry. They are prime examples of adaptation measures that cut

across different types of disruption, the latter in particular, as it forces airlines to have plans in place in order to be considered in the airport's capacity rationing.

3.9   Having reviewed the latest updates for both Heathrow and Gatwick's operational resilience plans, we are satisfied that the measures in place are fitting. They show true collaboration between the airports and the airlines and groundhandlers and a robust communication strategy in place, although the true measure of success will be testing the processes in a real situation.

Climate change adaptation across the aviation sector

3.10   In the 2011 report we offered a commentary on the adaptation reports submitted by the ten airports that had been directed to report by Defra. The assessment showed generally consistent findings and appeared to accord with the projections identified by UKCP09 and other studies.

3.11   We had planned to review the updated reports submitted by the ten airports, however, the airports' submission dates did not coincided with ours, which meant that we would not be able to consider all the reports at the same time and we saw little value in carrying out a partial analysis.

Chapter 4
Looking forward

Our ongoing activities

4.1   It is clear that we could do more to improve adaptation measures within its organisation and promote resilient business practices across the industry. However, the extent of our environmental scope (internal and external) is dependent first on government policy and second on Better Regulation principles which require us to be proportionate in our approach and resources available to us.

4.2   There has been progress since the last report in 2011 (discussed in Chapter 1) which has resulted in a number of actions and activities.

Greening the CAA programme

4.3   Phase 2 of the Greening the CAA programme has started, with a more streamlined, better focused approach and improved task distribution. The work aimed at monitoring the targets in the key areas has been delegated to the Estate Services department who are best equipped to calibrate the building management system to obtain the highest energy savings, check water meters, carry out data analysis and generally take care of all the operational issues. The Greening steering group is thus free to focus on strategically driving the programme forward and communicating and engaging with colleagues to campaign for more positive environmental behaviour.

4.4   A part of the new strategy of the Greening the CAA programme is a workstream that is aimed at auditing our Transformation Programme to ensure that sustainability is taken into consideration both at the project management stage and when designing new systems and processes. This is a key commitment which seeks to address sustainability at the root by tapping into the change programme as it gains traction and challenging decision-making to ensure the environment is integrated.

Risks, business continuity and accommodation

4.5   In the last report it was stated that the assessment of adaptation requirements to climate change would be an ongoing piece of work. This has partially taken place. The new Civil Aviation Act 2012 has allowed us to put an operational resilience condition in the economic licence of Heathrow and Gatwick airports and we have developed a set of guidelines on dealing with disruption for all other airports by working collaboratively with the AOA. Internally, a new risk management framework is in place, however, progress has been slow in

embedding specific climate change related risks to the business continuity process, so that interventions to mitigate those risks directly could be put in place. This work is currently gathering pace, as illustrated in Table 5 (Chapter 2).

4.6   Adaptation also has a strong synergy with accommodation and it is intended that adaptation requirements will be considered widely as part of the work aimed at identifying suitable locations for our offices. This work is due to begin early in 2016.

4.7   With regard to improving adaptation measures within the industry, we are due to begin a piece of work aimed at including a condition in the economic licence of the en-route branch of NATS. This is an opportunity for the organisation to develop operational resilience plans similar to those of the two licensed airports, but aimed in particular at its IT system, following the power failure that occurred in December 2014 which caused severe disruption and many hundreds of flight cancellations.

Future challenges and opportunities

4.8   Our key barriers to implementing effective adaptive action fall mainly around economic and political uncertainty. As part of the work carried out to develop the next strategic plan and the new risk framework, the Board undertook detailed horizon scanning analysis, considered future events and trends and made a number of assumptions on what the prospective regulatory environment could be like. Those relevant to this report are detailed below.

Economic climate

4.9   The future economic climate is likely to see low-average rates of growth, limited investment and continued pressure on cost effectiveness. This will limit spending within the organisation, but can be considered both a challenge and an opportunity. The former because it will force us to prioritise the funding of the adaptation measures identified in our business resilience processes (as per the work that is in progress to embed these risks in our framework). The latter because it creates an opportunity for the Greening the CAA programme to push forward our internal sustainability agenda by highlighting cost savings options. Cost-efficiency also has synergy with our accommodation strategy. Lack of funding could limit our options in planning for our future offices, and the adaptation measures that may be required. It could also represent an opportunity to source accommodation that is highly sustainable, offering savings in energy, water and heating, and already adapted to counteract climate change related effects.

Political climate

4.10   Political uncertainty revolves around new government policies and stances, especially on capacity expansion, the pending EU vote, increasing calls for deregulation and ambiguity about our future funding model. The debate on capacity expansion is connected to the Future Airspace Strategy and the environmental benefits and resilience improvements that could derive from its implementation (considered in detail in Chapter 3).

Climate science

4.11   Scientific uncertainty also plays a part in adaptation planning. It does not dispute the likelihood of climate conditions that will be experienced in the future, however, the UKCP09 probabilistic information have an array of possible outcomes based on a range of parameters, including the level of emissions (high, medium and low) and the probability. Selecting appropriate criteria very much depends on the risk and adaptation appetite of the organisation.

Interdependencies

4.12   The key utilities have a significant effect of the functioning of the CAA's activities: energy for heating, cooling and power, communications systems, IT, digital data exchange and telemetry, drinking water and sewage. Disruption to utilities could leave the CAA's premises and services vulnerable. It could also:

- increase the threat to working conditions for staff, making the internal office environment uncomfortable or even impossible to work in;

- affect the day-to-day digital data exchange (emails, text messages, instant messenger, Skype etc.) which could leave us unsighted on critical information.

4.13   Difficulties with surface access to our offices are addressed through the Business Continuity and Crisis Management plans.

4.14   A final interdependence is local authority action in respect to flood defences, relevant in the case of our Gatwick premises, as these are on a flood plain. On a day-to-day level, this is dealt with through contingency planning, however, as a longer-term measure, the vulnerability of our Gatwick office, due to proximity to potential river/urban flooding, will be a key element factored in the project looking at future accommodation.

4.15   The same interdependencies described above are also relevant for the aviation sector. For instance, the key utilities have a significant effect on the functioning of airports and air traffic services units: energy for heating, cooling and powering sophisticated terminal buildings, communications systems, IT, digital data exchange and telemetry for air traffic control centres and related infrastructure, water for a variety of uses across the airport. Similarly to our own treatment of these risks, disruption to key utilities for the aviation industry is dealt with at

business continuity level, while the regulated airports have to demonstrate compliance with the licence condition that focuses on resilience.

Testing contingency planning: good practice

4.16   On 1 April 2015 we had the opportunity to test our Business Continuity and Crisis Management plans in a live situation. On that day, a fire broke out near CAA House, caused by a faulty electrical junction box beneath the street. Smoke and flames came out of manhole covers along Kingsway, which prompted the evacuation of 2000 local office workers, including CAA colleagues. The fire was treated as a major incident and covered by most newspapers and TV stations.

4.17   The recovery teams worked on contingency plans to remedy the damage to communications and allow colleagues to return to normal operations. In line with business continuity specifications, the majority of staff worked from home and those who could not, decanted to Aviation House, as access to CAA House was strictly for emergency personnel only. Critical services were restored and available from Aviation House within two working days and by the week after steady progress was being made to restore mains power and data communication.

4.18   Once the incident had been declared resolved and closed, we carried out an extensive review of the plans and processes that had been applied. There were a number of successes, including: a timely decision to evacuate, proven by the development of events to be the correct one; excellent communications through the incident, both at senior level and cascaded to colleagues; robust server and mobile email technology, which held up well to the increased traffic from home-working.

4.19   Naturally, there were also many lessons leant and follow-up actions. One of the major issues that impacted IT service availability was the fact that the entry point for telecoms and power cables into CAA House was a single point of failure. So this was addressed by introducing additional entry points at CAA House and reviewing the cable entry point at Aviation house to ensure resilience capability.

4.20   Other improvements focused on introducing a virtual server environment and enhancing data replication, in order to have more "warm standby" resources from the IT perspective.

4.21   The incident demonstrated that our contingency plans are fit for purpose and stand a good chance of holding up against climate change related events such as flooding or extreme weather occurrences. Furthermore, the post-incident review has highlighted a number of key specifications for future accommodation, which will be considered when the project takes off.

Sharing best practice

4.22   We have met with other regulators regularly during 2015, as part of the UK
         Regulators Network Adaptation Working Group, attended by representatives
         from Ofgem, Ofwat, Ofcom and the ORR and concerned with resilience and
         adaptation. The meetings were useful to learn from the experience of other
         regulators in submitting their respective reports and discuss the implication of
         emerging common themes. Further sessions will also be beneficial to maintain
         the cross-pollination of ideas which in turn should ensure a more holistic and
         harmonised approach to regulatory policy on adaptation.

Annex A: Summary of actions

Existing actions

Summary of actions (from 2011 report)	Timescale	Progress	Assessment of extent to which actions have mitigated risk	Benefits/challenges experienced
1. Risks from climate change to be considered in isolation and addressed with specific adaptation measures (rather than bunched into generic exceptional natural events).	Not specified	None	Not carried out	The work did not take place due to lack of dedicated resource*. We have now started to address this (see 'New actions' table below).
2. Continue to evaluate new climate information to inform future adaptation measures.	Not specified	None	Not carried out	The work did not take place due to lack of dedicated resource*.
3. Adaptation measures should be considered as part of the strategic planning process.	2011-2016 and beyond	Resource to produce update to 2011 adaptation report included in strategy for environment programme.	CAA Contingency and Crisis Management Plan tested during fire incident on 1 April 2015 and shown to be adequate.	Resource is a challenge*. Benefits include a clearer understanding of climate risks. Some work done to isolate these within corporate risk framework (see action 1 above).
4. Adaptation measures should be considered as part of the accommodation strategy.	2011-2019	Very little, but gaining pace	Not carried out	Finance is a challenge. Locating a sustainable office space could provide opportunities for savings (cost and environmental). See 'New actions' table below.
5. New powers from Civil Aviation Act 2012 will enable more nimble economic regulation and ability to publish environmental information.	2012 onwards	Heathrow and Gatwick have a new economic licence from April 2014, which includes an operational resilience condition. Information duties (s.84) have been discharged with a set of web page providing environmental aviation information.	Analysis of resilience plans produced by each airport has been carried out. Plans seem satisfactory, but won't know until tested in a real situation.	Benefits to passengers from well-managed incidents.\n\nReputational and operational benefits to airports.

*Note:　　as previously explained, the extent of our environmental scope (internal and external) is dependent first on Government policy and second on Better Regulation principles which require us to be proportionate in our approach and resources available to us.

New actions

Further or new action planned	Risk addressed	Timescale
6. Linked to action 1 in above table. Work has commenced to map climate risks as Tier 3 business risks, with specific mitigation and adaptation measures.	Little awareness of impact of climate risks – these can impact on working practices in the short and long-term (e.g. in the short-term due to severe weather events and in the long-term from temperature increase).	3 years
7. Linked to action 4 in above table. Project team is in the process of being assembled to address the CAA future accommodation strategy.	End of lease in December 2019.	To 2019

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