



NATS



RP3 Business Plan
2020-2024

NATS (En Route) plc

26 October 2018

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Foreword

by Martin Rolfe, CEO

Our business plan is written in a period of unprecedented change for UK aviation.

By the end of RP3, it may well be easier to list what has remained the same than to name what is new or different. On current expectations, the UK will have left the European Union, we will be about to mark the inaugural flight from the country's first new major runway in more than 20 years and will have more aircraft, of more varieties, in our skies than ever before in our nation's history.

More than just interesting context, these are crucial considerations both for us in developing our plan and for our customers and wider stakeholders in responding to it. Traffic, already at record levels, will exceed current airspace capacity according to all existing forecasts. The choice is a stark one - continue to invest in order to complete the delivery of new technology, procedures and comprehensive airspace redesign for the benefit of all, or risk seeing significant air traffic delay, congestion at airports and increasing noise for communities. Each option has profound economic consequences, the first option positive, the second one negative.

We are already well along the path of introducing the technology and procedures, set out a decade ago in the Single European Sky ATM masterplan. Building on our SESAR investments in RP2, by the end of RP3 we will have completely modernised the UK ATM infrastructure and operation. It will deliver the additional resilience, cyber security and capacity needed to safely handle the traffic of the next decade, and beyond, as effectively as we do today.

In addition, we will have mapped out a path of airspace modernisation for the UK with all stakeholders that will benefit everyone: airlines, general aviation, commercial and recreational drone users, and even space tourists. More than that, we will be designing, delivering and operating airspace that improves life for those on the ground as well as those in the air, reducing the impact of aviation on communities close to airports.

These crucial changes have to be made while we continue to deal with today's traffic safely and efficiently. We cannot stop what we currently do while we implement these imperatives, and that will take continued investment in people, technology and airspace. In fact, even without these changes our underlying service is more efficient than it has ever been. And this trend of efficiency is set to continue into future reference periods through the use of these new systems, new airspace, and ever safer, more secure operations.

Our RP3 plan is a key step towards that future. It is a bridge that connects today's operation to tomorrow's. It is designed to safely manage traffic volumes and a range of users that as a nation we have never had to deal with before. A watchword will, however, be flexibility. We live in uncertain political times. The economy and traffic forecasts could take unpredictable and

sudden turns, while cyber terrorism and geo-politics pose ever-changing threats. Our plan includes regulatory mechanisms that would enable us to respond to changing circumstances and the evolving needs of our customers.

We take our responsibilities to the travelling public for delivering and operating a significant piece of the critical national infrastructure extremely seriously. I believe RP3 will be our most challenging regulatory period since the start of the century. We need to increase our operational staffing to catch up with the unforecast traffic growth we have seen in RP2, and to have the resilience to manage the additional traffic and deliver the additional responsibilities we will be tasked with in RP3.

We will rely on the engagement and full support of government, the CAA, airports and airlines to achieve our ambitious goal of modernising airspace, which we propose to lead on behalf of all stakeholders. Our industry's ability to come together around a single plan and engage openly with society will be the determining factor in the outcome.

Through our consultation with airlines and airports this summer, we discussed their priorities and requirements and incorporated them in this plan. We heard first hand that they have been experiencing significant ATM disruption outside of the UK, across continental Europe, due in the main to a lack of operational staff and coherent technical investments by the larger ANSPs. This has further reinforced my firm belief that the essential investment in people and technology outlined in this plan is critical if we are to continue to deliver safety and prosperity to the UK in uncertain times, and as we have done successfully for the last decade.

My commitment to you is that over the next reference period we will deliver the services needed, and make critical changes for the future of aviation, at a lower price to our customers than ever before. This plan sets out how we will do that.



A handwritten signature in black ink, appearing to read 'Martin Rolfe'.

Martin Rolfe

Executive summary



Executive summary

The UK's regulated air traffic management service is a vital part of our national infrastructure. We operate a safe and efficient network in the skies for the aviation industry, and our aim is to remain at the forefront of global air navigation service provider (ANSP) performance. Our overarching duty is to deliver safety to the flying public. It is our aim to deliver that outcome in a way that ensures we support the growth and success of our customers and airports, and work for the benefit of passengers and other users.

Our essential service delivers benefits to customers, stakeholders and the wider UK economy. It underpins aviation's contribution to GDP of over £50bn a year. As a global trading economy, the country relies heavily on aviation and will continue to do so for decades to come.

Our service quality compares extremely well with other ANSPs. Few can match our track record of improvement over the past decade in safety, delay, fuel efficiency, environmental performance and cost. When 2018 unit rates were set, we had the second lowest unit rate of the five largest European ANSPs¹.

However, the scale of aviation in the UK is becoming increasingly challenging to handle. In the last two years, UK air traffic has grown at a very fast rate, and it is predicted that by 2030 there will be more than 30% additional flights than in 2015. Add new airspace users, such as drones, into this picture and it is clear that UK airspace will become ever more complex.

This presents two fundamental challenges for us in RP3: providing a safe, resilient service capable of handling current traffic; while simultaneously making the investment in, and changes to, our operation to create even more capacity and capability for the future.

In RP2, we started the comprehensive change programme to provide the new underlying technology, processes and technical skills that are essential if we are to continue to deliver an excellent service in the future. This programme of change will be completed in RP3. Therefore, our business plan is an important bridge between the work that is currently underway in RP2 and its completion in RP3. It will provide the platform to modernise airspace and deliver significant benefits in capacity, flexibility, efficiency and resilience in RP4.

The plan is robust. It has a complex series of interdependencies between its elements and will deliver a balanced set of outcomes in key performance areas. Appropriate investment in technology, airspace change and resource levels in RP3 and beyond is necessary in all areas if we are to deliver our objectives now and in the longer term.

By the end of RP3 we will have delivered efficiency improvements of around 25% in real terms since the start of RP1. This is equivalent to more than 2%² every year, and we expect this rate to increase still further in RP4 after we have completed the investment in the technology and airspace modernisation programmes. This investment is essential if we are to achieve these efficiencies and deliver the day-to-day service performance that our customers require both in RP3 and beyond.

We believe this is the right plan to deliver the priorities of our customers and the wider industry. It will enable us to keep pace safely with projected traffic increases and provide a reliable, resilient, secure and efficient service at the right performance levels, with lower average prices to our customers building on the significant reductions seen in RP2.

Having the right resources in place at the start, rather than trying to catch up later, is a far better route to success – for us, our customers and the UK as a whole. This plan will deliver the technological and airspace infrastructure for decades to come.

Customer consultation

Our RP3 customer consultation in summer 2018 on our business plan was very constructive. We received positive feedback on the process from our customers, the co-chairs and the CAA.

Customers agreed with many of our proposals, including:

- > Our targets for safety and service performance, including electronic conspicuity;
- > The imperative of airspace modernisation, which will be enabled by the completion of our technology programme; and
- > The need for our proposed regulatory mechanisms with appropriate governance.

However, there were areas of disagreement that both we and our customers expect the CAA to reach a view on. The main areas include:

- > The timing of automatic dependent surveillance-broadcast (ADS-B) deployment in our oceanic service to deliver a step change in safety for transatlantic passengers;
- > The resources that we believe we require to provide a safe, reliable and resilient service and the resulting level of prices; and
- > The extent of our wider role in airspace modernisation.

We have updated our business plan, as appropriate, to reflect feedback from airline customers, airports, the CAA and their consultants.

¹ As published in the London Gazette in December 2017.

² Average annual reduction in determined unit costs.

Key customer benefits in RP3

Our core en route plan is designed to meet the two key challenges of maintaining service quality in RP3, despite rising traffic, and making us fit for RP4 and beyond. It is safety and performance-led, and delivers value for money for our customers.

Safety: We will continue to comply with the targets set by the European Commission (EC), which should be adopted next year. We will also set our own aspirational safety targets at a more detailed level. By working towards both sets of targets, we will make the required contribution to the current UK State Safety Programme. This will ensure that we offset the increased risk from traffic growth.

Capacity: We will continue to use our current delay performance metrics as these are well aligned with our customers' priorities. We will deliver delay performance in line with our RP2 targets on the higher traffic that we expect in RP3, as we know this is critical to achieving the on-time performance that our customers need and the travelling public expect.

We will do this while continuing to upgrade the underlying infrastructure, as well as increasing our operational staffing, to catch up with current traffic demand and to meet future demand, as well as maintaining the resilient UK ATM operation that our customers require.

Environment: To deliver a balanced set of environmental incentives, we will focus on reducing fuel burn and emissions impacts above 7,000 feet. We will continue to use 3Di as our environmental metric with a number of proposed refinements. Our target is to deliver results similar to RP2 despite the forecast rise in traffic.

We will work collaboratively with local airports and airlines to mitigate the impacts of noise on communities, noting that there will be difficult trade-offs between reducing noise and operational efficiency and the commercial interests of airlines. Our approach will involve developing new data and processes to analyse noise mitigation options when making changes to procedures or airspace. We will also expand our community engagement strategy, although, even at a local community level, agreeing noise mitigation strategies that are acceptable to the majority of those affected can be extremely challenging.

Prices: Our prices will have reduced by 27% in real terms in RP2. This reduction will continue into RP3 with a projected average price of £48.85 per chargeable service unit (in 2017 prices), which is 14% lower than in RP2 in real terms.

We plan an improvement in real terms in cost efficiency in RP3, with a reduction of 2.3% p.a. in our determined unit costs, while also delivering many vital changes. Our new technology, transformation to airspace and improved resilience will help our customers to meet their needs.

Our core en route plan

These key outcomes will be delivered through our core en route plan, with two areas of focus:

Delivering our day-to-day service, which includes:

- > Maintaining our excellent safety record;

While:

- > Maintaining service quality;
- > Strategic and tactical planning of operations, and working collaboratively with our customers on a transparent, daily operational plan;
- > Ensuring operational, technical, business and cyber resilience; and
- > Continuing to improve our environmental performance.

Evolving our service for the future, which includes:

- > Delivering our safety strategy;
- > Modernising airspace;
- > Deploying new technology through our DSESAR³ Programme;
- > Developing our ATM service;
- > Modernising engineering; and
- > Integrating our operations.

In order to deliver these improvements, it is vital that, in a competitive employment market, we invest in the right number of people with the right skills. This comes at a time when the demographic changes in our workforce mean that we are likely to see high levels of retirements.

Unless we secure additional highly skilled resources, we will not be able to deliver the customer benefits of this plan. With these resources, we will be able to meet demand, make our service more resilient to existing and emerging threats, and introduce vital airspace changes.

³ The deployment of the Single European Sky ATM Research Programme into our infrastructure.

Our wider plan

Our wider plan covers requirements that remain uncertain at this point in time. We propose a regulatory mechanism for addressing these when they are sufficiently mature for us to do so in a practical way. Some of these requirements may be outside the current scope of our Licence and the charging mechanisms under it, and would therefore require substantive Licence modifications.

Successful delivery of our airspace modernisation is vital to the travelling public and overflow communities. This requires a high degree of co-ordination and collaboration across the industry. We have made an offer to the industry that we develop and lead a co-ordinated and sequenced masterplan of airspace change between 2020 and 2040. We would create a new internal function to manage the programme, oversee its delivery to a common timeline and co-ordinate public consultations.

We understand that the CAA is likely to mandate electronic conspicuity as part of an airspace integration programme that will affect most of UK airspace. In line with this, they have requested that we make proposals for the delivery of electronic conspicuity outside of controlled airspace. Low power, ground based ADS-B is a potential way of delivering this, and we aim to incorporate this into our surveillance infrastructure in RP3.

Our wider plan includes a proposal for an enhanced information service that would support both manned and unmanned users outside of controlled airspace.

If the nature and volume of drone traffic differs materially from our core plan assumptions, we would need to increase the cost of our service to maintain safety in controlled airspace. In that case, we propose to recover the additional costs via the wider plan regulatory mechanism.

Oceanic service

The challenge for our North Atlantic service is the unprecedented growth in traffic and its impact on safety and capacity. At the beginning of RP3 we will need to transition our North Atlantic service in the Shanwick airspace from a procedural oceanic operation to a satellite based surveillance operation to deal safely with the growing traffic. This will match the service being offered in the Gander airspace.

The technology will provide highly accurate position reports every four seconds or less for all aircraft across the entire North Atlantic. This benefit alone will enable the North Atlantic operation to meet the existing state level International Civil Aviation Organisation (ICAO) safety targets.

Irrespective of these targets, providing satellite surveillance over the busiest ocean in the world for air travel is simply the right thing to do for the safety of the travelling public.

As well as being essential for safety, satellite surveillance (ADS-B) will be critical for delivering the required increase in capacity forecast over the North Atlantic.

Unlike most investments in safety and capacity, this is unique in that it will also deliver significant fuel savings that will more than offset the incremental cost of the satellite surveillance charges. We estimate the savings to airlines to be at least double the surveillance charges, noting that we estimate that these will cost around 30p per passenger for the full oceanic portion (Shanwick and Gander combined) of a North Atlantic crossing. Further benefits include improvements in flight efficiency and CO₂ emissions.

Satellite surveillance will increase flexibility and ensure that our customers' preferences can be met. From 2020, we expect that around 90% of North Atlantic traffic will be allocated its requested flight trajectory, compared to around 60% at present.

In addition, we will be able to remove the fixed speed restriction that currently applies to all traffic, enabling 80% of it to fly without speed restriction. We will also be able to provide access for all aircraft to the south east corner of our oceanic airspace (the Tango routes) - a growth hot spot with increasingly constrained capacity.

We propose that in RP3 our charges will change from a single fixed fee per flight to different prices for Tango routes and North Atlantic crossings. Each charge will be made up of a core oceanic cost and a satellite data charge that we will incur to deliver greater capacity and meet ICAO safety targets.

Excluding satellite surveillance charges, our direct cost efficiency in RP3 for our oceanic service will also improve further, with an average price per flight of £52.36 (in 2017 prices), which is 13% lower than in RP2 in real terms.

Governance

Working with customers, we have developed proposals for enhanced governance around the development of our annual service and investment plans (SIP) in RP3. This will enable us to consult more closely with customers on any material changes in our plans to reflect new or different requirements. These will be considered by the CAA and their independent reviewer.

Strong governance around the boundaries between NERL and NSL exists to provide assurance that they operate on a fair, commercial and arms-length basis, consistent with Licence condition 9, which prohibits cross-subsidies.

The functions delegated by NERL to NSL are largely limited to those that were established at the time of the privatisation in 2001. NSL has performed those operations reliably and we keep this under constant review to assure ourselves that the rationale behind the case for the delegation is still sound and that benefits to customers are being provided.

Evidence

We have based our plan on comprehensive planning and detailed evidence. The relevant evidence is in the appendices and signposted in the main text.

The right plan for delivering essential modernisation and high levels of service

Over the past decade there has been extensive EU-wide strategic optioneering which resulted in the SESAR ATM masterplan. In RP2 we consulted on options for delivering the UK version of the European SESAR ATM masterplan. Since the beginning of RP2, we have been engaged in delivering large elements of this plan, which are critical if we are to handle the increase in traffic. This necessarily limits the extent of options that could be efficiently or effectively implemented at this point in time. In creating this plan, we have consulted with customers on the options that remain and included those they supported.

We believe that this is the best plan for our customers, the travelling public, the wider industry and the UK economy. It will enable us to continue to provide safe, resilient and excellent service through RP3 and into the future, ensuring we play our role in delivering aviation's £50bn contribution to the UK economy.

Important note:

Our business plan has necessarily been prepared on the basis of assumptions concerning matters outside our control, for example, in relation to the applicable regulatory framework and targets during RP3, which are not yet known, and the prevailing uncertainty and risk in relation to traffic forecasts as a consequence of Brexit.

As such, our plan should be read with the following qualifications in mind:

- > Where our plan is based on assumptions about matters outside our control, we have highlighted this in the body of the plan and set out the evidence and rationale underpinning our assumptions in the supporting appendices. For more information on our assumptions, see Appendix N; and
- > We strongly believe our assumptions are sufficiently reasonable and robust to justify them forming the basis of our plan. However, they are inherently uncertain and, as such, there remains a risk that they will prove inaccurate or that they will be superseded by events that cannot reasonably be foreseen. If we consider any of the assumptions forming the basis of our plan are likely to be sufficiently inaccurate so as to have a material impact on the deliverability of our plan and the outcomes that our customers expect, we will advise the CAA and seek guidance from them on how to take account of this in the UK performance plan.

Headline figures for our core en route service

KPA*	Measure	Target
Safety = RP2 With ↑ traffic	Effectiveness of safety management	Compliance with EC targets
	Rate of accidents/serious incidents	
	Rate of runway incursions and losses of separation	
	Rate of over-delivery by the Network Manager	
Service quality = RP2 With ↑ traffic	C1: Average ATFM ⁴ delay per flight from all causes	13.8 secs
	C2: Average ATFM delay per flight from NERL attributable causes	10.8 secs
	C3: Weighted metric that captures the impact of the timing and length of delays	23.8 secs
	C4: Variability of daily average delays expressed as a daily excess score	2,000 score
	Allowance for special event transition delay**	To be agreed ahead of specified transitions
	Technical resilience	Compliance with Licence condition 2 requirements
Environment = RP2 With ↑ traffic	3Di flight efficiency***	Score of c.16.2-17.9 p.a.
Investment (and longer term resilience) Enables the above	Total RP3 investment (2017 prices)	£725m - £800m
	Contribution to RP3 unit price (2017 prices)	£3.81 per chargeable service unit (8% of the price)
Average price ↓ 14% RP3 v RP2	Real price reduction	
	> Average RP3 v average RP2	-14%
	> Average RP3 v average RP1	-25%

*Showing planned outcome relative to RP2 performance.

**Relating to major transitions, e.g. DP en route, DP lower & LAMP, in place of exemption days.

***Target relates to refined 3Di metric which excludes lower level airspace and other adjustments to ensure the metric is fully within our control.

⁴ Air traffic flow management.

Chapter 1:

The UK operating environment for ATM



Chapter 1: The UK operating environment for ATM

Since becoming a private company we have reduced air traffic delay in the UK by a factor of ten while safely handling 25% more aircraft.

Further traffic growth in RP3 can only be handled effectively through investment in people, systems and airspace change.

Following decisions taken in RP2, we will deliver major new technology in RP3 and help to lead the way in modernising airspace. This will deliver significant benefits in capacity, flexibility, efficiency and resilience in RP3 and beyond.

A challenging operating environment

The current operating environment for ATM in the UK is defined by some of the highest traffic volumes the country has ever seen; a trend that is set to continue in the coming years. This is creating significant pressure on today's ATM operation across safety, service, capacity, resilience and the environment. Resolving this in the future will require continued investment in infrastructure, airspace change and the skilled individuals who deliver the operation.

In addition, the presence of new users, such as drone operators, is expected to increase the complexity of UK airspace. Meanwhile, societal and environmental concerns are growing about emissions, air quality, noise and the rights of the overflowed public.

The most immediate consequence of these dynamics is that capacity will become an increasingly constraining factor as airlines and airports seek to make the most of growing demand. If, as expected, traffic volumes continue to rise throughout RP3, the UK will face a critical juncture - for the first time since the start of commercial aviation the number of flights will exceed the capacity of our airspace and ATM systems. The changes required to address this, particularly the effect of airspace change on the public, will make ATM a more political issue than it has been to date.

Our ATM service quality has improved significantly over the past two decades (see table below). In addition, our performance compared to similar ANSPs is positive.

Summary of our performance since PPP

	PPP year	CP2					CP3				RP2		
	01/02	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2015	2016	2017	
Traffic (flights, millions)	2.0	2.5	2.4	2.2	2.1	2.2	2.1	2.2	2.3	2.3	2.4	2.5	
Safety Risk bearing airprox (A/B)	8	2	0	0	0	0	0	1	1	0	0	0	
Delay seconds NERL attributable seconds per flight	109.4	26.8	19.3	4.3	4.3	7.3	1.4	5.5	2.4	2.4	12.7	6.2	
Fuel savings (kT - latest estimate)		5.3	10.4	30.4	13.0	41.2	26.5	19.3	188.8	51.0	18.8	71.7	
CO₂ emissions savings (kT - latest estimate)		16.7	33.0	96.6	41.4	131.2	84.1	61.4	600.3	162.2	59.8	228.0	

In the paragraphs that follow, we describe how our aviation environment is going to change over RP3 and why we need to develop our service for the future.

Traffic

We have managed significantly more flights in RP2 than was assumed when the RP2 plan was developed. Traffic volumes in 2017 have returned to peak 2007 levels.

Investment in systems and people allowed us to handle this level of traffic safely in 2017, with just one quarter of the delays experienced in 2007. By 2017, three years into RP2, we handled on average around 7% more traffic than assumed at the start of RP2. Over the five years of RP2, we estimate that traffic will have grown by 13%, and will be 7% higher than the RP2 STATFOR¹ assumption by 2019.

As the charts below show, our August 2018 forecast projects further annual growth in both UK and oceanic flights over RP3. This indicates that UK flights will rise by an additional 10% during RP3 to 2.8m. Our August 2018 base case represents our view of the most likely scenario and reflects a slowing in the rate of annual growth, mainly as a result of airport capacity constraints within the UK.

See Appendix B for more details on our traffic forecast, including a high level review against the STATFOR forecast, and a description of the uncertainties and risks inherent in the forecasts, particularly around Brexit.

Our core plan is designed to accommodate our traffic forecast safely and efficiently in RP3 and ensure we are ready to handle further growth, and changes to traffic mix and flows in UK airspace in RP4.

Safety

Our investments in safety have reduced the risk in our operations so we can deliver higher traffic levels with fewer safety events. The number of Airprox attributable to us has reduced to zero or one per year for the last decade.

Safety risk and traffic volumes are inextricably linked. As traffic levels rise towards 3m movements through RP3, and as drones increasingly use the airspace, the safety risk will increase. Consequently, we need to continue to invest in changes to technology, operational procedures, and airspace design to address this increase in safety risk. This will ensure we are able to maintain our safety performance while delivering an ATM service to more aircraft than ever before.

Airspace capacity

Existing airspace and the route network structures that support the ATM system are increasingly outdated for the expected traffic volumes, types and patterns. They are also operationally inflexible. Traffic growth is not uniform across the whole network, and some sectors are already routinely operating at capacity. This combination of factors limits our ability to create the additional capacity necessary to meet demand.

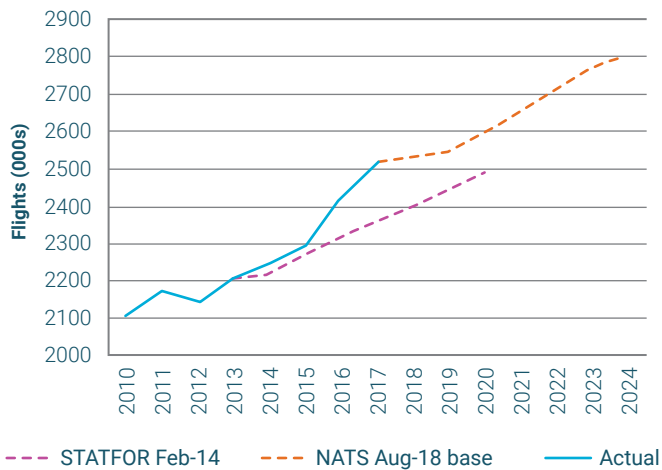
If there is insufficient airspace capacity, we have to regulate traffic in order to ensure safety. This creates delay for the travelling public. On behalf of the Department for Transport (DfT), we analysed the impact that capacity constraint could have, based on future traffic forecasts. The analysis showed that without redesign of UK airspace, delays faced by passengers could soar to 4.4m minutes (around 80 seconds delay per flight) by 2030, up from 90,000 minutes (2.4 seconds delay per flight) in 2015.

In addition, airport growth will be constrained by the lack of capacity unless the airspace is modernised.

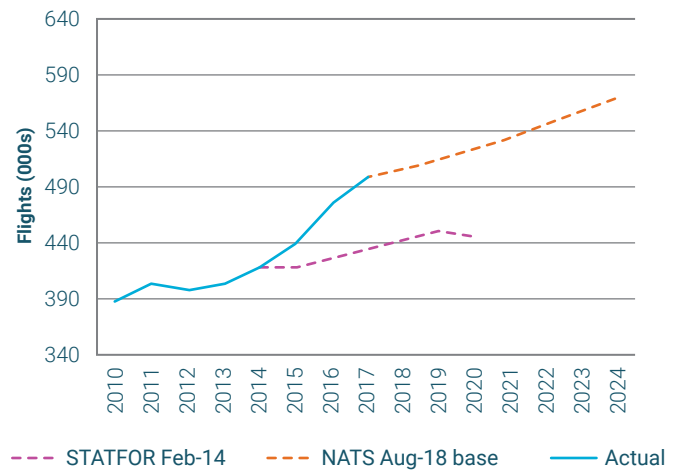
Modernising airspace at lower levels is extremely challenging given the nature and extent of impact on those overflowed. With the support of government, the CAA, airports and airlines we will deliver a programme of change in RP3 that will fundamentally modernise en route airspace to address these capacity limitations in time for RP4.

¹ Statistics and forecast service of the Eurocontrol Agency.

UK flights



Oceanic flights



Service quality

Since becoming a private company we have reduced air traffic delay in the UK by a factor of ten, while handling 25% more aircraft. This was achieved through investment in technology, analytics, and procedural improvements. In parallel, we have reduced the cost of delivering the service to our customers through improvements in our operation's productivity that allowed us to make significant reductions in our headcount, both operationally and more widely in the business.

Before the start of RP2, we realigned our operational ATCO² staffing with the reduction in traffic levels in 2012 and the lower growth rate indicated by the STATFOR forecast. However, in 2016 traffic grew substantially, and has continued to increase, well ahead of forecasts for RP2. At the same time, changes to pension legislation have had the effect of substantially increasing the number of retirements of ATCOs.

The factors above have led to a level of operational staffing which is finely balanced between demand and supply. As our performance in 2016³ indicates, it only takes a combination of a few factors to have an impact on our service quality. These include: rapid increases in traffic volumes that were not forecast, airspace changes, a challenging employee relations environment, and higher than usual staff sickness.

While they are happy with our safety performance, some of our customers complained about the level of service in 2016 from a delay perspective, which was two seconds worse than target. They stressed to the CAA and us the overriding importance of receiving a consistently resilient service that can respond to changing external conditions. In RP3 we face the challenges of delivering our high quality performance with improved resilience, while modernising airspace and ATM infrastructure to handle increasing traffic. To deliver this outcome, we will need to increase our operational resources to catch up with current traffic demand, as well as to handle the future growth in traffic in RP3 and manage an effective transition.

Environment

We remain unique among ANSPs in our provision of the 3Di tool, which enables our controllers to play their part in optimising flight efficiency. The table on page 13 shows the significant fuel and CO₂ emission savings that we have already delivered to customers over the last decade. However, growing traffic makes it increasingly difficult to deliver the most efficient environmental routing to every aircraft in our airspace.

The interrelationships between noise, emissions and other operational factors, such as delay and capacity, are often complex and at times fundamentally contradictory. Therefore, the delivery of positive outcomes in all areas is not always possible. It is clear, however, that fuel burn, emissions and managing the impact of noise on local communities are high on the agenda for all stakeholders.

The government will increasingly focus on its climate change commitments, and society continues to expect improvements in sustainability across all industrial sectors. Local communities around airports expect the whole of the aviation industry to pay greater attention to noise and emissions. Our core plan seeks to manage the environmental impact of growing traffic as far as possible until we are able to fundamentally redesign the airspace towards the end of RP3.

² Air traffic controller officer.

³ 2016 average ATFM delay per flight from NERL attributable causes was 12.77 seconds against a target of 10.8 seconds.

Technology

ATM technology has evolved over many years and is tested and certified to an exceptionally high level of reliability. However, it was not designed to deal with the ATM environment that the UK is likely to experience in the decade ahead. Not only will existing systems not meet future performance or security requirements, but we also face higher risks to service quality and operational resilience through the obsolescence of existing equipment.

We recognised this issue before the start of RP2 and put in place a technical modernisation programme called DSESAR. It will replace the many disparate and ageing technologies that exist across the UK ATM network with a single unified architecture.

This new technology will meet both our needs and those of our customers, now and in the future, and the required investment strategy was discussed and agreed during RP2. The programme is now nearing its halfway point and in RP3 we will complete our DSESAR Programme, building UK national infrastructure that will meet the requirements of the future.

As we are part of the European air traffic network, collaboration across international boundaries will continue to be important, including in a post-Brexit environment. This means that in RP4 and beyond, we will need to develop our technology plans further, taking into account the SESAR ATM masterplan which sets out the ambitions for ATM to 2035.

Some examples of how we plan to respond to these challenges include:

- > The roll-out of advanced tactical management tools in lower airspace to increase capacity, reduce pilot workload and maintain safety levels during traffic growth; and
- > The deployment of enhanced decision-making tools for planner controllers to reduce the level of co-ordination required and improve controller resource utilisation.

Further, we will exploit the investment made during RP2/3 in system wide information management (SWIM) technologies and the widespread exchange of trajectory data. This will lead to the integration of arrival and departure management tools that will optimise sequences and co-ordinate them across multiple airports, delivering benefits across the network. All of these investments will be critical to our ability to maximise the benefits of a redesigned modern airspace and deliver new capacity to the UK.

Drones

There is no doubt that drones will play an increasing role in the future use of airspace. While this role will be beneficial to the UK economy and the public, it is important that we integrate drones safely in UK airspace and protect commercial air traffic from the risks posed by drones.

The UK has a relatively liberal regulatory environment for drones and usage is increasing. Over 50,000 registered users and 40,000 drone flights have been logged in just over a year. This increases the risk to the safety of all categories of aircraft in both controlled and uncontrolled airspace. In July 2017, drones accounted for 53% of Airprox reports in the UK, compared to close to zero in 2015.

Drone usage will further increase the capacity pressures on UK airspace. The disruption caused by a drone at Gatwick on 2 July 2017 was a good example of this. As a result of that single event, arrivals and departures at Gatwick were stopped for two ten-minute periods, five flights were diverted and 64 flights were delayed, affecting over 10,000 travelling passengers.

In RP3, we aim to introduce a package of measures that will maintain the safety of commercial air traffic from the emerging risk posed by drone operations.

In addition, by the end of RP4, we expect there to be in the region of 76,000 commercial drones registered in the UK, including drone taxi services. Drone usage will further increase the capacity pressures on UK airspace. We will need to consider how this volume of new airspace users will be integrated with existing users.

Europe and industry

Our operating environment is further shaped by the European landscape and its evolution, including the various requirements and operational concepts that we expect to continue to develop and deploy as part of our commitment to the EC's Single European Sky (SES) initiative and/or the UK's own policy objectives.

The EC's Pilot Common Project (PCP) prescribes a set of pan-European ATM functionalities that will deliver benefits across the European ATM network. The EC is currently proposing the next EU-wide deployments, Common Project 2, and it is expected that these will be agreed later in 2018 for later deployment.

While it is unclear whether the UK will continue to participate in such projects post-Brexit, we, along with other European ANSPs, will continue to implement them. Our RP3 plan is therefore designed to allow us to address these obligations, recognising that there will be uncertainty until the requirements for Common Project 2 are fully defined and agreed and until the implications of Brexit for the participation of the UK in EU ATM are known.

Chapter 2: Our customers' priorities



Chapter 2: Our customers' priorities

After safety, our customers' most commonly raised priorities are airspace modernisation and operational and technical resilience.

Our customers' priorities are the key drivers of our business plan for RP3, alongside the requirements of our regulators in the UK and Europe.

Set out below is a list of the requirements that airlines and airports gave us in 2017, which they confirmed during our RP3 customer consultation over the summer, with the addition of queue management from airports. These are listed largely in priority order, taking into account varying preferences between customers. See Appendix C for more details.

Safety: This remains of utmost importance.

Airspace modernisation: This is necessary to provide increased capacity, and to meet and realise the benefits of airline and airport investment plans. It includes important programmes such as the London Airspace Management Programme (LAMP) and the Prestwick Lower Airspace Systemisation (PLAS). While customers are generally supportive of us taking a leading role in broader programme management for the airspace modernisation changes, there appears to be a range of opinions on how this should be achieved. For the airspace elements of this plan to be deliverable, it is critical that this point is resolved well ahead of RP3.

Modernisation of airspace tools and procedures: This includes enhancement to queue management, free route upper airspace (FRA), enhanced flexible use of airspace (FUA), enhanced network collaborative decision-making tools, and independent parallel approach (IPA) at Heathrow. Customers support increasing the scope of IPA to include the early morning (0600-0700) period, making this part of the core plan.

Operational and technical resilience: Provide a predictable and consistent service.

Improved environmental performance: Mitigate and, where possible, reduce fuel burn and CO₂ emissions.

Cost efficiency: Maintain the focus on delivering a cost efficient service.

Improved services outside controlled airspace: In particular on the east coast and for traffic crossing the UK flight information region (FIR).

Protection from unmanned aircraft: New airspace users, such as drone operators, should pay for some, if not all, of the cost of unmanned aircraft system traffic management (UTM).

Oceanic: Investments that deliver value for money.

Making use of airborne capabilities: This includes the ability to use target time of arrival (TTA) and extended use of air to ground datalink communications.

Improved resilience under adverse weather conditions: Noting that this may require investment. The UK Met Office is conducting a separate consultation on this.

Choice within our business plan: Where this realistically exists in our current and future operating environment, noting that wherever possible we presented options as part of the RP3 customer consultation.

Queue management: A number of airports specifically supported initiatives to extend the arrival management metering and sequencing, including to the North Atlantic, to allow arrival sequence to be efficiently optimised. Heathrow and Gatwick airports also requested the pairwise mixed-mode time based separation (TBS) deployment to be accelerated if possible.

We obtained this feedback in 2017 through face-to-face, teleconference and multilateral meetings, and through the RP3 customer consultation.

In developing our business plan, we have taken these priorities into account and carefully considered how to respond to feedback from airline customers, airports, the CAA and their consultants. We have also updated some of the assumptions in our plan, where these evolved during the consultation period. As explained at our customer meetings and RP3 customer consultation, there are trade-offs in some areas of the plan in order to meet our Licence obligations, including the core requirement for safety, as well as requirements for capacity, environment and efficiency.

The main elements that have been updated in our business plan following the RP3 customer consultation include:

Traffic forecast: To reflect our August 2018 update. This projects around 1.5% more traffic in RP3 than our previous December 2017 forecast. This arises mainly from the inclusion of additional flights, based on receipt of airport capacity plans. At the time of writing our business plan, we did not have access to the September 2018 STATFOR forecast and therefore we have not been able to make any comparison.

Uncertainty and risk are inherent in any forecast, and this is particularly the case with the current unknowns around Brexit and the effect this may have on the UK economy and traffic over the coming years. Therefore, we will continue to update the CAA on our RP3 traffic forecast as an input to the UK's performance plan, which will be published in the first quarter of next year and ask that the CAA keep this under continuing review. See Appendix B for more details.

Airspace modernisation: This emerged strongly as a key priority for airline customers who were keen for us to play a leading role in the programme co-ordination function for airspace at both higher and lower altitudes, noting that there are a range of governance options for how this could be achieved in practice. Our recommendation in our wider plan is for us to establish a new internal function, with a written charter of participation to confirm its responsibilities and powers, and our estimates of the costs involved. See Chapter 7 for more details.

Scope of investment programme: Customers have confirmed the broad strategic thrust and scope of the RP3 investment programme, and, where we offered choices, the particular airspace and technology projects that they wish to see included or excluded. We have reflected these choices in our plan. See Chapter 6 and Appendix L for more details.

Oceanic satellite surveillance: During the RP3 customer consultation, we engaged with customers on the details of the benefits case and the efficiency of the proposed data charges for the service. We have included evidence relating to this in our plan, along with the justification for our proposal to treat data charges as a pass-through to customers at cost, with no financial benefit to us. See Chapter 8 and Appendix M for more details.

Electronic conspicuity and drones: Customers are supportive of the development of a known environment for uncontrolled airspace through the use of ADS-B technology. This would include a legal requirement for all airspace users to carry the necessary equipment to be conspicuous in UK airspace to improve the safety of the air traffic system as a whole. We understand that the CAA is likely to mandate electronic conspicuity as part of an airspace integration programme that will affect most of UK airspace. In line with this, they have requested that we make proposals for the delivery of electronic conspicuity outside of controlled airspace. See Chapter 7 for more details.

Service performance: Customers confirmed that they would like our service performance in RP3 to be in line with our RP2 targets and metrics, despite projected higher traffic levels. This is likely to prove challenging given the current airspace environment and traffic growth, but we have included in our plan the reasons why we think this approach is appropriate and why alternative approaches are sub-optimal. This is subject to EU-wide targets yet to be confirmed. See Appendix E and Appendix K for more details.

Environmental performance: As our customers have reaffirmed that our 3Di metric is the most relevant and meaningful in UK airspace, we have based our proposed environmental performance targets on this measure. See Appendix G for more details.

Cyber security: We have updated our core plan to include the resources needed to meet the requirements of the EU networks and information systems regulations, which were implemented in the UK in May 2018.

Mitigation of noise: The CAA have asked us to explain the levers we have to mitigate noise and the limitations of these under existing and emerging DfT policy and CAA requirements, including airspace design, redistribution of air traffic and any new requirements from the DfT's aviation strategy. We have updated our plan to address these areas. See Chapter 3 and Appendix G for more details.

Governance: Working with customers, we have developed proposals for enhanced governance around the development of our annual SIP in RP3 so that we consult customers more closely on any material changes in our plans to reflect new or different requirements. These will be considered by the CAA and their independent reviewer. We have also described how NERL manages interfaces with NATS' non-regulated activities. See Chapter 9 and Appendix L for more details.

Evidence for our plan: We have based our business plan on comprehensive planning and detailed evidence, and we have expanded this to include areas that we presented during the RP3 customer consultation. This includes evidence in support of our headcount levels, more detailed benefits of our investment programme including satellite surveillance over the North Atlantic, further justification for increased asset management costs, and our proposals on cost of capital and financeability testing. See Appendices K, H, L, P and Q for more details.

Our plan is based on our understanding from the RP3 customer consultation of the performance outcomes that our customers expect, and the existing (RP2) regulatory framework. This is because the European RP3 regulatory framework is still being developed along with the EU-wide targets. If, when these are finalised, we consider that they will have a material impact on the deliverability of our plan and the outcomes that our customers expect, then we will advise the CAA and seek guidance from them on how to take account of this in the UK performance plan.

Chapter 3:

What our core en route
plan will deliver



Chapter 3: What our core en route plan will deliver

Our plan addresses two fundamental challenges in RP3:

- > Providing a service capable of handling the increase in traffic;
- > While simultaneously changing our operation to create more capacity and capability for the future.

We will deliver between 100,000 and 150,000 metric tonnes in enabled fuel savings to customers across RP3, worth £54m to £81m p.a. by 2024.

The projected average price in RP3 of £48.85 (2017 prices) is 14% lower than in RP2 and 25% lower than in RP1 in real terms.

Our aims: A safe, efficient and reliable service day-to-day and to evolve our future service



Introduction and approach

This chapter describes the outcomes that we propose to deliver in RP3 under each key performance area (KPA) – safety, capacity, environment and cost efficiency.

We have undertaken a comprehensive planning process, examining many options and scenarios across the KPAs. They have complex interdependencies with one another, and changes in targets in one area can adversely affect the achievement of targets in another, for example, trade-offs between capacity and cost.

Our plan addresses two fundamental challenges in RP3: providing a service capable of handling the rise in traffic using existing technology and airspace, while simultaneously changing our operation to create more capacity and capability for the future.

The business plan is designed to work as a whole, based on the direction and programmes started in RP2. The individual components support each other, with an appropriate balance between targets in each key performance area. We have costed our plan accordingly.

We believe that this plan offers our customers and the CAA the best outcomes, benefits and costs in the operating environment of RP3.

Chapter 7 contains supplementary information on requirements that are currently uncertain and possible future developments, the 'wider plan' referred to by the CAA in CAP 1625¹. As invited, we have proposed a regulatory mechanism for addressing these requirements should they be needed in RP3.

¹ Guidance for NERL in preparing its business plan for Reference Period 3, issued in 2018.

What our core en route plan will deliver in key performance areas

Safety

KPA*	Measure	Target
Safety = RP2 with ↑ traffic	Effectiveness of safety management Rate of accidents/serious incidents Rate of runway incursions and losses of separation Rate of over-delivery by the Network Manager	Compliance with EC targets

*showing planned outcome relative to RP2 performance

Until it is clear what will happen following Brexit, we expect to continue to comply with the safety targets set by the EC. These are expected to include:

- > One key performance indicator (KPI) on the effectiveness of safety management;
- > Three performance indicators (PI) on the rate of:
 - Accidents or serious incidents;
 - Runway incursions and losses of separation (LoS); and
 - Over-delivery of traffic by the Network Manager.

We will also set our own internal, aspirational safety targets to ensure that we continue to challenge ourselves on the safety of our services. It is important to recognise that failure to achieve or exceed an aspirational target does not mean that the safety of our services has been compromised. Our commitment is to continually strive to improve our operational safety performance and to minimise our contribution to the risk of an aircraft accident as far as is reasonably practicable.

The primary objective of the internal targets is to drive the right behaviour and outcomes across the organisation. We will continue to use the standardised European risk assessment tool (RAT), but, as it can only give a limited perspective on safety performance, we will use five further measures of safety with associated targets. These are set on the principle of “...maintaining or improving safety levels by ensuring that the number of serious or risk bearing incidents per flight does not increase and where possible decreases”.

These new measures supplement our understanding of risk and build on our experience of using RAT in RP2 (see table to the right).

Our key performance indicators	Proposed target
Category A or B Airprox attributable to us	Zero A or B risk bearing Airprox attributable to us
Category A and B RAT events incurring RAT ATM ground points	Maintain or reduce the number of our RAT A and B events
LoS	Maintain or reduce the number of LoS per 100,000 movements attributable to us
Our RAT score split between controllability and severity	Maintain or reduce the RAT controllability points per 100,000 movements Maintain or reduce the RAT severity points per 100,000 movements
Our overall RAT score	Maintain or reduce the overall RAT points per 100,000 movements

The level of traffic complexity and unpredictability can also impact on controllers’ workload and consequently on safety performance. To mitigate this, we will continue to monitor a wide range of other safety measures and investigate operational issues such as safety and workload hot spots. Where necessary, we will address these with tailored action plans.

By achieving the European targets, and working towards our own aspirational internal targets, we will make the contribution required to the current version of the UK State Safety Programme.

See Appendix D for more details.

Capacity

KPA*	Measure	Target
Service quality = RP2 with ↑ traffic	C1: Average ATFM delay per flight from all causes	13.8 secs
	C2: Average ATFM delay per flight from NERL attributable causes	10.8 secs
	C3: Weighted metric that captures the impact of the timing and length of delays	23.8 secs
	C4: Variability of daily average delays expressed as a daily excess score	2,000 score
	Allowance for special event transition delay	To be agreed ahead of specified transitions
	Technical resilience	Compliance with Licence condition 2 requirements

*showing planned outcome relative to RP2 performance

Our customers agree that their priorities are well aligned to our current delay performance metrics². Therefore, we propose that these should continue to apply in RP3. This would help ensure that we prioritise first and last wave performance, seek to minimise the length of any delays we cause and provide day-to-day consistency of our service.

Our en route delay performance is amongst the best of the major European ANSPs, which we intend to maintain through RP3. We will deliver delay performance in RP3 in line with RP2 targets despite the predicted record traffic levels we expect to handle in RP3.

The combination of the introduction of new tools, additional operational resource and collaborative planning with the airlines and airports will provide the foundation for delivering at this level. However, the constraints on capacity and pressure on the network mean that this will be a challenge throughout RP3.

In addition, in order to mitigate the potential impacts of traffic growth on service quality, we are planning to introduce a number of significant and vital airspace changes. These include the next stage of LAMP in the south east of England. This will utilise the performance based navigation (PBN) capabilities on aircraft to deliver improvements in safety, capacity and environmental performance. The redesign of the airspace will also facilitate greater resilience to weather and faster recovery following disruption.

We will also be implementing a number of technology changes in RP3, some new, some already in progress in RP2. Typically, we introduce such changes in quiet periods of the year to avoid

impacting customers as far as possible. Many of the changes we are planning in RP3 affect both controllers and pilots and therefore will require more time to properly bed in.

With traffic in RP3 expected to be higher than previously experienced, and, given the scale of changes, the delay generated by these major transitions has the potential to become more noticeable. The current scheme allows the use of delay exemption days for planned airspace and technical transitions, which have been consulted and agreed on with customers.

In RP3, we propose to introduce a special event transition delay allowance in place of the current exemption days mechanism. We propose to consult on and then agree the allowance for pre-identified transitions with our customers as part of our regular consultations, learning the positive lessons from the ExCDS³ transition in 2017 and 2018.

This would allow a more tailored approach to transition planning that can take better account of customer priorities. Delay that exceeds any agreed allowances would count towards our delay performance targets. Customers have indicated that they support this approach.

In addition to the major changes planned for RP3, we have a range of smaller scale enhancements to the operation of UK airspace - our Airspace Network Improvement Programme - to focus on specific hot spots and capacity bottlenecks.

See Appendices E and F for more details.

² These metrics will need to be aligned to the RP3 European regulations when these are finalised.

³ Extended computer display system.

Environment

KPA*	Measure	Target
Environment = RP2 with ↑ traffic	3Di flight efficiency	Score of 16.2 - 17.9 p.a.

*showing planned outcome relative to RP2 performance

In RP3, we will continue to focus on mitigating and, where possible, reducing airline emissions (fuel burn and CO₂) and the impact of noise on overflown communities.

The relationship between these and other operational factors, such as safety and capacity, is often complex and contradictory, and it is not always possible to deliver positive outcomes in all dimensions.

To deliver a balanced set of outcomes, our focus will be on reducing fuel burn and emissions impacts above 7,000 feet for arriving traffic and 9,000 feet for departing traffic, rather than at lower altitudes where the responsibility for low level routes, noise mitigation and public consultation rests with each relevant airport.

In order to allow us to focus on achievable efficiencies for our customers, we propose that flight efficiency incentives and penalties below these levels should be removed. This would align our incentive regime with government policy and CAA guidance, which prioritise mitigating the effect of noise on overflown communities up to 7,000 feet.

Fuel burn and CO₂ emissions

Our 3Di metric was designed specifically for the UK airspace in RP2 and is a proxy measure for fuel efficiency. It measures the difference between the actual and ideal flight profile within UK domestic airspace.

3Di encourages us to improve fuel efficiency horizontally and vertically in the climb, cruise and descent phases of flight. It also incentivises us to collaborate with neighbouring ANSPs and provide direct flights horizontally point-to-point across our airspace and beyond.

The SES performance scheme for RP3 will continue to use horizontal flight efficiency (known as KEA⁴) as a proxy for fuel efficiency. This is to incentivise ANSPs to achieve their targets by developing optimal route designs, and deploying FUA and FRA. However, this measure is much less sophisticated than 3Di, since it takes no account of vertical efficiency.

We believe it is in our customers' overarching interests to include a vertical component of flight in the incentivised metric and propose to continue to use 3Di as our financially incentivised environmental target. This is because the large number of arrivals and departures in the UK's airspace makes the vertical dimension of flight an important part of flight efficiency, compared to other countries where more flights are in level cruise across the airspace.

Our use of one incentivised metric - 3Di - with monitoring on a range of other measures is consistent with the European performance scheme, which consists of KPIs and PIs. In the RP3 customer consultation, airlines supported the use of 3Di instead of KEA and communicated this to the EC.

Our experience during RP2 shows that the 3Di metric in its current form needs a number of refinements, which are assumed in the proposed target range that follows. These will ensure that it remains focused on delivering airspace efficiency in areas that we can influence, while still bringing the fuel burn and CO₂ emissions benefits that our customers value so highly. If these refinements are not made, then the 3Di target range will need to be modified upwards by around 15 points.

We will maintain our 3Di target for RP3 within our projected performance score of 16.2-17.9 points p.a. at the end of RP2, or our actual performance at that date if better. The chart on the next page shows the proposed target range and the contribution of the airspace and technology programmes.

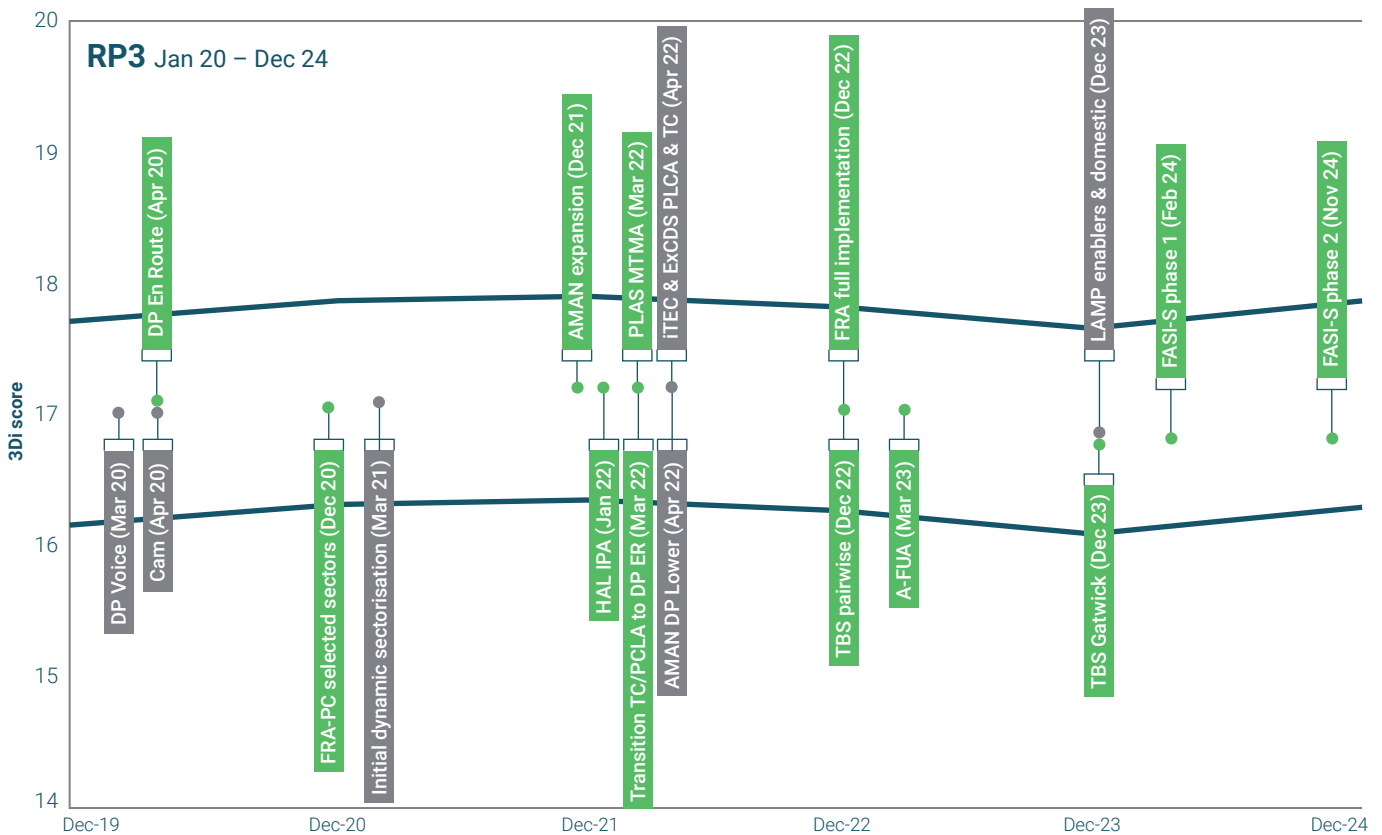
Our core plan will contribute to environmentally sustainable growth in aviation, despite increases in traffic levels. If the targets are achieved, we will deliver between 100,000 and 150,000 metric tonnes in enabled fuel savings across RP3, worth on average £54m to £81m p.a. by the end of RP3 to customers, based on current fuel costs and exchange rates (£540 per metric tonne⁵).

See Appendix G for more details.

⁴ Key performance environment indicator based on actual trajectory.

⁵ Using a fuel price of US \$700/MT and an exchange rate of £1 = US \$1.30.

Proposed 3Di target range



A-FUA Advanced FUA
 AMAN Arrival manager
 CAM Capacity and airspace management
 FASI-S Future airspace strategy implementation - south

HAL Heathrow
 MTMA Manchester terminal manoeuvring area
 PCLA Prestwick Centre lower airspace
 PLAS Prestwick lower airspace systemisation
 TC Terminal Control

Key to project assessments

- Benefit
- No impact
- Proposed target range

Noise

Aircraft noise is a complex issue, with many factors contributing to its effective management. Aircraft manufacturers, airlines and airports all have roles to play in the management of noise around airports.

We understand that aircraft noise is a key issue for the sustainable growth of the aviation sector and during RP3, where we have direct control, we will work to manage noise impacts on those overflow. Where we do not have direct control, we will work collaboratively with relevant airports and airlines so that they can conform to relevant noise rules, regulations and requirements.

Current relevant noise management regulations

There are a number of existing noise management mechanisms that are relevant to us, including noise instructions in the Aeronautical Information Publication (AIP); local rules set up as part of planning agreements for airport expansion, often known as section 106 agreements; and local airport KPIs, such as continuous descent approach targets.

The CAA's guidance on the airspace change process (CAP 1616) sets out the process that proposers of airspace change should follow, including detailed guidance on environmental assessments and consultation methodologies.

During RP3, we expect to conform to these various rules and regulations, to the extent that we are responsible. For instance, we will conform to elements of the AIP, local planning rules and KPIs on noise that are relevant to the operation of air traffic under our control. In the case of airspace change below 7,000 feet, responsibility rests with the airport concerned in RP3. But we will work in collaboration with the airports to ensure that their proposed changes connect with, and are consistent with, the en route network design, where we have specific responsibility.

Below 7,000 feet noise can be affected by changes outside of our control, such as the positioning of routes and the design of procedures. Once these routes are set by the airport, the distribution, type and number of aircraft on those routes will affect the noise experienced by overflown communities. Our ability to then affect those factors would be very limited.

In airspace below 7,000 feet it is our responsibility to operate air traffic in line with local and national regulations and, broadly speaking, to control air traffic in such a way that does not adversely impact noise on overflown communities.

Emergent noise management regulations and requirements

We are aware that the DfT and CAA are in the process of setting additional rules and requirements on noise management that are likely to be relevant to us during RP3. These include, but are not necessarily limited to, providing information on the planned and permanent redistribution of air traffic and requirements in the government's forthcoming airspace strategy.

While the exact requirements of these are not clear at the time of writing, we plan to conform to these emergent changes. Some of the tools and processes that will ensure this are set out below.

Noise and the CAA's airspace management strategy

Within the significant airspace changes required in RP3, there will need to be a high degree of co-ordination and negotiation of the designs that airports develop below 7,000 feet, as they will inevitably overlap with neighbouring airports' airspace change proposals (ACP). It will be necessary to identify the most efficient options, and, once the designs are optimised, consultations will have to be co-ordinated and synchronised to ensure that stakeholders are consulted in a fair and transparent way.

Within our wider plan, we have proposed to take a leading role in the overall co-ordination and delivery of airspace change through a new programme management office (PMO) function - the airspace modernisation organising group (AMOG).

AMOG would support ACP sponsors' improvement of their low level approach and departure designs to meet their noise obligations, within the scope of airspace modernisation. This may include respite routes, better climb profiles and new routes. Our objective would be to facilitate airports to achieve their aspirations of modernising the noise environment.

While we can offer this support to areas of airspace where we have no Licence obligation or contract for service provision, we have no say over whether such an offer is accepted in the current environment. The UK prospers through a network of privatised

airports and air traffic control (ATC) service providers and it is for these private entities to develop and modernise their own noise environments. We would be happy to work with the CAA and the DfT to change this arrangement if that were their preference.

Where, in accordance with the CAA's airspace change process, a local change to airspace design is proposed, the AMOG role is not intended to replace the resources that the sponsoring organisation would deploy to deliver that change.

We will explicitly comply with our responsibilities under the Licence and current policy and guidance, and will seek to comply with any new directions.

Our approach to noise management in RP3

As described above, in RP3 we will work collaboratively with local airports and airlines to mitigate the impacts of noise on communities, particularly below 7,000 feet where airports will be responsible for airspace and route designs. Our role will be to ensure connectivity with en route airspace.

The airports and their air traffic management experts, who they are likely to consult when they produce their redesigns, will be bound by the comprehensive guidance on environmental objectives and consultation set out in CAP 1616.

It should be noted that sometimes there will be difficult trade-offs between reducing noise and operational efficiency and the commercial interests of airlines. For example, re-routeings can impact on capacity or track miles flown. Even at a local community level, agreeing noise mitigation strategies that are acceptable to the majority of those affected can be extremely difficult.

In our core plan we propose that we work with stakeholders to ensure that future airspace designs mitigate or manage noise impacts where possible. This approach would be in line with the government's new airspace policy and developing aviation strategy, and the CAA's airspace change process.

As we deliver our investment programme throughout RP3, we believe important considerations for managing or mitigating noise impacts include:

- > New data and processes to analyse noise mitigation options when making changes to procedures or airspace, and to meet public data reporting requirements. We will develop these to meet the policy that is expected to emerge from the government's forthcoming review of planned and permanent redistribution of air traffic. In particular, we envisage the need for improved data, calculating the observed centreline and dispersal of flight tracks on routes, and will feed this into the change process to understand CAP 1616 consultation requirements.
- > Expansion of our community engagement strategy and new community engagement, education and airspace design tools to use in change consultations. This will ensure that our consultation arrangements are fit for purpose and that we use techniques that effectively allow all stakeholders, including industry and communities, to input into the design process at an early stage.

Prices and cost efficiency of our plan

KPA*	Measure	Target
Average price ↓ 14% RP3 v RP2	Real price reduction – average RP3 v average RP2	-14%

*showing planned outcome relative to RP2 performance

Prices for our en route service

We project an average price⁶ in RP3 of £48.85 per chargeable service unit (CSU), expressed in 2017 prices. This is 14% below our projection of the average price in RP2 of £56.82 and 16% lower than the CAA's average price assumption for RP2 in real terms.

The chart below shows actual prices (to 2018) and projected prices⁷ thereafter based on the assumptions set out in the appendices to this plan. Prices include true-ups⁸ for prior periods.

RP2

When setting prices for RP2, the CAA assumed a 21% real reduction from 2014 to 2019, with an average price in RP2 of £57.86 in 2017 prices (orange line in chart below).

Actual prices in the early years of RP2 include the addition of true-ups relating to RP1 for traffic and inflation. Prices in the later years of RP2 include reductions for true-ups for traffic and inflation during the reference period. We now project a 27% real reduction from 2014 to 2019, with an average price in RP2 of £56.82 in 2017 prices, which is around 2% lower than the CAA assumed (blue line in chart below).

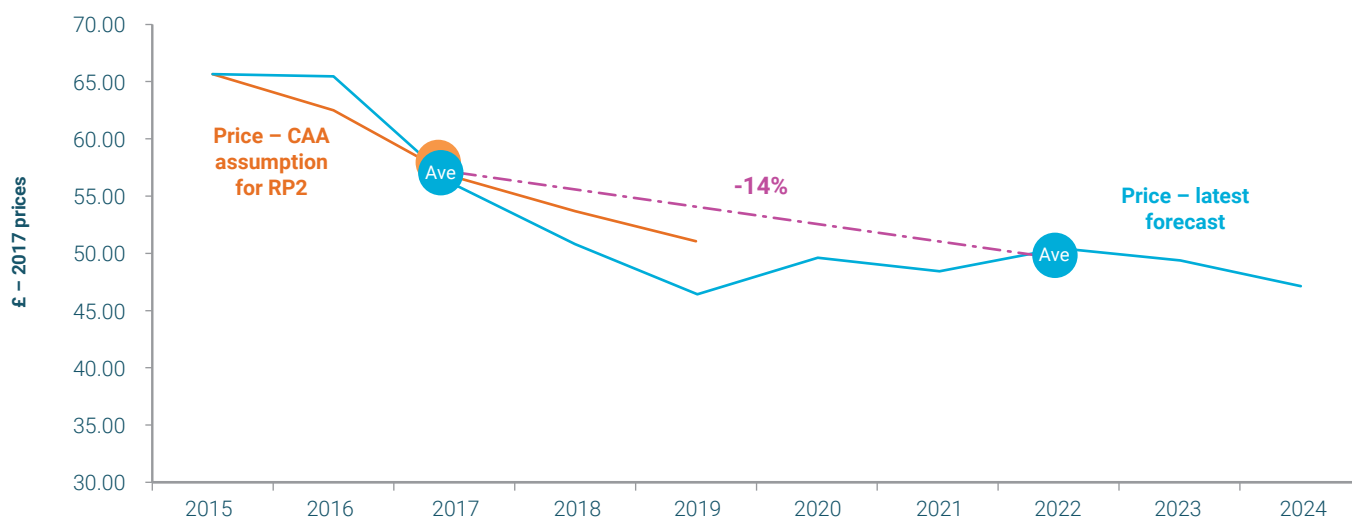
RP3

The projected average price in RP3 of £48.85 is 14% lower than in RP2 in real terms, as we handle even higher traffic levels without corresponding increases in our costs.

Prices in RP3 are reset to reflect updated assumptions for traffic and determined costs. This results in an increase from 2019 to 2020, which includes the cost of accelerating DSESAR and increases in operational resources to handle higher traffic with greater resilience. Thereafter, prices are projected to remain relatively stable. This mainly reflects a combination of the resources required to deliver the performance outcomes of our plan, underlying efficiencies, reducing pension costs and reducing regulatory depreciation.

See Appendices H, I and J for more details.

NERL (En Route) component of UK price excluding INEA funding



⁶ Calculated by taking a simple average of the prices over the period.

⁷ In order to provide a like-for-like comparison across the ten years, these do not include adjustments for INEA funding.

⁸ True-ups adjust prices to reflect the actual value of elements such as inflation and traffic volume risk sharing when these are known.

Reduction in prices due to INEA⁹ funding

During RP2 we have successfully applied for €119m of INEA funding, which will be passed to customers as a discount to prices starting in 2019. The amount will represent the GBP value of the net funds received in euros, together with any interest income earned, or any savings in bank interest, as a result of holding INEA funds. We will also deduct the cost of external audit fees, leaving us in a no better, no worse position overall. This approach is supported by our customers and the CAA.

The table on the right provides an indication of the level of discount on our component of UK en route prices from INEA funding.

Impact of INEA funding on our en route prices

Price per CSU £ (2017 prices)	RP2	RP3				
	2019	2020	2021	2022	2023	2024
Headline price	46.27	49.48	48.20	50.45	49.26	46.87
INEA funding (illustrative)	-3.53	0.00	-2.61	-0.19	-0.32	-0.08
Revised price	42.74	49.48	45.59	50.26	48.94	46.80
Impact of INEA funding	-8%	0%	-5%	0%	-1%	0%

Note: assumes exchange rate £1 = €1.15

Cost efficiency of our en route service

KPA*	Measure	Target
Average DUC ↓ 5% RP3 v RP2	Average DUC reduction – Average RP3 v average RP2 (real terms)	-5%

*showing planned outcome relative to RP2 performance

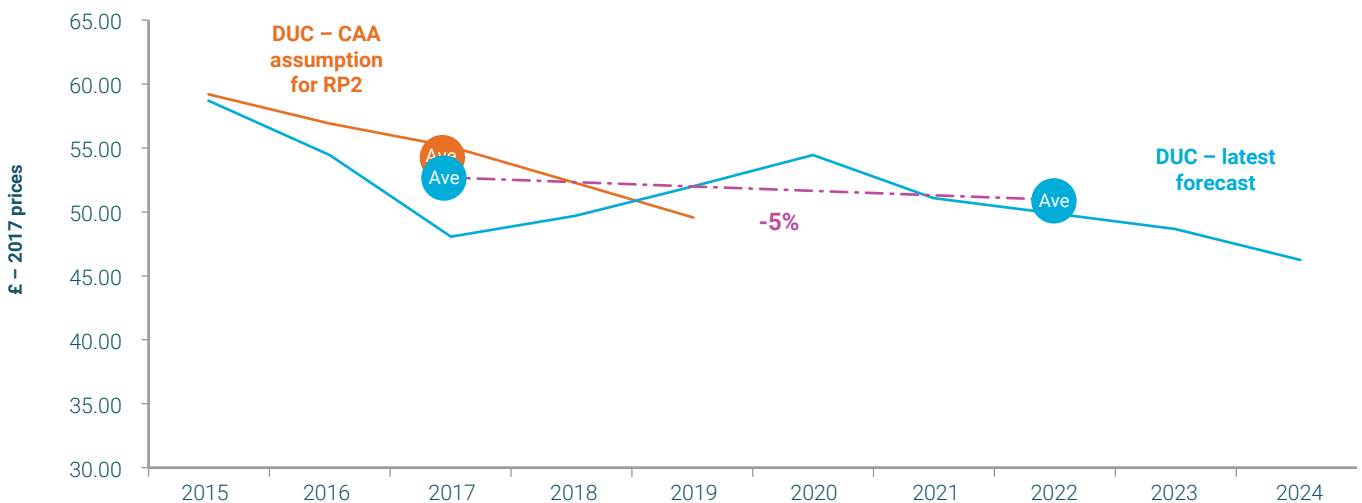
Historically, the CAA and the EC have measured the cost efficiency of the performance plans of ANSPs using determined unit cost (DUC). This is calculated by dividing our projected costs¹⁰ by projected traffic volumes to establish a unit cost. Unit cost differs from prices, which in RP2 are not updated for latest cost and traffic forecasts, but which do include true-ups in all reference periods.

Our plan reflects an average DUC in RP3 of £49.93 per CSU, expressed in 2017 prices. This is 5% below the average in RP2 of £52.55 and 8% lower than the CAA’s assumption for RP2 in real terms.

The chart below shows the profile from 2015 to 2024.

See Appendices H, I and J for more details.

NERL (En Route) DUC



⁹ Innovation and Networks Executive Agency created by the EC to increase the efficiency of the technical and financial management of certain programmes.

¹⁰ In RP2, the DUC projection reflects the fixed allowances set by the CAA for costs including pension costs and regulatory depreciation in line with the UK performance plan.

RP2

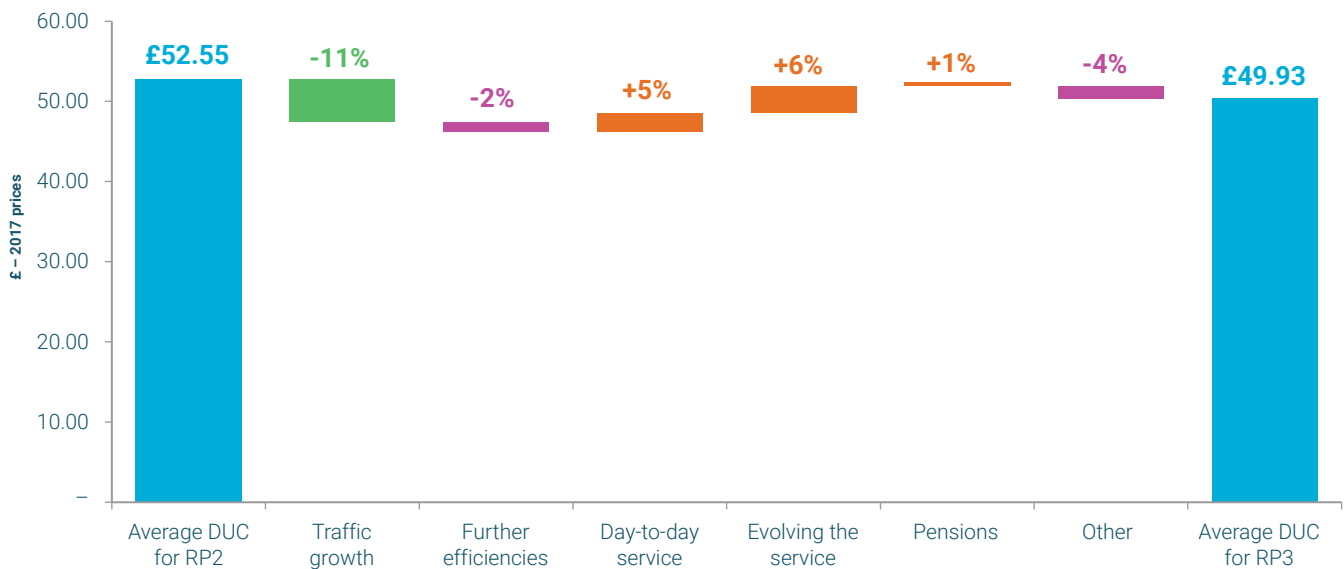
When setting the DUC for RP2, the CAA assumed a 4.8% p.a. real reduction from 2014 to 2019, with an average DUC in RP2 of £54.51 in 2017 prices (orange line in chart on previous page).

We have achieved an even greater reduction in DUC in the first three years of RP2, through a combination of higher traffic and efficiencies. We expect our costs to rise in the latter part of RP2, reflecting the resources required to support continued traffic growth and the acceleration of DSESAR (blue line in chart on previous page). This results in an average DUC in RP2 of £52.55.

RP3

The projected average DUC in RP3 of £49.93 is 5% lower than in RP2 in real terms, as we handle even higher traffic levels without corresponding increases in our costs. The chart below shows the main factors that account for the 5% reduction.

DUC bridge



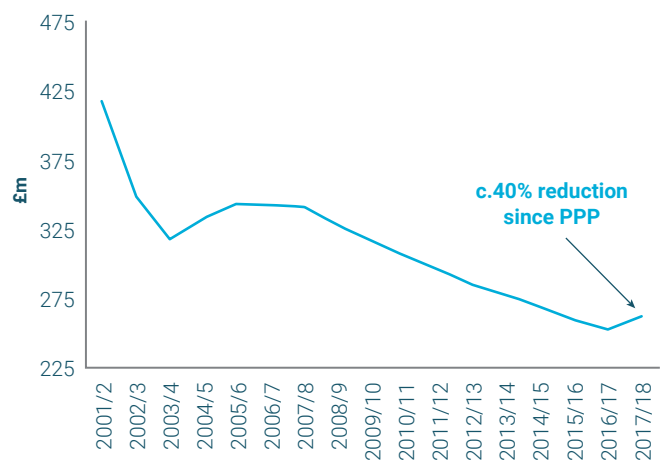
Traffic growth (DUC change: -11%)

Our traffic forecast projects growth in CSUs of 11% between 2019 and 2024, which corresponds to an increase of 13% in average CSUs in RP3 compared to RP2. This reduces the average DUC in RP3 by 11%¹¹ compared to RP2.

Further efficiencies (DUC change: -2%)

Our plan, and therefore prices, projects further operating cost savings amounting to around £70m, which reduce the average DUC in RP3 by around 2.3% compared to RP2. These efficiency savings relate to all areas of our business, but in particular to savings from managing and maintaining the new systems that we are implementing in RP2 and RP3. We will bear the risk if these savings cannot be realised. It is important to note that since our Public Private Partnership (PPP) began in 2001, we have reduced our controllable underlying operating costs by around 40% in real terms¹², as shown in the chart on the right.

Real underlying operating costs in £m (2008/09 prices)



¹¹ Calculated by dividing the determined cost base (DC) by a higher CSU volume (13% growth on average between RP2 and RP3), reducing the RP3 DUC by 11% (i.e. DC/1.127 = 0.89).

¹² Shown in 2008/09 prices using RPI indexation.

Day-to-day service (DUC change: +5%)

In order to provide customers with a resilient, reliable and good level of service, our plan includes additional operational resources that are essential, given higher traffic levels and the extent of training required to deliver airspace changes.

Evolving the service (DUC change: +6%)

We will incur additional transition costs to deliver DSESAR during RP3. These mainly relate to:

- > Dual running costs - to run and maintain both new systems and existing systems for a limited period;
- > Training costs related to airspace changes; and
- > Assuring and governing the change programme.

The majority of these transition activities and costs will end in RP3.

Pensions (DUC change: +1%)

Our plan includes pension contributions for employees in our defined contribution and defined benefit schemes. It also includes costs relating to employees who have opted out of the defined benefit scheme and who have accepted a pension cash alternative, which costs less than the future service cost of the scheme (see Appendix H).

There is a small increase in average DUC as a result of updating these projections. This arises because the CAA assumed that pension contributions would reduce towards the end of RP2 through improvements in financial market conditions that did not materialise.

Other (DUC change: -4%)

Other factors include:

- > Lower regulatory depreciation charges following the full depreciation of our PPP asset base;
- > The acceleration of £160m of capital expenditure from RP3 into RP2¹³, as agreed with customers during the RP2 SIP consultation; and
- > The lower cost of capital in our plan, while maintaining our on-going financeability (see Appendices P and Q).

This is partially offset by lower levels of non-regulated income, including the contract with the Ministry of Defence (MOD) for the provision of infrastructure where their share of our cost efficiencies will result in a lower contract price.

Relationship between our price and the UK unit rate

Currently the price for our service represents around 85% of the UK unit rate. The relationship between these two elements is explained in Appendix O.

Prices for our London Approach service

In line with our response to the CAA's consultation (CAP 1593¹⁴) we propose to maintain the existing arrangements on cost reflectivity of these prices. Based on our plan, our projections of these charges¹⁵ are set out in the table below. If London Biggin Hill Airport were included in London Approach, the unit rate would increase by 1p per service unit. See Appendix O for further details.

Prices for our London Approach service

London Approach price										
2017 CPI prices (calendar year) £	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Unit rate	14.04	14.03	13.83	13.60	13.41	12.27	11.76	12.05	11.89	11.93

¹³ This accounts for around a 2% increase in the average DUC in RP3.

¹⁴ Guidance for NERL in preparing its business plan for Reference Period 3 issued in 2017.

¹⁵ Charges for our London Approach service are calculated as a terminal weight based charge on departing aircraft (using an algorithm described in EU charging regulation No 391/2013, Appendix V) with revenues offset against our en route charges as part of a single till arrangement.

Chapter 4:

Delivering our core en route service in RP3



Chapter 4: Delivering our core en route service in RP3

Our plan is safety and performance-led and delivers value for money for our customers. It will keep pace with projected traffic increases and deliver the right service quality and resilience for our customers in line with their priorities.

The plan is designed to work as a whole. The individual components support each other, with an appropriate balance between targets in each key performance area.

This chapter describes how we will deliver our day-to-day service in RP3, and should be read in conjunction with the detail presented in Appendix K. In the next chapter we describe how we will evolve our service to provide future customer benefits.

Safety activities

Our main responsibility is to manage and maintain the safety of our operation.

Actions that we will continue to take day-to-day in RP3 include:

- > Continuing work to reduce infringements of controlled airspace, which account for a quarter of all LoS, working with the CAA to raise the required standards for general aviation (GA) pilots and to encourage the use of available technology, ensuring greater conspicuity of all aircraft;
- > Harmonising operational procedures and ensuring understanding of operations across different ATC interfaces;
- > Proactively minimising the risk of aircraft inadvertently entering danger areas;
- > Collaborating with drone manufacturers, users and regulators on the development of rules, procedures and technology to ensure the safety of all airspace users;
- > Balancing controller workloads to improve situational awareness and to reduce the risk of fatigue;
- > Retaining a high level of competence among our engineers to ensure the resilience and proactive maintenance and management of our current systems; and
- > Embedding best working practice when new systems and operational changes are introduced.

Delivering the service

As well as managing the safety of our operation, we aim to continue to deliver a predictable, high quality service to our customers every day.

We are already operating at record levels of traffic. 2018 saw the busiest days for both UK and European air traffic, and it is forecast that 2018 will be the busiest ever year for air traffic in the UK. Despite traffic growth that was significantly greater than the RP2 forecast, we continue to deliver delay performance that is considerably better than the European average.

The growth in traffic is not homogenous. It is concentrated at already busy times of the day, and growth also takes place in specific sectors of airspace. For example, in 2017, the Essex airspace experienced growth of around 6%, and in the period from 2015 the growth has been around 32% (or around 27,000 flights). The result of this is a constraint in capacity in parts of the network, which will only be addressed by airspace change. Additional traffic gives rise to greater complexity, more route constraints and more difficult decision making. Therefore, higher traffic can be disproportionately more challenging to accommodate.

The UK is the most complex ATM environment in Europe. For example, the most recent ATM cost effectiveness (ACE) benchmarking report published by Eurocontrol's Performance Review Commission¹ identified that the terminal control operation at Swanwick was significantly more complex than any other European ANSP, and that the area control operation at Swanwick managed the highest number of instrument flight rules (IFR) movements of any area control centre (ACC) in Europe.

The report said that we manage this high complexity and high traffic volume environment with fewer sectors than comparable ACCs. When considered alongside our good delay performance, this indicates a strong level of efficiency and effectiveness

¹ ACE 2016 benchmarking report, published in 2018.

compared to other European ANSPs. The study also identified our ATCOs as being consistently amongst the most productive in Europe. See Appendix J for more details.

Further traffic growth forecast in RP3 means we will need to improve continuously in order to maintain our service performance. We will continue to optimise network operations by using information from airlines, airports and other sources, such as satellite based ADS-B surveillance, to further enhance our strategic, pre-tactical and tactical planning processes, while managing the inherent variability and uncertainty of traffic. See Appendix K for more details.

Daily delivery of our operation is subject to many variables. These include significant factors outside our control such as weather (strong winds, thunderstorms, the position of the jet stream), airline technical issues, applicable air traffic regulations and local airport issues. As a result, our daily operational planning has to respond on a reactive basis. This requires an appropriate level of resilience in our staffing levels and management of the UK network, while working collaboratively with airports and airlines to optimise the flow of traffic.

Resourcing and training

Demand

The growing volume and complexity of traffic, and the need for greater operational resilience, have increased the requirement for more operational resources in RP2 and in RP3, even with high levels of productivity. See Appendix K for more details.

While traffic growth is an important driver of demand on resources, there are also a range of other important factors. For instance, in addition to delivering the core operational service, it is essential for our operational staff to undertake other duties in order to continue to provide a sustainable service. This includes on-the-job training, competency assessments and professional development.

It is also important for our operational staff to support the development of our technology and airspace programmes. This involvement is critical and not only improves the quality of the outcomes delivered, but also ensures a smooth operational transition of these service changes for our customers, and the realisation of the programme benefits. The criticality of a smooth transition also places significant training demands on our operational staff.

To a considerable extent, we have mitigated the need for additional operational staff by deploying new technology and a process of continuous improvement. For example, we handled the same peak traffic volumes in 2017 as in 2007, but with around 10% fewer ATCOs, 60% fewer ATSA²s and with 50% less delay.

However, continued traffic growth cannot be contained indefinitely without increasing operational air traffic controllers. From 2017 to the end of RP3, we need to increase the number of ATCOs from 915 to 1,018. This includes forecast growth relating to the third runway at Heathrow.

From 2017 to the end of RP2, we need to increase the number of ATSA²s from 480 to 562. This is because, in addition to supporting the delivery of the operational service, they support ATCO training and airspace development work. During RP3, we expect their number to reduce to 516 as we realise efficiencies from the introduction of SESAR projects.

We also project that there will be increasing demand for other non-operational resources, reflecting the various challenges we face. These include:

- > Record breaking traffic growth every single year;
- > The largest airspace modernisation and consultation since the 1960s affecting around 27m people;
- > A complex investment programme;
- > Transition to a single operation across two centres, requiring a significant change management programme; and
- > Additional scope and requirements, for example, cyber security, drones, enhanced programme governance and increased operational and technical resilience.

Supply

In the lead up to RP2, we reduced the number of operational and other staff to reflect the traffic forecast and cost reduction targets for RP2 set by our regulators in the UK and Europe.

Traffic has grown at substantially higher rates than that assumed for RP2. Also, changes in pension tax legislation have resulted in a higher level of retirements than we previously forecast. This has resulted in a shortfall in the number of available ATCOs compared to the demand. Without action, this shortfall will worsen as the demographic profile of our ATCOs means there will be higher levels of retirement in RP3.

Recruiting experienced ATCOs is challenging because of a worldwide shortage and the very small number of appropriately qualified ATCOs in the UK outside our organisation. Training and replacing our experienced ATCOs takes on average three years, with a further two years needed to achieve the same multi-validation level as an experienced retiree. Given the five-year lead time to achieve multi-validation, this creates a reduction in the flexibility of how we deploy our operational staff in the shorter term, adding to the need for a higher ATCO headcount.

Recognising these challenges, we have already started to increase our operational staff to the levels required to service the current demand, and we plan to further increase staffing to meet forecast future demand.

² Primarily through site consolidation and the introduction of new technology such as iFACTS and EFD.

Our plan for balancing demand and supply includes:

- > Using the full capacity of our college for training ATCOs;
- > Adopting more innovative training methods to improve success rates further and to reduce training time of new trainees and existing staff;
- > Employing additional external training for some elements of the course; and
- > Increasing the capacity of our operational staff to handle more traffic through the use of new tools.

The time needed to train staff in ATSA grades is considerably shorter than for ATCOs, typically three to 12 months, depending on the role and degree of flexible deployment required. So we expect to recruit and train them, and other staff, relatively quickly and easily to match the demand.

During the RP3 customer consultation, we discussed our resourcing and training plans extensively with our customers. We have also briefed airports on our resourcing plans and they have expressed their support.

See Appendix H and K for more details.

Preparing for RP4

The long lead times that are necessary to introduce major changes in our business mean that we need to start preparing for RP4 during RP3.

From an operational resource perspective, we need to be recruiting and training ATCOs from mid-RP3 to ensure that we will have sufficient staff to provide a service to a third runway at Heathrow and to address the significant increase in projected ATCO retirements in RP4.

Other resourcing plan options considered

The plans we have in place will deploy the maximum number of ATCOs that can be trained internally or externally until we reach the operational requirement in RP3. Therefore, there is no option to increase these numbers further.

Our analysis suggests that reducing ATCO numbers below the level that we are planning will introduce significant risk to providing the quality and resilience of the operational service that our customers require. Our obligation to maintain a safe service with fewer staff in ever-increasing levels of traffic density and complexity would necessitate much greater capacity regulation and would result in delays comparable to those seen across continental Europe this summer. It would also increase the risk to delivery of our technology and airspace programmes and the timely delivery of their benefits.

For example, our resourcing models suggest that if we were to have 50 fewer ATCOs available in 2024 than our current plan, C2 delay would be expected to increase from around 11 seconds to around 18 seconds per flight. In practice, service quality would also become less predictable. There would be more days with delay in excess of 10,000 minutes, which would increase the risk of cancellations, particularly first rotation delay. See Appendix K for more details.

On non-operational controller headcount we plan to maintain the numbers at current levels, despite an increase in the demand for the non-operational tasks that they perform. These include supporting the operation in handling increasing traffic growth and complexity, and working on expanding airspace and training programmes. We are satisfied that we do not need to increase these numbers beyond our plan in order to support the day-to-day service of the operation. We have considered whether these numbers could be reduced. However, it is important to note that there are interdependencies between the different types of staff that we employ.

Our plan minimises the amount of work the ATCOs perform outside the operation. This both reduces the cost of this work, and makes best use of the scarce ATCO skill. If, for example, the numbers employed in non-ATCO grades are reduced, then ATCOs would be diverted from the operation to take on these tasks, and the proposed service quality targets would need to be re-assessed. This would also impact further on the risk of delivering our technology and airspace programmes and their benefits.

For the reasons given above, we consider that there are no credible alternative resource options for delivering the levels of service and resilience that our customers require. If we are not able to secure the levels of headcount that this plan describes then we would need to reconsider what our plan could deliver.

Resilience

Operational resilience

This plan addresses our customers' request for enhanced operational resilience. In addition, we have taken on board the expectations from the CAA's guidance and recommendations at the conclusion of the Oberon enquiry³. In RP2 we consulted extensively with our customers on two options: a service-led plan with more resources and higher predictability of service performance; and a price-led plan with fewer resources and a lower predictability of service performance (more days where service delay would occur and/or where delays could be longer).

Our understanding of the basis of the CAA's adoption of the price-led plan in RP2 was that their evaluation of our performance against our Licence obligations - to ensure that sufficient resources were available to satisfy reasonable traffic demand - would be conditioned on the assumptions and rationale of that price-led plan and the trade-offs it involved.

While no breach of Licence was established following the Oberon enquiry, we now understand that the CAA's expectation is that we should have resources and flexible mechanisms in place to maintain operational resilience in the event of unforeseen high demand or other disruption. This is the case even where we embed premises and compromises in the business plan that are consistent with customer feedback and overall delay performance targets in the business plan.

Against that background, our RP3 business plan provides for appropriate levels of operational staff, while strengthening our operational resilience through a number of other measures.

³ The CAA's investigation into service delivery of Stansted approach sectors in summer 2016 under Section 34 of the Transport Act 2000: Project Oberon, final report.

We will create an ATM environment that is planned to a far greater degree through the introduction of a collaborative and transparent daily operational plan agreed with all willing stakeholders. This will include giving customers oversight on capacity issues, and advice that will allow them to make early decisions on whether to accept delays or re-route their flights if caught in particular hot spots.

We are planning to expand our airspace capacity management team in order to improve the network management support for operational teams in both the planning and tactical phases across the ATC centres. The team will also continue to develop and implement the SESAR concept of an increasingly planned ATM environment, so reducing the need for tactical intervention.

Improving industry-wide collaboration is critical to the success of these plans. We can achieve this through the sharing of data, planning and post-ops reviews. This will require different, more open ways of working between airlines, airports and us.

See Chapter 5 and Appendix K for more details.

Cyber security

We deliver a safety-critical service that is a major part of the critical national infrastructure. It is vital that we invest in effective cyber security controls, as the current threat is serious and evolving, and all indications are that it will continue to grow. We currently operate a comprehensive cyber defence capability, but cannot afford to become complacent in the face of this threat.

Warnings by senior UK military leaders⁴ of the capability of Russia to disrupt UK ATC operations are just one indication of the seriousness with which we need to take this threat. It is therefore critical in RP3 that we significantly bolster our investment in cyber defences, cyber monitoring, and pre-planned and rehearsed responses to both state sponsored and mainstream cyber attacks across our operational and business estate.

We liaise closely with the National Cyber Security Centre to ensure that we stay abreast of the latest intelligence on threats. We aim to develop further the right level of control and risk tolerance through a mix of policy, process, culture and technology.

We have increased the security of our operational and business IT systems, including the appointment of an external organisation to run our security operations centre, which will monitor and help protect the whole organisation from cyber attacks. With this capability we can continually monitor our systems in order to identify and address specific issues and threats, or unexpected deviations from normal behaviour. This will provide a level of resilience in our core services and generate intelligence on new threats that we need to be prepared for.

Investment in cyber technology and training enables us to manage this risk and comply with ISO 27001⁵, and meet our regulatory requirements including the Computer Misuse Act

1990, NIS Directive 2016 and General Data Protection 2016 Regulation, as well as European requirements such as EC Regulation 1035/2011 and ICAO Annex 17⁶.

See Appendix K for more details.

Technical resilience

It is crucial that we invest sufficient resources in the maintenance and provision of essential technical services to mitigate a broad range of risks. This will provide our customers with a robust and resilient service in a period of continued traffic growth, and ensure a successful transition to new technologies.

We will achieve this by maintaining and operating a resilient infrastructure of systems, people and processes that minimises the likelihood of overall service failure. In the event of a failure, this would minimise the impact and reduce the recovery time to return to normal operations. The infrastructure is supported by a thorough approach to asset management, including health reviews, preventative maintenance and planned investment.

There are a small number of enhancements to our current operational systems necessary to maintain performance and meet traffic growth. For example, an assessment of our older systems has predicted issues with track capacity that need to be mitigated early in RP3 in order to avoid capacity limitations in the busy London terminal manoeuvring area (TMA). We will continue to assess technical obsolescence and invest across our operational estate to prevent degrading our operational capability.

We will also make enhancements to the trajectory management systems to ensure we can cope with the additional flight strip information in large sectors at peak times. There are further changes that we are obliged to make to match changes by adjacent ANSPs and the MOD, or that are required by regulation.

Many of our remote communication, navigation and surveillance (CNS) assets have been in operation for at least 15 years. We review their health carefully and have a programme of mid-life refurbishments and replacements where appropriate.

We will maintain a balance of navigation aid provision through DVOR⁷ and resilient DME-DME⁸ coverage as the fall back for any failure of satellite navigation throughout RP3. We will have to begin to replace the ageing surveillance assets, such as primary radars, during RP3.

After careful consideration, we have taken a balanced approach that will maintain safety and resilience, and ensure compliance with CAP 670⁹. We will also exploit new surveillance technology and services as they become available. Additional considerations with regard to further potential surveillance service improvements are covered within our wider plan.

See Chapter 7 for more on surveillance technology and Appendix K for more details on technical resilience.

⁴ UK Defence Journal 2018, Military intelligence chief warns Russia could 'cripple' British infrastructure with cyber attacks, 8 March, <https://ukdefencejournal.org.uk/military-intelligence-chief-warns-russia-cripple-british-infrastructure-cyber-attacks/>.

⁵ ISO 27001 is the international standard that describes best practice for an information security management system.

⁶ The ICAO Standards and Recommended Practices for security.

⁷ Doppler very high frequency omni-directional radio range.

⁸ Aircraft use DME to determine their distance from a land based transponder to assist navigation.

⁹ ATS Safety Requirements issued in 2014.

Business resilience

We will ensure the availability of safe and secure information services (IS), and an estate that provides the base for a safe operation.

All aspects of our business and processes are supported by information technology and data analysis systems. They directly support just over 3,300 staff who must be able to work collaboratively and manipulate content and data across three main UK sites. IS also delivers customer benefits, for example, through the growing use of analytics to exploit the volume of data our operations generate.

We will deploy IS solutions that utilise the most cost effective mix of cloud based and on-premise platforms, and provide sufficient secure storage, transmission and compute capacity.

We own and operate infrastructure at 177 sites across the UK, 153 of which are classified as remote. This includes buildings with an insured value of £410m. By 2025, up to £278m worth of our assets will be past their expected lifespan, and failing to invest sufficient resources could lead to significant risk of technical failure and disruption to the travelling public.

The vast majority of remote sites provide our resilient UK-wide CNS infrastructure. This will remain necessary post-DSESAR implementation but will be subject to on-going review as new technologies for CNS become available.

See Appendix K for more details.

Environmental performance

We are continuously focused on opportunities to improve our performance through active management of environmental issues. Our on-going programme of airspace modernisation and tactical improvements will reduce fuel burn and CO₂ emissions, supporting the delivery of sustainable growth for the industry.

Fuel burn and CO₂ emissions

Reducing airline fuel burn is a financial imperative for our customers, even in times of relatively low fuel prices. And we expect the need for carbon efficiency to become increasingly relevant in RP3 as airlines enter the carbon offsetting and reduction scheme for international aviation from 2020, which will add to airline costs for increased fuel burn and CO₂ emissions.

Throughout RP2, we significantly increased our engagement with operational staff to make tactical improvements to flight profiles, fuel burn and emissions, and will continue this in RP3. In addition, we have stepped up training on the latest techniques of delivering fuel burn and emissions savings at our ATC college, which we will continue both at the college and throughout controllers' careers.

The data we collect on trends in airspace use helps us to identify

opportunities for environmental improvements. It informs the decisions we make both pre and post-operations to manage re-routing, sector planning and staffing, while providing a feedback loop to the business and staff on our performance.

We will also continue to measure the fuel savings that are enabled by our actions and report these to customers through the SIP and Flight Efficiency Partnership. This information supports customers in delivering fuel savings, business case decisions, and the requirements of environmental impact assessments.

Noise, airspace modernisation and community engagement

We are developing new tools that assess the noise impacts of changes below 7,000 feet for our work with airports on airspace and procedure designs in RP3. These tools will give us a better understanding of the noise impacts of the proposed changes and what level of consultation is required. They will also enable us to communicate the impacts in a simple and transparent manner to communities, stakeholders and politicians.

Although aircraft noise itself is not directly within our control, we can influence its distribution through implementation of low noise procedures such as continuous descent approach, continuous climbs and modern approach procedures such as avoiding orbital holding.

We will work with our airport partners as they engage with communities to ensure that future airspace design mitigates or manages noise impacts where possible, given the complex interdependencies and trade-offs involved.

It is important to explain both the need for significant changes to airspace in order to modernise it, and that modernisation can have a beneficial effect on the noise people experience. There are now tools that show the trade-offs that must be considered in changing routes, which we can use earlier in a wider awareness and engagement process. This gives the public an opportunity to be involved in the design process.

In order to ensure that we understand what the wider public think, we will use both qualitative and quantitative approaches, including deliberative tools. This is a social research technique that can move participants' opinion beyond their immediate reactions to complex and emotive issues, by providing them with balanced information and time to consider different perspectives. This process provides a balance to the views of self-selected samples.

London Approach

London Approach forms a very important part of our day-to-day service and the CAA have asked us to review the scope of the service and consider establishing metrics.

Our Licence requires us “to maintain the most expeditious flow of air traffic as a whole without unreasonably delaying or diverting individual aircraft”. To do this, we regulate the network to produce the necessary effect on the relevant sectors with the least negative impact on our customers. As far as possible, we distribute regulation across airports in order to avoid unduly penalising a small set of customers. To achieve this, we treat London Approach as an integral part of the overall network.

We will continue to implement the recommendations of Project Oberon in order to maintain and improve our performance in London Approach. We aim to avoid the closure of airports wherever possible. However, there are rare occasions when events combine to make this necessary. We will continue to manage any closures that do occur as efficiently as possible within the constraints of the scheme for regulation of air traffic controllers’ hours. This will ensure that there is little or no impact on airports, their customers and the travelling public.

In addition, we have agreed service delivery plans for airports in London Approach that wish to have them. We have worked closely with Heathrow, Gatwick and Stansted to assist with the implementation of service delivery plans, which are now in place. They describe the daily tactical plan and service requirements for each airport. One is also currently being trialled at Luton and we are working with London City Airport to assist in the introduction of their plan.

Metrics for London Approach

We have considered whether there should be separate targets for London Approach. However, segmenting different parts of the network in this way is not consistent with the Licence requirement described above, and we believe it could drive the wrong behaviours and lead to the wrong outcomes for the travelling public.

Such an approach is likely to result in an understandable desire by stakeholders for a continuous analysis cycle of the individual actions taken by experts who are trained to manage the network as a whole. We believe this will inevitably lead to lobbying for optimisation of one part of the network at the expense of other parts, potentially benefitting some customers while adversely affecting others. It could also produce a sub-optimal result for network efficiency overall. Customer feedback from the RP3 customer consultation supports maintaining the status quo, retaining data but not setting separate targets.

Given this, we believe that establishing separate targets for London Approach specifically would add cost, distract from delivering the best service for the network and potentially result in unfair outcomes to the travelling public.

As part of the work to develop our reporting on service performance and standards under Condition 11 of our Licence, we will consult with our customers on some additional reporting measures specific to our performance in London Approach sectors, building on the existing Oberon reporting data in Condition 11 including:

- > The availability of our service for London Approach airports;
- > Scheduled demand per hour compared to actual demand per hour; and
- > Traffic growth per airport compared with agreed forecast.

Scope of London Approach

In CAP 1625, the CAA asked us to consider the scope of the London Approach service, and in particular whether London Biggin Hill Airport should be included within London Approach so that the airport would no longer charge its airspace users directly.

If the pricing basis remained unchanged, the price to London Biggin Hill airspace users would fall, with a reduction in single till revenues. Based on our calculations, this would increase the en route charge by 1p per service unit.

Customers have expressed no strong opinion on this matter and this decision now rests with the CAA.

Chapter 5:

Evolving our core en route service to deliver future customer benefits



Chapter 5: Evolving our core en route service to deliver future customer benefits

UK aviation is united behind the need for a fundamental modernisation of our airspace. We will take the leading role in delivering this and will need the full support of government, the CAA and industry.

Modernising the airspace over the south east of the UK will bring significant long term benefits in RP4 to our customers, the travelling public and those overflowed.

DSESAR is our key enabling technology investment programme and a fundamental building block for modernising airspace and maximising the efficiency of our operations for the long term.

DSESAR is already well advanced, with seven out of eight major milestones planned for RP2 already delivered. DSESAR will complete in RP3.

In RP3, we face the twin challenges of maintaining a safe, high quality day-to-day service while continuing to evolve it for the future. In this part of our plan we set out the changes necessary to modernise airspace and deliver major new technology in RP3, and the significant benefits in safety, capacity and resilience these will bring in both RP3 and RP4.

Our approach to evolving our service

Our approach to evolving our service reflects the considerable time we have spent listening to our customers priorities. Our focus is on delivering the benefits that customers are asking for, in particular, the essential airspace change as early as possible.

With this in mind, our core RP3 plan is to execute our well established strategy to significantly accelerate the delivery of DSESAR¹. We agreed this plan with our customers and the CAA in RP2, and it is aligned with the SESAR Joint Undertaking plans for deployment through pilot common projects (PCP) and other European mandates.

To deliver DSESAR, we will bring forward the deployment of new technology and methods of operations. This will enable airspace change and the replacement our aging systems, which are reaching end of life and are unable to support future needs, and will equip the UK with en route infrastructure for the long term.

This approach is necessary as we expect further traffic growth in RP3. Without change, our current airspace designs will not be sufficient to maintain the safety and service levels that we have delivered in RP2. Our plan will reduce risk and improve the resilience of our service as the new systems will incorporate significant additional capabilities. We have sought options within the plan to ensure that we can deliver essential airspace change as early as possible, including our proposal to start key activities during RP2 to achieve this.

An essential part of our plan will be to enable our people to maximise the benefits of the technical improvements and redesign. This will be supported through new ways of working and even closer integration of our operations.

Our plan is robust and coherent, and we will ensure delivery of its benefits through oversight and management by our portfolio, programme and project office (P30). This overarching approach is important as the plan is highly interconnected and has a number of significant dependencies.

Safety

The provision of a safe service remains our highest priority and our ultimate obligation, superseding all others. Our safety strategy sets out our vision for the management of safety in ATM and identifies the key principles that deliver a safe service.

¹ RP2 Capital Investment Plan (2015-2019) for Condition 10 dated 31 March 2017.

The strategy considers our longer term actions in order to address any evolving safety risks arising from airspace changes, the evolution of our methods of operation and the introduction of new technologies, including DSESAR. This is in addition to managing safety in a complex, human-centred and dynamic environment such as ATM.

As well as long term investments in airspace and technology, we will focus on developing the capability of our people. By applying our extensive operational safety understanding, we will ensure that we can accommodate the rate of change required in an already busy operations room.

During RP3, DSESAR will deliver technologies that will reduce controller workload by minimising tactical interventions and manual co-ordination between the sectors. Improved trajectory prediction and associated tools support, particularly in terminal control airspace, will enable further safety benefits. The combination of these will allow the same controllers to handle more traffic.

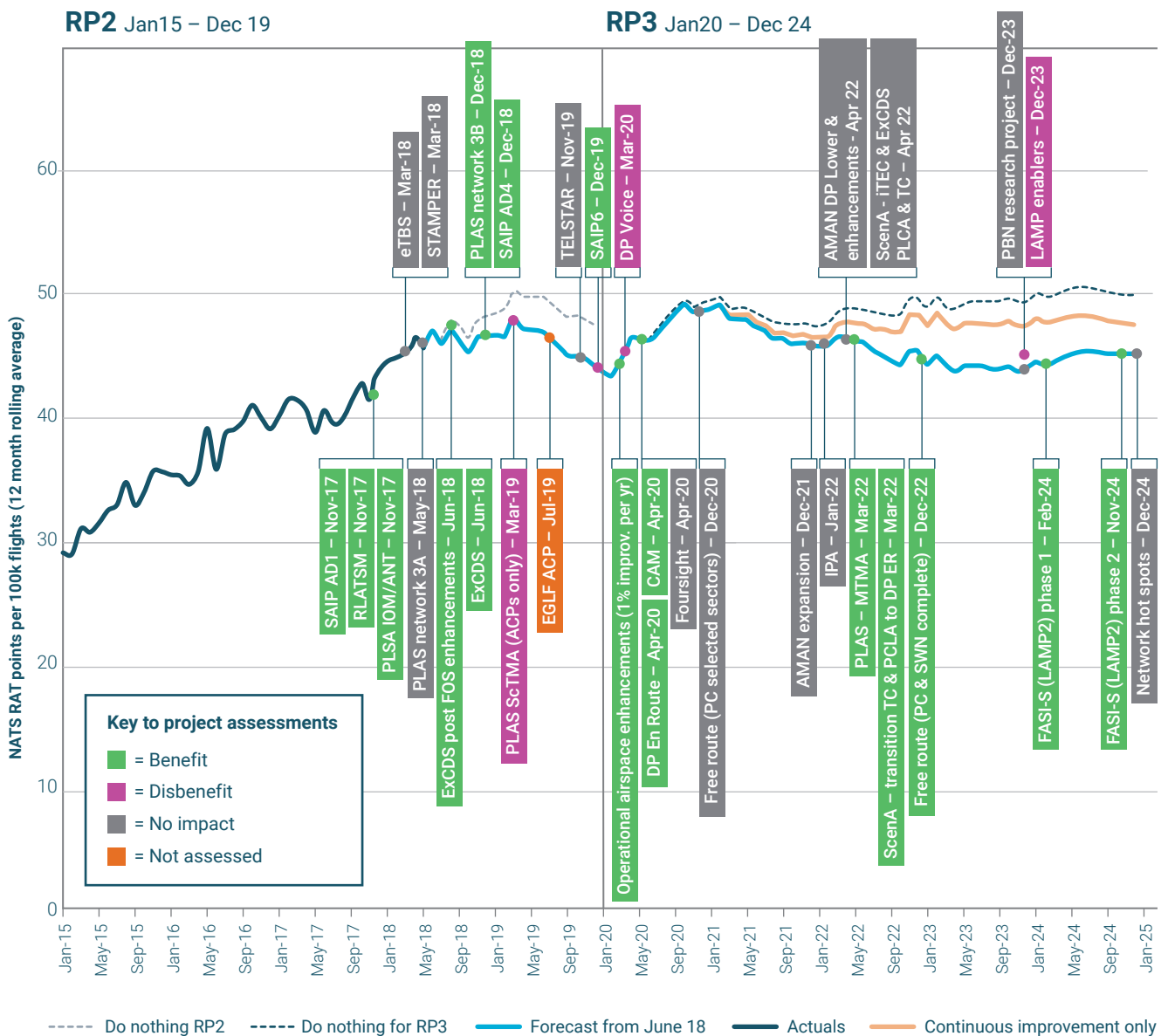
We can forecast the likely safety outcomes during RP3 by modelling the safety benefits and dis-benefits of our improvement projects. Analysis of the impact of our plan over RP3 indicates that we will be able to maintain our safety performance, based on assumed traffic growth. The following chart demonstrates this.

Programmes that will deliver meaningful safety benefits later in RP3 and the beginning of RP4 include: the Airspace Programme, Domestic En Route Programme and DSESAR Programme.

See Appendix L for more details.

The graph below shows our safety benefit model. It predicts the net outcome for safety of our investments and improvement activities. There are currently two programmes that are predicting dis-benefit: DP-Voice and LAMP enablers. In both cases they enable the future benefits from other projects and the net benefit is expected to be positive. It is also worth noting that these are early, dynamic assessments, which are continually updated through the life of the programmes.

Our safety performance as measured in RAT points



Modernising airspace

The UK aviation industry is united behind the need for a fundamental modernisation of our airspace, both around airports and in the upper airspace, and it is the key customer priority after safety. Our airspace structures have not changed significantly over the past 50 years and are no longer fit for purpose. This is because of the growth in traffic and the desire of the majority of UK airports to maximise the use of their existing infrastructure, along with a third runway at Heathrow.

Doing nothing is no longer an option. It would result in capacity constraints that would cause unacceptable delays to the travelling public and be detrimental to UK international trade. In addition, airport growth will be constrained by the lack of capacity unless the airspace is modernised. Of equal importance, airspace modernisation will create significant opportunities for airports to alleviate noise impact to local communities and reduce aircraft fuel consumption leading to lower CO₂ emissions.

From a capacity perspective, our initial assessment is that a do nothing approach to modernisation would result in delays of a minimum of 25 seconds per flight by the end of RP3. This would further deteriorate in RP4. Our primary driver is to deploy airspace modernisation as early as possible in RP3 in order to meet demand – it will deliver significant benefits to our customers in terms of environmental benefit, cost reduction and capacity.

The changes necessary for modernising airspace

Our RP3 airspace modernisation programme builds on the investment in airspace change in RP2. The most significant elements in RP3 that are designed to meet the needs of airlines and airports, and to fulfil EC requirements, are:

Systemised airspace: We plan to create fundamental new designs for lower level airspace in the south east and the Manchester area to increase capacity. These changes will use the existing advanced navigation capabilities of aircraft and will improve safety and our environmental performance. They will also improve the productivity of our controllers by reducing their workload per flight so delivering additional capacity.

Free route airspace: This will allow airlines to choose their preferred route without the constraints of a pre-defined route network, providing increased flexibility and environmental benefits. The aviation industry recognises the importance of the deployment of FRA. It could also bring significant benefits to airlines when implemented by other ANSPs across the European region. Similarly, the use of more stable trajectories will enhance the use of conflict detection tools. In addition, by working collaboratively with the MOD and sharing airspace more effectively we will further improve airspace efficiency.

Queue and capacity management: We will deploy our arrival management system, currently in use at Heathrow and Gatwick, at Stansted and Prestwick Centre. This is in line with increasing demand and PCP requirements. It will reduce stack holding and improve fuel efficiency. It will also enhance planning for arrivals and departures on mixed-mode runways.

During RP3, we will work with customers to extend the arrival management area, which will enable us to start sequencing aircraft earlier. This will be enabled in part by the introduction of variable mach in the North Atlantic.

Working with the airport, we will introduce IPA² at Heathrow, including early morning (0600-0700). This will provide increased resilience and reduced holding, and builds on the current tactically enhanced arrival mode. We will introduce TBS at Gatwick. We already operate this on Heathrow's segregated arrivals runway but will further enhance it by implementing static pairwise separation.

The introduction of new tools will allow us to manage airspace dynamically, aligning traffic flow with the available capacity and ATCO resources, without the constraints imposed by current sector design.

Operational airspace enhancements: These are planned for Swanwick and Prestwick airspace and will reduce controller workload, increase capacity, improve environmental performance and target hot spots. We will deliver these enhancements in conjunction with the major strategic free route and systemised airspace changes, seeking to enhance the benefits from these programmes where possible. We will consult customers on their priorities through the SIP process.

Managing and co-ordinating airspace change: The challenge facing government, the CAA and industry in delivering an airspace modernisation that delivers capacity and environmental improvements is highly complex and needs an integrated programme.

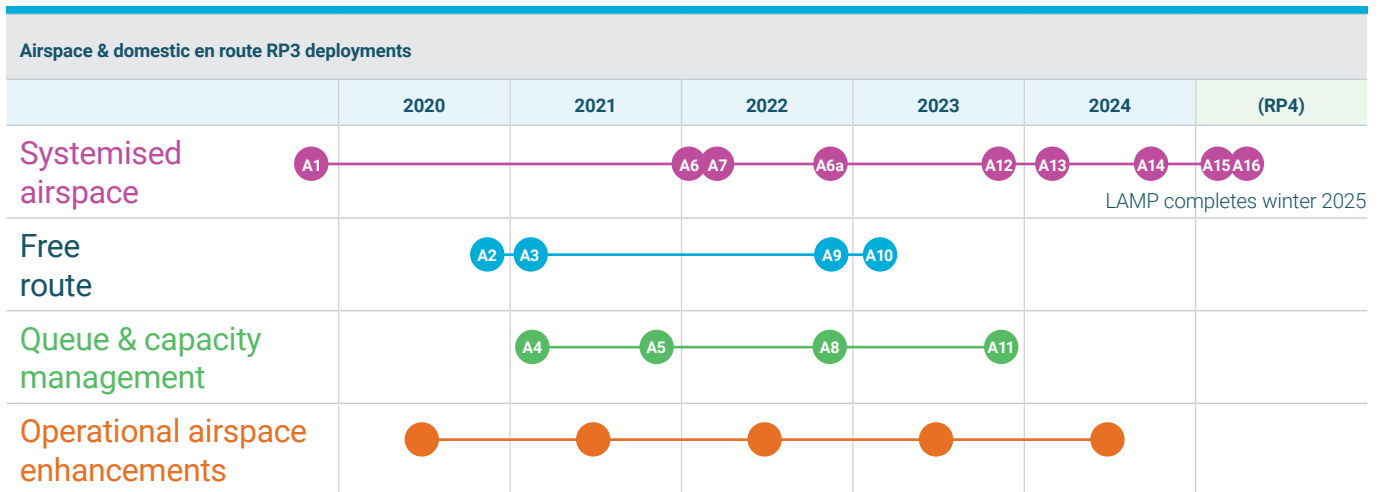
In response to the UK airspace modernisation strategy (AMS) and CAA guidance, in our wider plan we have proposed that we manage and co-ordinate the programme to deliver airspace modernisation for the south east and northern regions of the UK. This would ensure a synchronised delivery of modernised airspace during RP3, working collaboratively with the DfT, CAA, customers and other stakeholders, within the governance of the AMS. See Chapter 7 for more details.

The chart on page 46 shows key milestones for each of the elements of our core plan.

See Appendix L for more details of the individual elements of the airspace programme.

² The timescale for deployment of IPA will depend on Heathrow Airport's airspace consultation.

High level schedule for RP3 Airspace Programme



A: Airspace:

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> 1. PC lower airspace systemisation 2. PC free route airspace (selected sectors) 3. Initial dynamic sectorisation 4. AMAN expansion to Manchester 5. AMAN expansion to Stansted 6. Independent parallel approach (IPA) 6a. Heathrow IPA early morning | <ul style="list-style-type: none"> 7. PLAS Manchester TMA 8. TBS pairwise 9. Free route airspace (Swanwick and PC complete) 10. Advanced flexible use of airspace 11. TBS Gatwick (mixed-mode) 12. LAMP enabling changes 13. LAMP (Phase 1) | <ul style="list-style-type: none"> 14. LAMP (Phase 2) 15. LAMP (Phase 3) 16. LAMP (Heathrow R3 deployment) <p>Operational Airspace:
Localised benefit-led airspace enhancements delivered by domestic en route programme</p> |
|--|--|--|

Stakeholder and community engagement

Successful airspace change will require the full commitment³ of airports, airlines, the government and the CAA to build greater trust with communities. We must also demonstrate the industry’s openness to consideration of the public’s views and concerns.

Our responsibilities will include illustrating, in an understandable way, the effect of satisfying competing requirements on design solutions; and building understanding with all stakeholders about the trade-offs that are required to deliver any change successfully.

The government’s revised airspace policy and the CAA’s new guidance will form the basis for consultation on proposed airspace changes. We are already committed to engaging much earlier than in the past, and new technologies will help us reach a wider audience than previously.

Significant work is already in progress to develop new ways of showing how airspace works, in an easily understandable manner for a wide range of audiences. This understanding will be essential to explaining why airspace needs to be modernised, the technologies that will be part of that modernisation, and how the public can be involved in helping to develop solutions. It will also enable us to incorporate the needs of the travelling public and business to balance the debate appropriately.

³ As set out in the terms of reference of the programme management organisation.

New technology

Rationale and benefits of DSESAR

DSESAR is our core technical programme that is replacing our many disparate and aging systems with a single, unified architecture to meet the needs of our customers, now and in the future. The case for DSESAR is very clear – without it, our existing systems will ultimately prevent us from delivering future performance requirements and compliance with SES legislation.

The development of the European SESAR master plan underpinned the rationale we set out during RP2. Our customers supported this in the SIP 2017 consultation, and it is reflected in our revised RP2 plan under Condition 10 of our Licence. It will enable us to deliver a modern, flexible and agile ATM platform by 2022, rather than 2025.

The DSESAR technology will allow us to modernise airspace. It will strengthen safety, increase flight efficiency and improve the environmental impact of flights through advanced planning of flight trajectories. It will also improve interoperability with European centres.

The SESAR joint undertaking identified that the deployment of technology through the PCP projects had the potential to improve ATCO productivity by up to 12%. Around two thirds of this improvement relies on the development of projects that are not yet sufficiently mature and which will not be mature enough for the benefits to be realised during RP3.

Uncertainty around this was confirmed in September 2018 by the EC Performance Review Body which noted that the SESAR deployment manager is re-analysing the costs and benefits of the PCP and SESAR projects to better understand their contribution to European ATM performance⁴. These include projects for initial trajectory information sharing and downlink of an aircraft's extended projected profile.

Based on the SESAR projects that are mature, we estimate productivity gains of approximately 2% for ATCOs in RP3. We will continue to work with the SESAR deployment manager to realise the additional benefits as the SESAR projects mature, although we would not expect to see these benefits until RP4 at the earliest.

This technology will enable us to achieve our vision of one operation across our two centres by 2025. This will provide greater consistency, flexibility and resilience, while also providing the basis for on-going efficiency gains in the future.

These benefits will be realised progressively as we move to the new systems, de-commission our existing systems and introduce advanced capabilities that can take full advantage of the new technology.

We are following best practice and building on lessons learnt during RP2 by consulting with our customers on the best approach and timescales for major deployments, so as to manage and mitigate any potential customer impact.

The changes necessary to deliver new technology

The level of change associated with DSESAR is significant, and delivering these changes in the complex and busy UK airspace, especially in the London area, requires thorough planning and co-ordination.

The continued successful delivery of DSESAR relies to a large extent on our major technology suppliers. We will work closely with them to refine and develop the detail of the remaining elements of the deployment plan to manage and mitigate risks.

We will also continue to work very closely with our customers as we approach each of the technical and operational transitions to minimise their impact.

The key programme milestones

DSESAR is already well advanced, with seven out of eight major milestones planned for RP2 already delivered. The final deployment which had been planned in RP2 was the replacement of the voice system. In order to optimise our plan, this milestone has now been combined with the DP En Route milestone described below. This will reduce the risk of multiple changes while maintaining the expected benefits. The remaining major deployment points (DP) are:

2020: DP En Route: We will move our en route operations to the new platform at the beginning of RP3, completing a programme of work that we will mostly undertake during RP2. We will introduce new flight data processing capabilities, supported by modern controller tools and a new controller working position. This will be underpinned by modern surveillance systems and a new voice communications service.

These will be hosted on a highly available hardware platform that offers increased flexibility and resilience and will support trajectory based operations. It will provide increased safety and efficiency and also enable further developments, including FRA.

While the DSESAR platform will be technically ready for deployment in April 2020, we intend to split this deployment across 2020 between Prestwick (April) and Swanwick (November) to avoid disruption and maintain the best service across the year for our customers while this major transition is delivered.

2022: DP Lower: We will extend the same platform and capabilities to our lower level airspace across the UK. To simplify this transition, we will first transfer some of the lower level sectors to our upper airspace operation on the new systems. The remaining sectors will then be moved to the new platform, including the flight data processing system, and will be supported by the existing ExCDS system.

⁴ PRB 2018 "PRB advice to the Commission in the setting of Union-wide performance targets for RP3", page 17.

The deployment of ExCDS during winter 2017-18 has already realised significant benefits, including a reduction in safety risk for both terminal control and area control, as well as a reduced requirement for operational support staff. Safety risk will be further reduced as we evolve ExCDS. We will maintain these capabilities as we introduce iTEC into terminal control.

Introducing iTEC by the use of ExCDS is lower risk, and simpler, than moving immediately to advanced controller tools, and delivers the same safety, resilience and efficiency benefits in lower airspace as those enabled by DP En Route in upper airspace.

This step also enables developments that include LAMP and further advanced tools.

Once this milestone is complete we will be managing all of our airspace on the new technology.

Advanced tools for lower airspace: These will be developed in the latter part of RP3 and deployed in RP4. The tools will be an upgraded version of those deployed in upper airspace in RP3, with enhanced capability for the more complex and dynamic lower airspace.

See Appendix L for more details.

Cost of DSESAR

We expect that the cost of the DSESAR Programme will be within the range of £750m - £830m in outturn prices across RP2 and RP3, which remains in line with our previous estimates. This covers the deployment of the new platform and the completion of the removal of key legacy systems.

By the end of RP2, we will have made significant progress on DSESAR. New core infrastructure will have been developed and deployed, along with a new voice system and all the enabling work for the DP En Route milestone.

This represents just over 60% of the total work effort for DSESAR, enabling us to complete the programme in the first part of RP3 as planned. We expect to invest around £220m to complete the DSESAR transformation in RP3.

In addition we will start to develop the capability of the DSESAR platform by investing around £80m in the deployment of advanced tools in lower airspace, which will optimise the use of the modernised airspace, to deliver improvements in safety and capacity.

During RP2, we have matured our delivery processes and embedded the lessons we have learnt in our processes. This has enabled us to provide increased surety on the overall management of this set of complex programmes. We will continue to build on this during RP3.

We will also take the opportunity to make sure that we manage the regulatory boundary between RP2 and RP3 effectively. This will ensure that when we make decisions the delivery of SESAR as a whole is taken into account.

All of our programmes will be managed and governed through our P30, which we established in RP2. This is a recognised, standard approach for effective management of large, complex and transformational programmes. Its remit includes understanding and prioritising requirements, and ensuring the successful delivery of project outcomes that enable benefits within time, cost and quality restraints.

It has introduced an improved approach to cost and time planning through a developed three-point estimation process, which will provide more robust detail within programmes and projects during RP3. We have also been able to use our experience of planning and delivery during RP2 to help ensure that we have robust estimates for RP3 activities that are a good assessment of the work required.

In parallel, we have enhanced our approach to securing greater value for money with our supply chain management. We engage ever more closely with all of our suppliers in a process of continuous improvement to drive out all available savings and efficiencies, and improve the business relationship and quality of product.

We have adopted a range of sourcing techniques. These include:

- > Open competition where practical;
- > Incentivised contracts; and
- > Benchmarking, using external expertise, to maximise value for money where we do not have a wide choice of suppliers.

We have a high level of confidence in our process. External assessment has confirmed the effectiveness of our approach and the value for money that we secure through benchmarking and competition.

We propose to accelerate into RP2 some of the preparatory work for DP Lower in 2022 to assure deployment by this date. This will mean spending around £23m more in RP2, with a corresponding reduction in RP3. This gives us an opportunity to optimise our resource levels across the reference period boundary. This proposal is described later and is reflected in our core plan.

Following positive reaction to this during the RP3 customer consultation, we will include this additional spending in RP2 as part of SIP 2019 and will report on its use through subsequent SIP consultations.

Some dual running costs will be incurred from late RP2 into RP3 as the new platform is installed and run alongside existing systems. We have worked hard to mitigate these costs as much as possible, while ensuring that we have sufficient resources to maintain resilience and deliver an effective transition.

See Appendix L for more details.

Evolving our ATM service

Developing our current ATM capability

Alongside our major programmes, we will deliver a series of smaller scale changes to our ATM service. Typically, these will include localised airspace changes to address safety, capacity or efficiency issues. They will also include small software builds on existing systems to provide performance improvements. In this way, we will continue to evolve our operation to optimise performance by making best use of the capabilities delivered by the major programmes.

Developing our future ATM capability

To support the safe and efficient movement of ever-increasing numbers of aircraft, including drones, we must be able to continue to deliver new and innovative tools, airspace designs and operational procedures. In order to do this, we need to continue to develop solutions with real benefits for our customers, for example, TBS.

No other country in Europe has the same level of airspace activity and complexity as the UK, and we need more innovative solutions earlier than our European partners, such as the need to develop new tools to support the London TMA. Our current work has been co-ordinated and partly funded through the SESAR programme. But in the likely absence of this funding after Brexit, we must look for additional sources to deliver the number and type of improvements of previous years. Therefore, our plan includes the costs necessary to continue to develop technical solutions required for the UK.

We will consider how new techniques can be applied to address four key business needs: safety and security, airspace optimisation, runway efficiency and automation. Success will enable us to deliver real improvements. Customers will be able to fully use the technology on their aircraft, and our operations will be less labour intensive, with controllers able to handle more aircraft, improving cost efficiency.

We expect to work closely with other stakeholders on these activities, including other ANSPs, airlines and universities. Where possible, we will continue to participate in industry programmes, both in UK and Europe.

Modernising engineering

It is important to deliver the right technical capabilities to support both our current and future operational systems.

The service-oriented architecture of DSESAR allows us to adopt a new service-oriented engineering approach, based on the proven information technology infrastructure library⁵ (ITIL) service model. This is a new approach for the ATM industry, but it is common in many service industries. The following paragraphs describe the transition from our current ways of working to our new model.

Our current model: This follows a traditional approach to ATM systems. Many of our systems are standalone, operate separately from one another and require significant point-to-point integration, which is inefficient. This creates the need for engineers with deep specialisms who cannot support a wider range of systems.

While this approach was a constraint in our legacy systems architecture, introducing a more modern architecture will enable a more flexible and efficient approach.

Our new model: This is based on the industry-recognised ITIL service framework. It brings the benefits of greater automation, a focus on prevention, proactive incident management, improved capacity and change management, all in support of greater efficiency and improved system availability.

The new model will require a shift to a wider range of more generic, IT-led service management competencies in our staff. This brings with it greater flexibility and agility as it is easier to recruit and roster these more generic skills across the business.

Moving forward, we will need to train our current staff in new skills, as well as retaining and developing core ATM engineering skills where they are required. This will drive a change in culture, with individuals taking on expanded roles with broader capability.

See Appendix K for more details.

⁵ ITIL provides a set of detailed practices for IT service management that focuses on aligning IT services with the needs of the business.

Integrating operations

Our aim is to have one operation delivered from two centres, operating on a common platform with aligned ways of working. This will allow more flexible and productive use of staff and enable us to be more resilient than ever, while improving our customers' experience.

Our current model: Our current operational systems and processes have built up over time, based on the technology available, resulting in separate teams with different ways of working. Many staff perform bespoke roles, with specialist skills often relating to specific and different sectors of airspace. The combination of these processes with legacy technology creates inflexibility across diverse teams, which is inefficient.

Our new model: This combines the airspace and technology changes described above with people and process changes. These are being delivered through a transformation programme across the two centres that will deliver a standardised organisation design with aligned safety and operational procedures. This approach will provide mutual contingency, increased resilience, and greater capacity and efficiency to handle predicted traffic growth.

These changes need to be well communicated and supported by our employees and trade unions through local and national agreements. Employees will experience a common working environment with common standards for training and competency, increasing our flexibility to roster staff on different airspace sectors and programmes.

See Appendix L for more details.

Developing our people

A critical part of our plan is ensuring that we develop the right skills and capabilities in our people so we can maximise the benefits of the new tools and technologies.

ATCOs need to be trained on new systems while we maintain the day-to-day service. We are applying new and more innovative approaches to conversion training, which will allow it to be scheduled more flexibly to avoid having a significant impact on our service.

In addition, we have relied on a relatively stable and skilled workforce but we now face a demographic challenge in the future, with a predicted 30% of our workforce likely to retire by 2025. This means that we must compete for and attract people with the essential science, technical, engineering, mathematical and digital skills in a competitive labour market.

Reward and employment terms are a key element of ensuring that we recruit and retain future talent. The development in RP2 of the pension cash alternative has enabled a significant shift in our pension profile, and reduced the cost and risk of the pension scheme. Further areas of focus in RP3 include new employment terms replacing tenure based pay, flexible benefits, performance incentives and greater scope to link pay to performance.

Good employee relations are crucial while we transform our business in order to maintain a resilient day-to-day service. We have established an improvement programme with our trade unions, with joint problem-solving approaches to avoid a repeat of the difficult pay negotiations of 2016 and the consequent operational challenges.

Drones

As drones become an increasingly significant part of UK aviation, it is critical that we establish a framework for unmanned aircraft. The proposals in our core plan are based on our current knowledge of drone usage. However, the direction and detail of their future development is not certain, so we have included any uncertain elements in our wider plan - see Chapter 7.

The government wants to encourage the growth of drone usage, as studies show that they enable economic growth and there is public support for their use. We want to facilitate this, while ensuring that we maintain safety levels for our customers.

We have already put several measures in place to improve safety, including:

- > Education campaigns and online training for hobbyist drone users;
- > Drone no-fly zones; and
- > The UK Drone Assist safety app, which, after one year, has generated a large and useful volume of safety data on drone usage.

Our plan to evolve our service will ensure a safe environment for commercial air traffic and the travelling public in the context of an expansion of more widespread drone applications. It will also ensure alignment with European and international regulation.

Our proposals include:

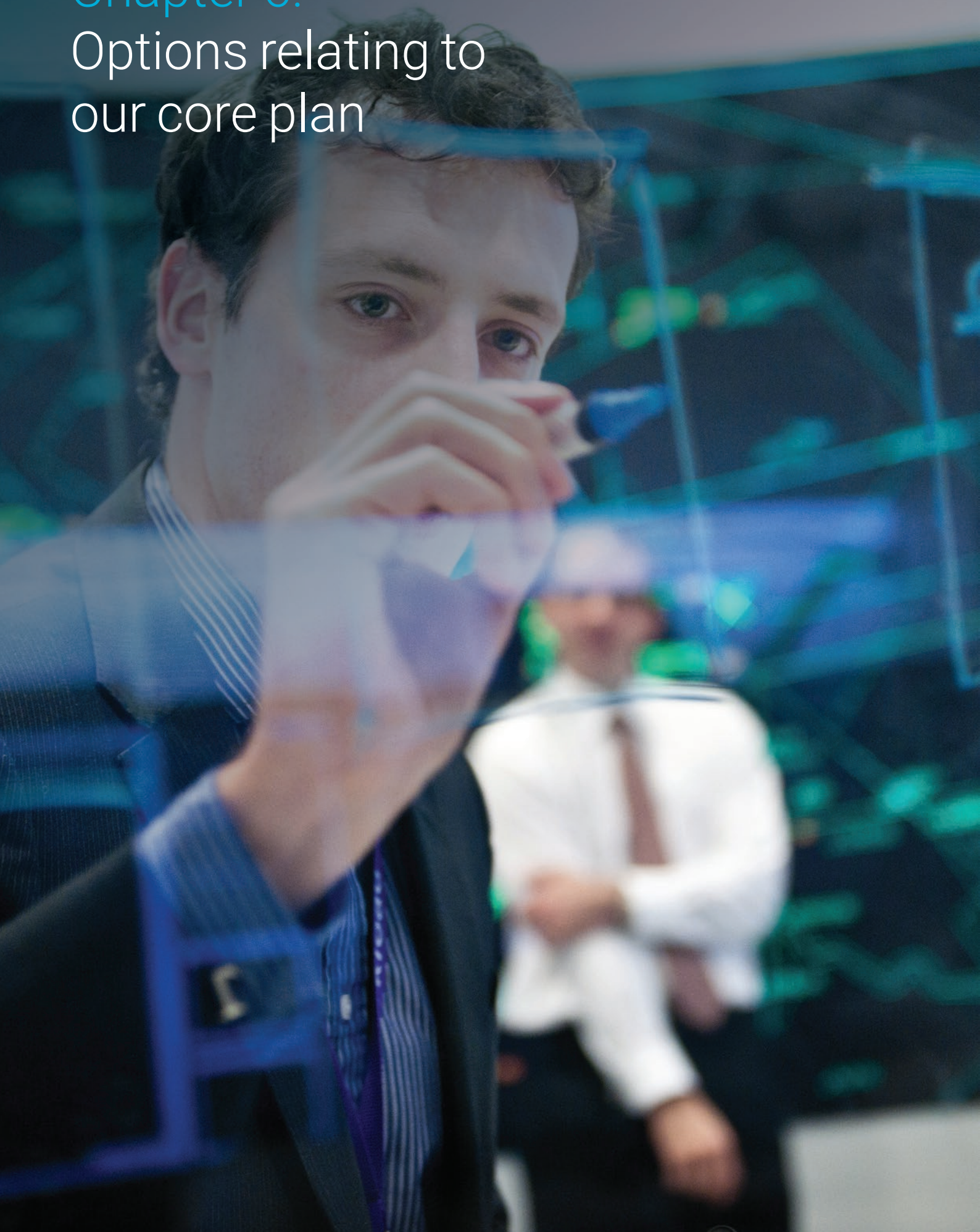
- > User registration, online training and education for non-certified users;
- > Management of drone no-fly zones and publication of associated data;
- > Real-time flight planning and airspace approval;
- > Notice to airmen (NOTAM): pre-flight and real-time notifications;
- > Automated tracking and monitoring; and
- > Interface with existing ATC operations.

These measures will ensure that both our customers and drone operators have conspicuity and a common picture of airspace usage, safeguarding all users.

Just as our core plan protects airspace users against safety risks from GA activities, so our plan includes the cost of maintaining the safety of commercial air traffic in controlled airspace from the emerging risk of drone operations. Investment in systems or operations for drones that go beyond this core safety requirement would need to be funded by the commercial drone operators.

See Appendix D for more details.

Chapter 6: Options relating to our core plan



Chapter 6: Options relating to our core plan

We consulted customers on a number of tactical options for our core plan. These would allow us to maintain the expected level of service performance and resilience without delaying DSESAR and the airspace changes that our customers require.

Customers confirmed the broad strategic thrust and scope of the RP3 investment programme. Where we offered choices, we have reflected in our plan the particular airspace and technology projects that they wish to see.

While we appreciate that our customers wish to have options within our technology and airspace plans, these are constrained, in practice, by the execution of the strategy agreed in RP2 to accelerate the deployment of SESAR technology. The programmes are relatively mature and on track to deliver over the next five years. They take account of customer views and obligations under our Licence.

Accordingly, our plan to complete the DSESAR transformation programme and major systemisation of lower airspace is now set. However, there are a number of tactical options which we discussed and agreed with customers during the RP3 customer consultation.

The agreed options and their current status are described in the table below. Each £10m change in capex costs during RP3 is estimated to change our DUC by 5p per CSU, equivalent to a 0.1% change in the average RP3 price.

As with any programme of this scale and timeframe, it is essential that we continually review our plan. As a result, there may be opportunities to further enhance and optimise the technology and airspace programmes throughout RP3. Where appropriate, we will describe the benefits and costs of these opportunities and offer customers a choice through the SIP process.

Our core plan deliverables reflect our customers' priorities and the requirements that we deliver our day-to-day service safely with the expected level of performance and resilience, implement DSESAR, and make the airspace changes required in RP3. Given the complex and highly integrated nature of our plan, we have not been able to offer any significant alternative ways of delivering these outcomes other than through the options set out below.

Agreed core plan options

Option	Description	Cost	Impact of choice	Status
Early spend of £23m ¹	Option to bring forward £23m of the planned RP3 investment to 2019 to initiate work to support DP Lower.	No impact on total cost.	<p>After safety, the key customer priority for RP3 is the LAMP airspace change. LAMP has a complete dependency on the delivery of DP Lower on time and contributes to the wider benefits of DSESAR.</p> <p>This option smooths the investment profile for DSESAR, enabling best use of internal and external resource. Early investment will enable the delivery of detailed requirements and key design features in late 2019 to ensure successful implementation.</p> <p>This does not change the planned level of investment but the earlier work enables our plan to deliver DP Lower by 2022 and de-risks subsequent deployment of LAMP within RP3. It is in line with International Air Transport Association's (IATA) and customers' request that reference period boundaries should not be seen as a barrier to progress.</p>	Included in core plan.

¹ Additional information is provided on page 55 in Further information on early spend of £23m option (£23m based on 2017 prices).

Table continued overleaf

Option	Description	Cost	Impact of choice	Status
ExCDS for PC Lower	<p>Option to deploy ExCDS in both Swanwick and Prestwick thereby delivering a single solution for both in early 2022. Prestwick lower would be upgraded to FourSight in line with TC after completion of the LAMP programme.</p> <p>Our initial plan had been to deploy FourSight into Prestwick lower airspace at the DP Lower milestone in 2022, with ExCDS deployed in Swanwick terminal control.</p>	Option would reduce investment in RP3 by £50m.	<p>In order to reduce the impact of transition delay, this option provides a unified, systematic and simplified approach by adopting a single solution for the transition to an FDP supporting four dimensional trajectories for all sectors in DP Lower.</p> <p>The use of a known tool (ExCDS) will reduce the level of transition required for controllers and reduces technical risk as there is no need to develop two variants of the same system. Importantly, this also avoids delaying implementation of DP Lower by up to two years if an alternative solution was used.</p> <p>Further, this approach enables the transfer of less complex lower airspace sectors to the en route system using FourSight.</p>	Included in core plan.
Delayed surveillance investment	<p>Option to make minimal investment in surveillance sustainment in RP3 by extending life of existing assets to continue to provide a safe and resilient service.</p> <p>The alternative would be to make investments in RP3 and RP4 to replace all existing surveillance assets which have an end of life date of 2027.</p>	<p>Option minimises investment in surveillance sustainment during RP3.</p> <p>Replacing all surveillance assets which will reach end of life in 2027, would require an additional £20m in RP3.</p>	<p>This option maintains a safe and resilient surveillance service in accordance with our Licence requirements and CAP 670.</p> <p>Extending the life of surveillance assets will enable net savings taking into account the potential future rationalisation of these assets in RP4.</p> <p>The approach allows for potential further evolution of surveillance policy before we complete the sustainment programme in RP4.</p> <p>This means that options will be available to us in RP4, and ensures our spend in RP3 is as efficient as possible.</p>	Included in core plan.
Risk based sustainment	Option to implement a risk based approach to sustainment of our current systems' resilience and facilities management planning, averaging costs across the portfolio, rather than allocating funds for each asset group separately under a schedule based sustainment approach.	<p>Option reduces investment required for sustainment and resilience.</p> <p>Alternative would increase investment by £55m.</p>	<p>The option enables us to meet safety requirements while delivering an acceptable level of technical and operational resilience.</p> <p>Our services are designed to be resilient to failure. They use main and standby architecture with diverse routing for network connections. Overlapping cover is provided through our CNS sites in order that a single failure does not impact the service.</p> <p>Allocating funds for each asset group separately would provide additional assurance, but at an increased cost.</p>	Included in core plan.
Delay to FourSight development	<p>Proposed plan is to commence development of FourSight solution for lower airspace in the last years of RP3 to allow early deployment in RP4.</p> <p>Option is to delay investment to commence in RP4.</p>	Option would reduce investment in RP3 by around £60m.	<p>Option would delay deployment of FourSight until late RP4, meaning capacity and safety benefits would be delayed by at least two years.</p> <p>The delivery of significant safety and service benefits post-technology transformation and post-airspace systemisation will be increasingly reliant on sophisticated tools. The forecast growth in traffic in RP4 may result in unacceptable service performance if this option is selected and would also preclude potential productivity gains by not enabling a reduction in ATCO workload.</p>	Project included in our core plan i.e. delay not proposed.

Option	Description	Cost	Impact of choice	Status
Queue and capacity management changes	<p>Option to deliver additional airspace change in RP3 to provide enhanced queue and capacity management capability.</p> <p>This could include:</p> <ul style="list-style-type: none"> – TBS Stansted (£5.9m) – TBS Luton (£5.9m) – Heathrow IPA early morning (£5m) – AMAN at Prestwick (£1.5m) – AMAN/DMAN integration (£3m) 	Total estimated costs are £16.3m.	<p>The optional queue and capacity management projects would deliver improved operational performance in environment and service quality.</p> <p>Not adopting this option allows the higher priority airspace changes to be included in our core plan without adversely affecting our ability to deliver these.</p> <p>Our airport customers have limited appetite currently for these changes, except for the delivery of Heathrow IPA early morning, which we have included in our core plan. Heathrow IPA early morning will build on current tactically enhanced arrival mode (TEAM) procedures to reduce holding and increase resilience.</p> <p>The AMAN/DMAN option advances the level of integration between the NATS AMAN and airport DMAN. This provides an automated runway setting policy to balance arrivals and departures and maximise capacity gain/reduce controller workload for other systems such as the proposed Gatwick mixed-mode TBS.</p>	<p>Not included in our core plan, with the exception of Heathrow IPA early morning, which was supported in the RP3 customer consultation.</p> <p>Airlines have expressed interest in the AMAN/DMAN option and this will be further developed and discussed at a future SIP.</p> <p>Note, there are no legislative requirements to implement these projects.</p>
Delay FRA deployment	<p>Option to defer or remove FRA from the RP3 plan.</p> <p>Deployment of FRA is required by January 2023 to meet the PCP mandate.</p>	This option would reduce RP3 investment by £15.8m.	<p>The option would simplify and de-risk key elements of the RP3 programme, notably DSESAR and LAMP.</p> <p>However, we would not be able to comply with European legislative requirements. PCP mandates are state level obligations and any decision here would require support from DfT.</p> <p>There would also be a significant loss of the environmental fuel saving from FRA assessed at around 38kT.</p>	Not included in core plan.

Further information on option for early spend of £23m

In our initial planning we sought to deploy DSESAR in lower level airspace (DP Lower) at the earliest realistic time. It is a key enabler for LAMP and is consistent with the other early milestones. We have assessed a number of approaches and believe that it is feasible to deliver this in 2022.

However, there is a significant amount of work to define, develop, test and deploy this capability and we would have to make an early start to achieve this date. Therefore, we believe that we should accelerate £23m of the capital expenditure to 2019. This will enable us to initiate work to support DP Lower to ensure its delivery in RP3.

This would speed up the development of key DSESAR technology, with the significant benefit of reducing the risk to delivery in RP3 and consequently the risk to the delivery of LAMP. It would also enable us to smooth the expenditure profile between RP2 and RP3, further reducing the risk to delivery.

This approach is aligned with our customers' and the International Air Transport Association's request that we should take the optimum approach in order to deliver the programme efficiently for customers, not letting the artificial boundary between RP2 and RP3 impede this. Without this acceleration we would not be able to achieve an optimum resource profile, nor deliver DP Lower in 2022.

Chapter 7:

Our wider en route plan



Chapter 7: Our wider en route plan

In line with the CAA's guidance, our wider plan considers activities that have uncertain requirements, or which may develop significantly in the future.

We have proposed a regulatory mechanism to deal with any remaining wider requirements that could materialise after our business plan is published. This avoids charging our customers in our core plan for activities that remain uncertain.

In line with guidance from the CAA in CAP 1625, there are a number of areas where our requirements are less certain and where there could be significant future developments. The CAA describes this as the 'wider plan'. The requirements that we have identified are set out below, together with any information we can provide on performance and costs.

Given their nature and potential impact, some of these requirements may also require substantive changes to our licence and/or the charging mechanisms. This would require further consideration, along with the applicable regulatory processes, when the requirements are sufficiently certain.

As a number of these may not be resolved in time for the UK's National Performance Plan for RP3, we have proposed a regulatory mechanism to deal with this uncertainty, which builds upon existing mechanisms and processes. This will allow us to recover costs for requirements that are currently less certain, but could materialise during RP3.

Wider plan requirements

Airspace modernisation

The strategic case and benefits of airspace modernisation are well established and accepted by the government and industry. However, the industry faces a significant delivery challenge, particularly in the south east, of co-ordinating many different, yet overlapping, low level airspace changes across multiple airports, and integrating them efficiently into the airspace changes we will make at medium and high altitudes.

Previous projects have failed to deliver full benefits when timelines are delayed or projects stopped due to lack of public support, political difficulties or lack of a cross-industry plan for delivery.

Airspace changes across airports in the south east are likely to be highly interdependent. Therefore, a high degree of co-ordination and collaboration will be needed between airports. All stakeholders now accept that success can only be achieved within the demanding timescales through a co-ordinated and synchronised airspace change programme. Moreover, consultations are complex, costly and demanding and inevitably raise risks of judicial review and other delays.

We therefore propose establishing a new airspace modernisation organisation (AMOG) with a written charter of participation to confirm its responsibilities and powers, which:

- > Delivers effective programme management, governance, oversight, transparency, delivery assurance and performance management for the airspace modernisation programme for the south east and northern regions, under authority of the DfT;
- > Employs proven senior programme management and technical experts from across the industry to ensure the team has sufficient expertise to cover the wide area of technical and operational knowledge required;
- > Oversees and manages the industry commitment to deliver co-dependent changes to a common timeline and standard. This is likely to require a level of binding commitment at the outset to deliver a set of jointly agreed objectives;
- > Co-ordinates and supports the public consultations on airspace change to ensure a coherent outcome; and
- > Provides clear focus on the known airspace modernisation programme to 2025.

The developing airspace management strategy has identified the need for the creation of an airspace design and implementation masterplan, and the CAA has decided that we are best placed to take on this emerging role. We have to submit a masterplan, which covers the period to 2040, by the end of 2020, in order to:

- > Enable the CAA to understand how individual changes relate to each other so their decisions are better informed;
- > Inform the use of potential new legislative powers to compel airspace change to happen; and
- > Identify opportunities to improve airspace design that will deliver a wider set of benefits, not just to increase capacity.

The scope of this emerging work is to identify:

- > Where airspace changes are needed to deliver capacity, against evaluated alternatives;
- > Other changes that may be required to deliver the benefits as suggested by the CAA, against evaluated alternatives;
- > The operational concepts required to deliver these changes;
- > The recommended, coherent sequence of individual or modules of changes against the evaluated alternatives, and the party responsible for taking each airspace change forward; and
- > The interdependencies between individual changes.

The CAA's letter outlining their expectations for our business plan¹ provides further information.

Costs

We initially estimate the AMOG function will cost in the range of £2.5m-£3m p.a. in RP3. This does not include the emerging requirement for us to create the airspace design and implementation masterplan, which can only be costed when its terms of reference are fully mature.

It is important to note that some of our core plan outcomes, specifically our service and environmental performance, both in RP3 and beyond, rely to a significant extent on the AMOG function being established and funded from the start of RP3.

The table below provides an indication of the impact on our component of UK en route prices if the CAA requests us to include it in our RP3 core plan.

Impact of airspace modernisation function on our en route prices

Price per CSU £ (2017 prices)	RP3				
	2020	2021	2022	2023	2024
Headline price	49.48	48.20	50.45	49.26	46.87
Airspace modernisation function costs (illustrative)	0.23	0.22	0.22	0.21	0.21
Revised price	49.71	48.42	50.67	49.47	47.08
Cost as % of price	0.5%	0.5%	0.4%	0.4%	0.4%

Customers proposed the creation of an interim body, funded by the government, to expedite the airspace modernisation programme, which would become a separate legal entity by the beginning of 2020.

While this model may have some perceived advantages around independence from any one party, we believe it has significant risk of further delaying critical airspace modernisation. We believe that appropriate governance as outlined in the draft AMOG terms of reference can be applied to the role we have volunteered to take on to overcome any real or perceived issues of independence. We therefore do not support the proposal for a separate legal entity.

Where there is a need for us to take on a wider role, for example to perform design work on behalf of other stakeholders, we would either do this on a normal commercial basis or use the wider plan regulatory mechanism to allow the work to be funded.

¹ https://www.caa.co.uk/uploadedFiles/CAA/Content/Accordion/Standard_Content/Commercial/Airspace/Air_Traffic_Control/20180925SmithRolfe%20NERL's%20RP3%20business%20plan22.pdf.

Operational resilience

In CAP 1625, the CAA suggested that we take account of relevant recommendations by the Voluntary Industry Resilience Group as a wider plan requirement. Our core plan contains our proposed resilience activities (see Chapter 4). Therefore, no wider plan activities are required.

EU common requirement changes for ANSPs' service provision

In November 2017, the EU introduced updated common requirements² for ANSPs' service provision during RP3. We are working with the CAA and EASA to understand the implication of these changes, which are likely to create an additional compliance burden on our business. The higher compliance costs are not yet known and we will need to be able to recover these via our wider plan regulatory mechanism.

Electronic conspicuity and drones

The airspace environment in the UK is changing. The diversity of air vehicles is increasing, alongside a rapidly evolving variety of uses for airborne platforms. Key among these is the expansion of the drone market and the need for greater flexibility in the use of all UK airspace, both controlled and uncontrolled. We expect that the demand for beyond visual line of sight (BVLOS) access to controlled airspace will exceed our ability to manage it by our current methods by the early 2020s.

We must be ready to utilise fully new forms of surveillance data in order to:

- > Integrate the full spectrum of new vehicles safely and efficiently;
- > Provide flexibility for new operations; and
- > Support the CAA's AMS outcomes for 2022 on revised flight information services and interoperable electronic conspicuity.

From 2019, we will begin this with the introduction of ADS-B space based surveillance in the oceanic operation. ADS-B will also enhance our existing ATC services outside controlled airspace - London lower airspace radar advisory service, western radar, London flight information, North Sea helicopters; and data services such as aeronautical information services, NOTAMS and submitting of flight planning/intent.

See Chapter 8 for more details.

We understand that the CAA is seeking to implement an airspace integration programme that is likely to include a mandate that will lead to electronic conspicuity of all UK airspace users in large parts of UK airspace. This will result in a rationalisation of existing airspace classifications, leading to a single class of serviced airspace. It will deliver safety benefits for airspace users, while also giving them more rapid and flexible access to the airspace, as long as they are equipped to the necessary standards.

We recognise that there are challenges in achieving this, including for technical, resource, financial and GA operational practice. We set out below the potential benefits and our proposals on how we can best contribute to this strategic outcome in RP3.

Adding new electronic sources to the UK's surveillance capability will enable a range of operational, industry and business benefits. Key benefits of early adoption of an electronic detection capability are:

- > Reduced consequential risk from infringements of controlled airspace;
- > Reduced risk of mid-air collision in all airspace;
- > Creation of a known traffic environment, regardless of surveillance source, that can facilitate improved and new services;
- > Enabling safe integration of BVLOS drone operations, without which we believe the forecast growth in the UK economy will be constrained by 2022;
- > Mitigating the impact on our service of proposed regulatory changes, for example, alignment with ICAO flight information service rules and interoperable electronic conspicuity; and
- > Enabling potential future rationalisation, during RP4, of our primary surveillance radar network.

We believe that these benefits provide a strong case for the urgent introduction of a broad electronic conspicuity capability in the UK.

An essential driver will be an early declaration of the intention to mandate electronic conspicuity by, for example, 2025. It would be a clear signal to the wide range of stakeholder communities. At the same time, it will be important to establish some momentum quickly to ensure that the deadline can be achieved.

We believe that we are well placed to take a leading role, on behalf of the CAA, to manage this programme of change and deliver benefits to both new and existing users. We are conscious of the need to enable competition, maximise choice and, in doing so, reduce the cost to airspace users. In determining our role, we have identified those activities best served through our License, while at the same time ensuring an open and competitive market downstream that will welcome new technologies and innovation. The diagram below illustrates our proposal and how we intend to accelerate the development of a competitive downstream market for UTM.

² EU 2017/373 "The ATM-IR" replacing EU 1035/2011 "Common Requirements".

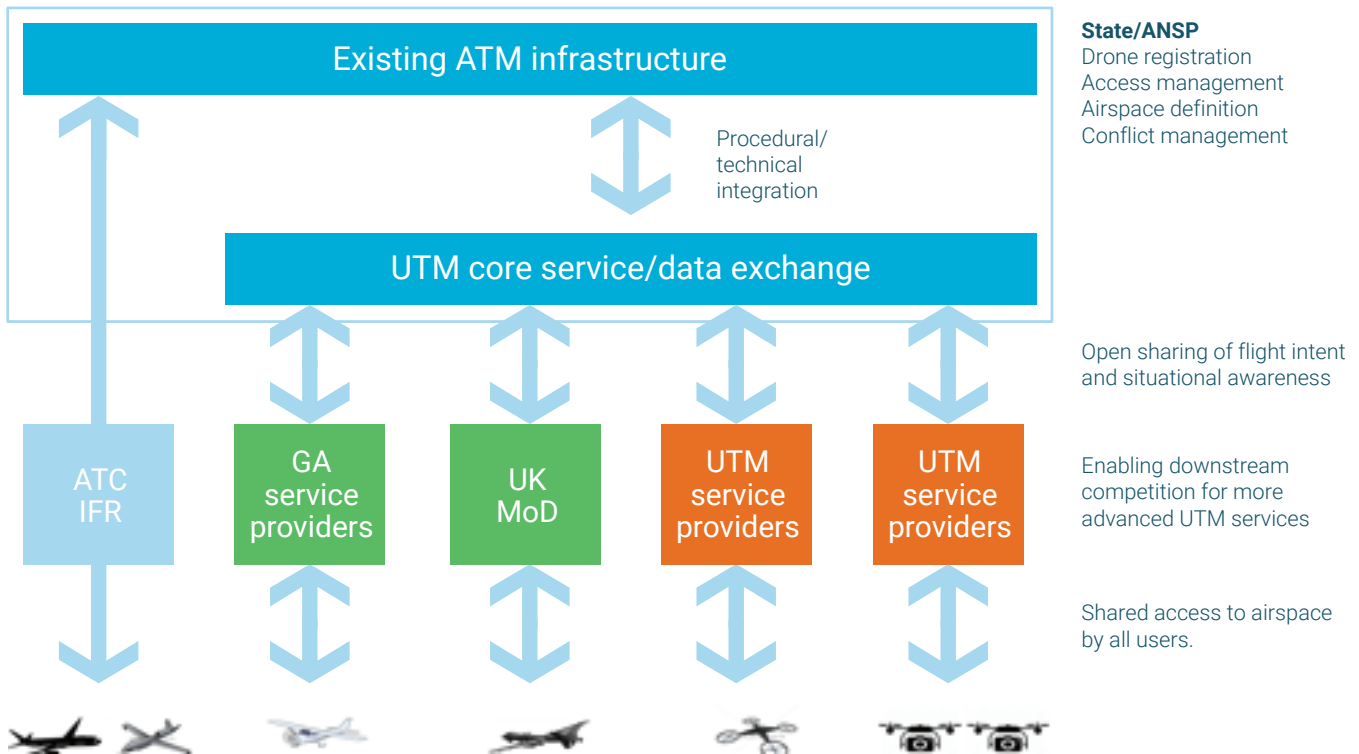
Our proposal in this wider plan for a service for all users of non-controlled airspace would allow electronic data to be shared to increase situational awareness pre, during and post-flight. This builds on our proposals for drones in our core plan (see Chapter 5).

We will enable the interoperability of multiple types of airborne platforms and technologies through the provision of ground based data capability. Combining this with our existing ATC services and procedures, and our understanding of current and future challenges, we will be able to provide a significantly enhanced level of safety and service to users of non-controlled airspace, with a focus on areas where the earliest benefits can be obtained.

Ultimately, by acting as the orchestrator of the airspace, we will ensure safe, fair and equitable access to airspace, and enable the CAA to move quickly towards their ambition of electronic conspicuity for all users.

Some of the potential electronic conspicuity technologies are not yet at a mature state, for example, 5G or bluetooth. What is certain is that new capabilities and innovations will emerge over the course of the next five years. Therefore, we will seek to ensure that our surveillance tracking capability can accommodate any source of electronic conspicuity data that meets future interoperability mandates, and ensure that it is fit for purpose for the future concept of operation.

The success of this approach will rely on the development of the legal and regulatory framework by the CAA and the DfT, alignment with the AMS, clarity around future electronic conspicuity mandates, and the development of new funding and cost recovery models outside of our existing pricing arrangements. We would welcome further discussion with the CAA on how best we can take forward our proposals and realise the benefits for UK aviation.



Brexit

We do not yet know what the impact of Brexit will be on the regulatory framework for RP3. This will become clear when the UK/EU negotiations conclude.

There are therefore a number of uncertainties at the time of submitting this plan, for example, whether the UK will remain within the European Aviation Safety Agency. If the UK's membership ends, then the CAA is likely to need to increase the number of staff it employs and the costs that it charges us for safety oversight.

Other impacts of Brexit that are still uncertain at the time of writing include the risk of a significant drop in the value of sterling against other major currencies, changes to trade tariffs, and possible restrictions on the ability of EU nationals to live and work in the UK.

These factors could potentially affect the cost of suppliers who help maintain our operational assets and systems, support our day-to-day operations, including facilities management, or support our project activities. These factors may increase our costs and we have not made any provision for these risks in our plan.

Where uncertainties remain, we propose to recover the associated costs via our wider plan regulatory mechanism.

One outcome of Brexit negotiations could be that the UK ceases to be part of the fully liberalised EU aviation market and has freedoms of access similar to Canada and the US. In this event, there could be a material impact on air traffic routes that are served from the UK, with a corresponding reduction in UK air traffic movements.

Given all these uncertainties and the effect they may have on the UK economy and traffic over the coming years, we will continue to update the CAA on our RP3 traffic forecast as an input to the UK's performance plan, which will be published in the first quarter of next year, and ask that the CAA keep this under continuing review.

After any update required to the traffic forecast in the UK's performance plan, we would expect variances to be dealt with under existing traffic volume risk share arrangements or, beyond this, the alert mechanisms under existing EU regulations (or equivalent if we are regulated domestically). This could lead to a re-opening of the price control.

Radio spectrum

Under the current regulatory framework, unforeseen spectrum costs arising as a result of changes in national law are eligible to be recovered through the costs exempt provision. Emerging proposals for the European performance and charging framework for RP3 indicate that this provision may be removed.

In the 2017 autumn budget, the government indicated that it would consult on commercial options to improve mobile communications for rail passengers. Guidance issued suggests that this will impact the lower portion of the 2.7GHz frequency band currently used for aeronautical purposes. Therefore, there could be a material impact on the radio spectrum costs we incur in RP3.

Our core plan contains our best estimate of radio spectrum costs in RP3. However, where there is a material difference in spectrum costs from the assumptions set out in our core plan, as result of policy or regulatory developments or changes in national law, we propose to recover these via our wider plan regulatory mechanism.

Cyber security

Our core plan will enable us to comply with known cyber security requirements and will equip us with the resources necessary to defend our safety critical service from cyber threats.

In CAP 1574, the CAA provided guidance detailing cyber security controls as a framework for the regulation of cyber induced risks within the aviation industry. Following that guidance, the network and information systems regulations came into force in May 2018. Our core plan contains the resources required to ensure we adhere to these regulations. If further requirements would cause us to incur materially more cost than assumed in our core plan, we propose to recover these costs via our wider plan regulatory mechanism.

Restructuring costs in RP3

European rules permit ANSPs to use provisions in the regulations on restructuring costs to recover one-time costs to support the introduction of new technologies and processes. The CAA has previously indicated that potential use of these provisions should be highlighted in our plan before the start of the new reference period.

Currently, our core en route plan does not include restructuring costs in RP3. However, we wish to record in this section of our plan that we reserve the right in RP3 to present a business case to customers and the CAA if this has merit.

We would present such a business case through the SIP process. This would then require subsequent approval by both the CAA and the EC. We would recover the RP3 restructuring costs in RP4.

Regulatory mechanisms for wider plan

Where unforeseen costs arise as a consequence of matters outlined in the chapter, we propose the following approach to deal with any remaining, wider requirements that could materialise after the publication of this plan. We propose this regulatory mechanism should be formalised via a modification to our Licence at the outset of RP3 and we would welcome further discussion with the CAA as to how this can best be achieved.

When significant new requirements outside of the core plan materialise, and we need to take action – to fulfil our Licence obligations, address important customer needs, or respond to events outside of our control – we will write to the CAA identifying these. At that stage, we would describe the programmes or activities proposed, along with the rationale including scope, timing, benefits, costs and impact on prices.

We propose that this mechanism would be made available to us so as to allow us to seek an adjustment of our prices to enable us to recover our cost outlays, including associated future service pension costs³. This would be subject to CAA review, and appropriate customer consultation, including the investment or business case where relevant.

In the case of capex, depending on materiality, it could be agreed that the regulated asset base is adjusted on a net present value neutral time basis at the start of the next reference period. In the case of opex, we recognise that the current European framework prevents 'in period' adjustments to determined costs. Therefore, we would like to discuss options to address this with the CAA.

This approach is similar to Ofgem's assessed uncertainty mechanisms. It delivers efficient prices as it avoids the need to allow for such risks within the costs of the core plan, for example, within operating costs and cost of capital.

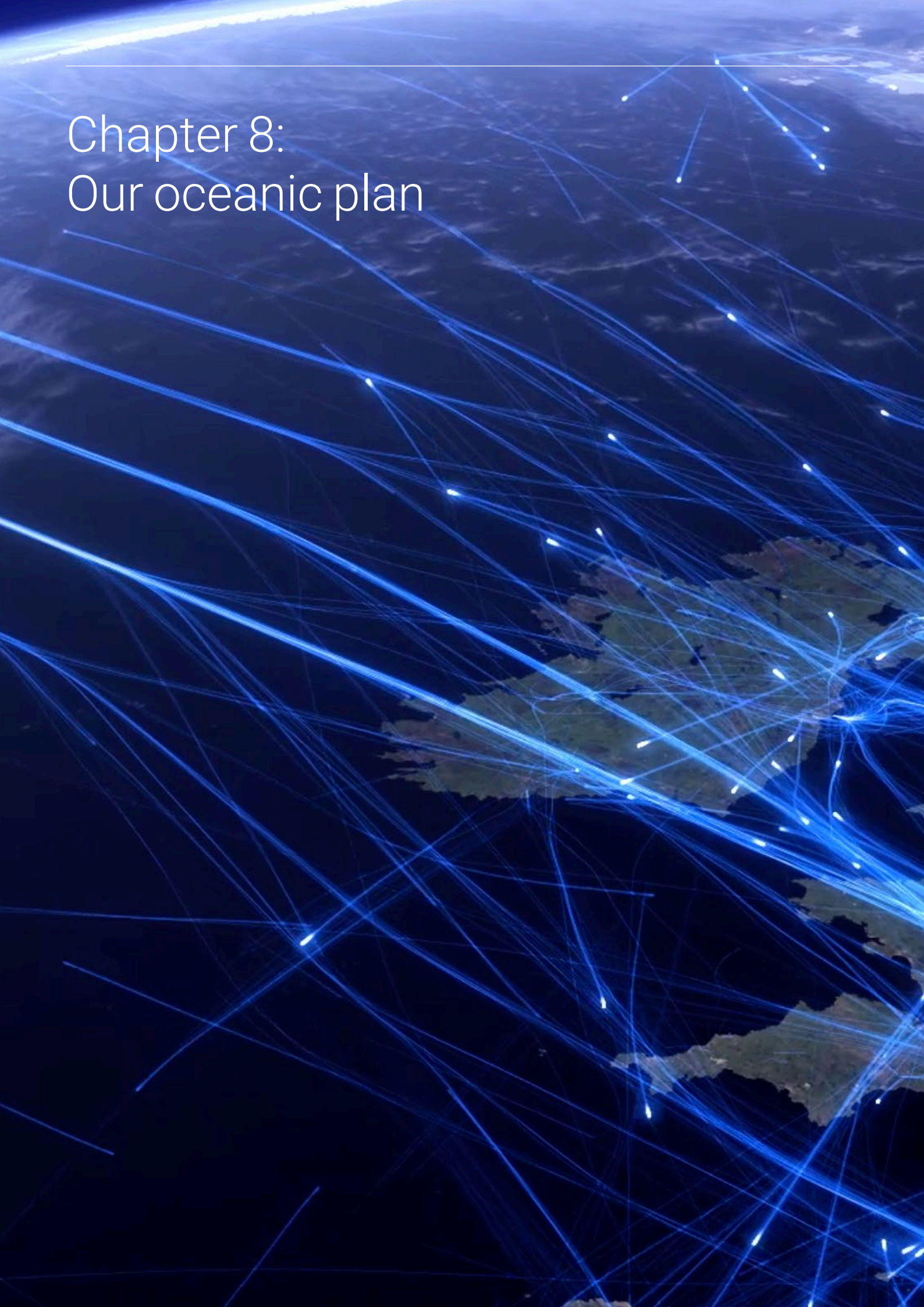
Summary

A summary of the wider plan components and the proposed method to deal with the associated uncertainty is provided below.

Area	Proposed method to deal with uncertainty
Airspace	Costs associated with any approved airspace modernisation function to be recovered via wider plan regulatory mechanism.
Operational resilience	No wider plan activities or costs identified at this time.
Drones	Costs related to provision of the core service where nature and volume of drone traffic differs materially from assumptions to be recovered via wider plan regulatory mechanism. Costs related to uncertain requirements to be recovered via wider plan regulatory mechanism.
ADS-B and electronic conspicuity	Costs related to uncertain requirements to be recovered via wider plan regulatory mechanism.
Brexit	Residual uncertainty on requirements to be recovered via wider plan regulatory mechanism.
Radio spectrum	Costs related to uncertain requirements to be recovered via wider plan regulatory mechanism.
Cyber security	Any further requirements to be recovered via wider plan regulatory mechanism.
Restructuring costs in RP3	We will present a business case to customers and the CAA if there is merit in using provisions related to restructuring costs to recover one-time costs to support the introduction of new technologies and processes.

³ As suggested by the CAA in CAP 1625, paragraph 4.40.

Chapter 8: Our oceanic plan



Chapter 8: Our oceanic plan

The advent of satellite based surveillance offers an opportunity for us to transform our service.

We will deliver safety improvements to meet ICAO targets.

We will deliver capacity growth to meet the rising demand over the ocean.

Airlines will be able to plan and fly routes that are significantly more predictable and fuel efficient than currently possible.

We will ensure continued access to the south east corner of oceanic airspace for aircraft not equipped to meet ICAO's mandate.

The management and development of North Atlantic airspace (NAT) is governed by ICAO.

In partnership with the Irish Aviation Authority (IAA), we provide air traffic management of the Shanwick oceanic control area across the NAT to 30 degrees west, with Nav Canada providing a similar service across the other half of the Atlantic. Our airspace forms the gateway between North America and Europe, and we handle 80% of NAT flights. The effectiveness of our oceanic service is essential to the smooth running of our domestic en route service, and the wider European network.

Land based radar cannot provide surveillance over such a large expanse of ocean. This means that we plan aircraft routes and trajectories hours in advance, and monitor flight progress through periodic reports from the aircraft.

For safety, aircraft in oceanic airspace have larger degrees of horizontal separation than in radar controlled domestic airspace. This is because the location of aircraft cannot be continuously tracked through land based radar. The greater separation and lack of instantaneous position reporting requires a more formal track structure. This limits capacity and constrains the more fuel efficient routes, flight levels and variable speeds that airlines would like to fly.

Even with this formal track structure in place, the NAT operation does not meet the current ICAO NAT target level of safety in relation to estimated vertical collision risk. The forecast demand over the ocean has also now reached the point where it cannot be met without implementing the new ICAO reduced separation standards in 2020 through the use of satellite based surveillance data.

The advent of satellite based surveillance offers an opportunity for us to transform the North Atlantic operation. Using this data, we will have instantaneous updates on flight progress. This will

allow us to meet the ICAO safety targets and deliver increased capacity and more dynamic airspace use, and shorter notice flight planning. In addition, we will be able to provide more fuel efficient routes, flight levels and variable speeds.

As supported by our customers during our RP3 customer consultation, we will provide continued access to the south east corner of oceanic airspace for aircraft not equipped to meet ICAO's mandate¹.

The need for this approach is underpinned by our projections of continued strong growth in North Atlantic traffic in RP3 and beyond. Without satellite based surveillance, we cannot meet existing ICAO safety targets or increase capacity while at the same time improving the fuel efficiency of the North Atlantic.

Our plan to deploy space based ADS-B surveillance from 1 January 2020 was discussed extensively with airlines during the RP3 customer consultation. During this process we also considered whether there are any credible alternatives. After the consultation, we remain convinced that deployment of this system will deliver transformational safety benefits, with its cost largely offset by capacity and fuel efficiency benefits that cannot be delivered in currently available alternative ways.

We believe that this approach is important, providing both safety and capacity benefits in RP3 and beyond, when airspace across the North Atlantic will become increasingly busy and capacity constrained.

At a much more fundamental level, we firmly believe that converting the busiest oceanic traffic flows in the world from intermittent procedural position reporting to a satellite surveillance based air traffic control service is in the interests of every member of the travelling public that crosses the North Atlantic.

¹ NAT DataLink Mandate (NAT DLM).

Traffic

During RP2 we expect oceanic flights to grow by 23%, which is more than double the level of growth originally assumed for RP2. In RP3, we expect flights to grow by a further 11%.

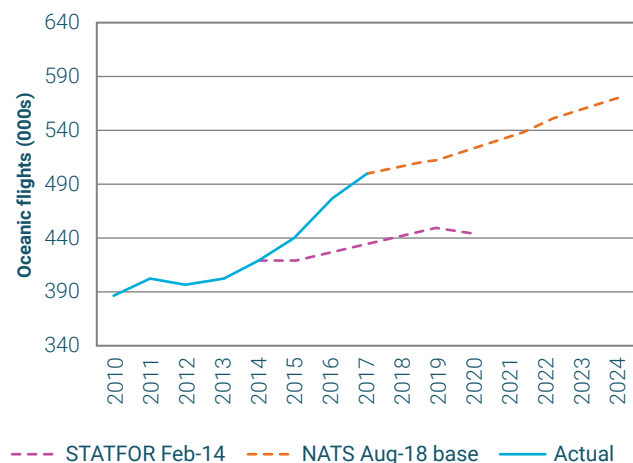
Safety

Satellite surveillance will alert our controllers in seconds, rather than minutes, when aircraft change level or route without our clearance. This will enable quick intervention to assure separation, reduce safety risks and meet the existing ICAO target level of safety. And, in some cases, it will prevent a potential incident.

Analysis jointly undertaken by us and Nav Canada, endorsed by ICAO, projects around a 76% reduction in vertical collision risk² that cannot be delivered by alternative changes to existing systems and processes. Achieving this will fulfil the ICAO safety target.

Alternative options to increase ADS-C reporting rates and/or maximise the benefit from existing safety risk mitigations were explored during the RP3 customer consultation. Airlines acknowledged these alternatives could not deliver the level of safety performance required to meet the NAT target.

Oceanic flights



What our oceanic plan will deliver

KPA	Measure	Target
Safety	Vertical collision risk (measured as fatal accidents per flight hour)	Meet the existing ICAO target level of safety
Service quality	% of flights cleared on requested flight trajectory	c. 90% (up from 60% today)
	% of aircraft able to fly without speed restriction	c. 80% (up from zero today)
	Access to south east corner	Access for aircraft not equipped to ICAO mandate
Environment	Fuel burn saving after satellite data cost	Net saving of \$174 - \$344 per flight (Shanwick and Gander) (Gross saving 406kg - 649kg, net saving assumes \$700/MT fuel cost)
	Emissions saving	1290kg - 2060kg CO ₂ per flight
Investment enables the above	Total RP3 investment	£15m
Average price RP3 v RP2	Real price reduction (excl. satellite data)	13% reduction

² NAT target level of safety (TLS).

Service quality

By using satellite surveillance, we can safely reduce the minimum distances between aircraft to optimise and then remove the oceanic organised track system (OTS), and add capacity to handle traffic growth. We expect that around 90% of traffic across the North Atlantic will be allocated its requested flight trajectory, compared with around 60% at present.

In addition, around 80% of traffic will be able to fly without speed restriction, compared with current operations where all traffic is allocated a fixed speed. Providing aircraft with their requested trajectories and allowing them to fly without speed restrictions will deliver fuel savings for airlines.

Around 8% of aircraft that fly through the NAT south east corner do not have the level of communications equipment required to meet the ICAO DataLink mandate for the North Atlantic. ICAO has agreed that a combination of satellite surveillance and VHF communication service will meet their requirements, giving these aircraft continued access to this airspace.

This means airlines would not have to bear the cost of equipping their aircraft to the ICAO standard, or of flying longer routes to avoid the south east corner. Our customers support this pragmatic approach.

Environment

By increasing flight efficiency, we will reduce our customers' fuel burn and CO₂ emissions. Based on current fuel prices³, we estimate savings, after the cost of satellite data, of between \$174 and \$344 for a full North Atlantic flight including both Shanwick and Gander airspace⁴. This represents a gross saving of between 406kg and 649kg of fuel, equivalent to around 1290kg to 2060kg of CO₂ emissions per flight.

These savings have been calculated relative to the level of flight efficiency that could be achieved using the performance based communications and surveillance separation standards that will be in place at the end of RP2 and do not require satellite surveillance. We expect that these total benefits will be representative of those achieved by flights using Shanwick airspace.

We estimate that the cost of fuel would need to reduce from its current level of \$700/MT to below \$300/MT before the net savings would be eroded. On the other hand, if the cost of fuel increased, net savings would grow accordingly.

For ease of reference, and because of its importance, the chart on the right shows the areas of benefit based on analysis by ICAO and us⁵.

See Appendix M for more details.

Prices

We propose that our RP3 oceanic prices change from a single fixed fee per flight to two different prices. The first price for North Atlantic crossings will contain our core oceanic service along with a satellite surveillance data charge. The second price for Tango routes flying in the south east corner will contain the same core oceanic service but with a smaller satellite surveillance data charge, reflecting the cost agreed with our supplier, Aireon.

Excluding satellite data charges, the average price for our core service for RP3 will reduce by 13% in real terms, compared to the average price in RP2. This is because we will handle far more traffic without corresponding increases in cost. Prices for RP3 are shown in the table on the following page.

During the RP3 customer consultation, we briefed customers on the work we have carried out to ensure that the ADS-B data from our supplier, Aireon, is priced at levels that represent value for money. This helped our customers understand the scope and structure of Aireon's data service fees, which reflect Aireon's global charging rate for high density oceanic airspace for the whole North Atlantic crossing.

Benefit area	2020 & 2021	2022	2023 & 2024
Shorter flight times	0.3 mins	0.3-2.4 mins	
ASEPS implementation	85 kg		
Variable mach/cost index	237 kg		
Avoided fuel uplift	84 kg		
UPR savings	–	122 kg	243 kg
Fuel saving per flight (kg)	406 kg	528 kg	649 kg
Cost saving per flight (at \$700/MT)	\$284	\$370	\$454
Estimated data charge per flight	\$110	\$110	\$110
Net saving per flight	\$174	\$260	\$344

³ \$700 per metric tonne, reflecting IATA's Jet Fuel Price Monitor price of \$717.1/MT as at 14th August, 2018.

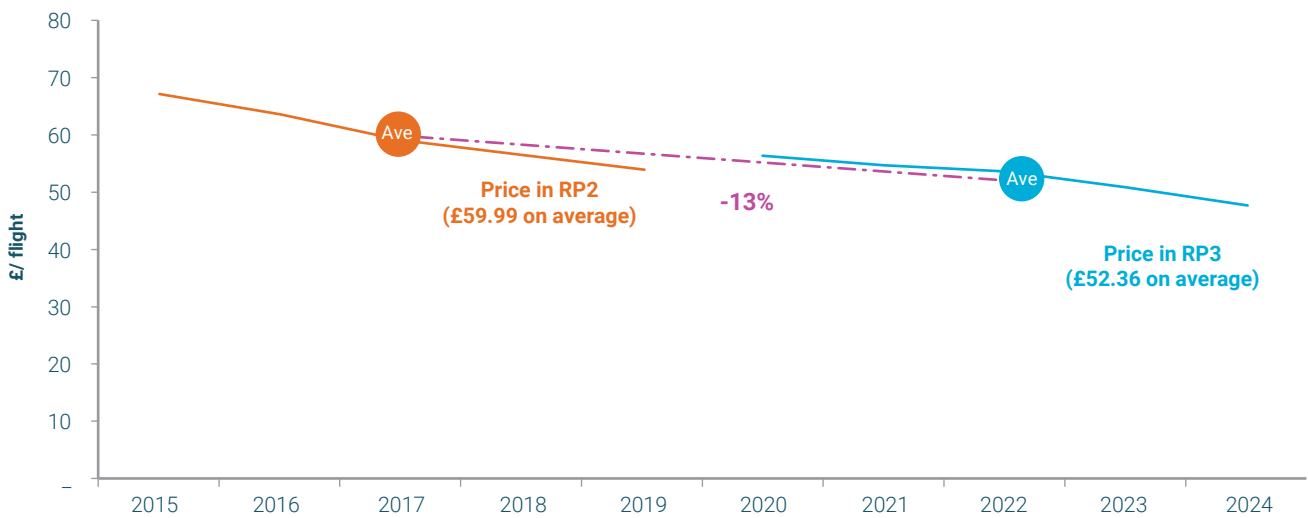
⁴ Net saving after illustrative satellite data cost of \$110/flight for an entire NAT crossing (2.75 hours at an illustrative data cost of \$40/hr).

⁵ NATS Report A1596, Version 1.1.

2017 CPI prices (calendar year)	2020	2021	2022	2023	2024
£/flight	Plan	Plan	Plan	Plan	Plan
Core oceanic price	55.95	54.04	53.43	50.81	47.57
Satellite data charges – Tango routes	3.98	3.81	3.64	3.48	3.35
Satellite data charges – North Atlantic crossing	31.29	31.29	31.29	31.29	31.29

In the chart below, we show the development of prices for our core oceanic service:

Prices for core oceanic service: £ / flight (2017 prices)



Taking 2021 as an example:

- > A Tango flight would pay £57.85 (2017 prices) comprising £54.04 (core) plus £3.81 (data). The data charge represents a cost of £180k p.a. relating to the estimated number of Tango flights within the south east corner. This cost has been agreed with our supplier, Aireon;
- > A North Atlantic crossing flight would pay £85.33 (in 2017 prices), comprising £54.04 (core) plus £31.29 (data). The illustrative data charge reflects Aireon’s global charging rate for high density oceanic airspace with no alternative surveillance. This is still being negotiated.

Following consultation with our customers on the structure of our prices, we propose:

- > Calculation of prices by dividing costs by projected traffic for each year, as shown above, rather than profiling by a CPI-X⁶ factor as in previous periods. This approach better reflects the cost of our service and is the method used for calculating en route prices;

- > Charging on a per flight basis, which would be consistent with the existing charging basis, but the CAA will consider the merits of recovering the data charge (and even the core service cost) on a distance and weight basis (chargeable service unit). This latter approach could provide consistency with the Canadian ANSP’s charging if it adopts this basis for its charges. It should be noted that customers are currently not supportive of charging by weight and distance, or by time; and
- > A true-up mechanism for satellite data charges to recover actual costs on an n+2 basis.

See Appendix M for more details.

Reasons for changes in core oceanic prices

The chart below shows the main factors explaining the 13% real reduction in the average price of the core oceanic service between RP2 and RP3, excluding satellite data charges.

⁶ CPI-X is a method of setting prices using the CPI index of inflation, less a constant percentage each year.

Traffic growth (price change: -20%)

Our traffic forecast projects an increase of 26% in average flight volumes from the level that was used to set prices in RP2, and our projection for RP3. This reduces the average oceanic price in RP3 by 20%⁷ compared to RP2.

Oceanic ATCOs (price change: +3%)

We plan to increase the current number of oceanic ATCOs from 45 to 55 full time equivalents (FTE) by 2024. This is necessary to manage significant traffic increases beyond levels that we can handle with existing resources, augmented by voluntary overtime, with adequate service resilience. By multi-skilling our controllers and support teams they will be able to work more flexibly and efficiently across our operation. This has enabled us to avoid increasing ATCO headcount by a further 10%.

Recovery of RP2 investments (price change: +5%)

During RP3 we will start to recover some of the £15m oceanic investments (Stamper and Telstar) made in RP2, following consultation with our customers. This adds around £3 to an oceanic flight.

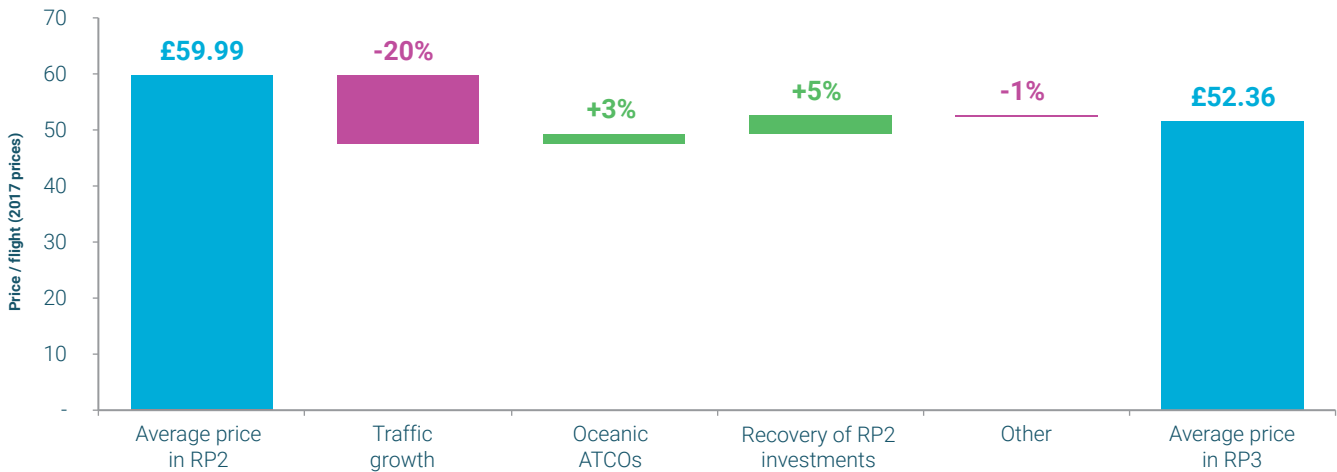
Other factors (-1%)

Other factors include:

- > The lower cost of capital in our plan;
- > A small increase in pension costs;
- > Costs relating to the oceanic operation's share of DSESAR costs, which will improve resilience and performance of core ATM systems and DataLink communications; and
- > Other net reductions in regulatory depreciation, including the partial recovery of new oceanic investments of £15m in RP3. These will enhance traffic management capability and enable reduced separation standards, a reduced conflict horizon and a tactical clearance capability.

See Appendix M for more details.

Oceanic price bridge – RP2 average to RP3 average



⁷ Calculated as 1-(average cost/1.26) = 0.20 (rounded).

Transforming our oceanic service

In the paragraphs that follow, we describe, with reference to the roadmap below, how we will transform our oceanic service year-on-year.

The horizontal timelines represent the following:

- > Strategic changes: To our method of operation which are essential enablers;
- > Plan benefits: That will be delivered to our customers;
- > Oceanic service and trials: Showing how changes will be tested before implementation; and
- > System changes: Investments necessary to deliver the transformation.

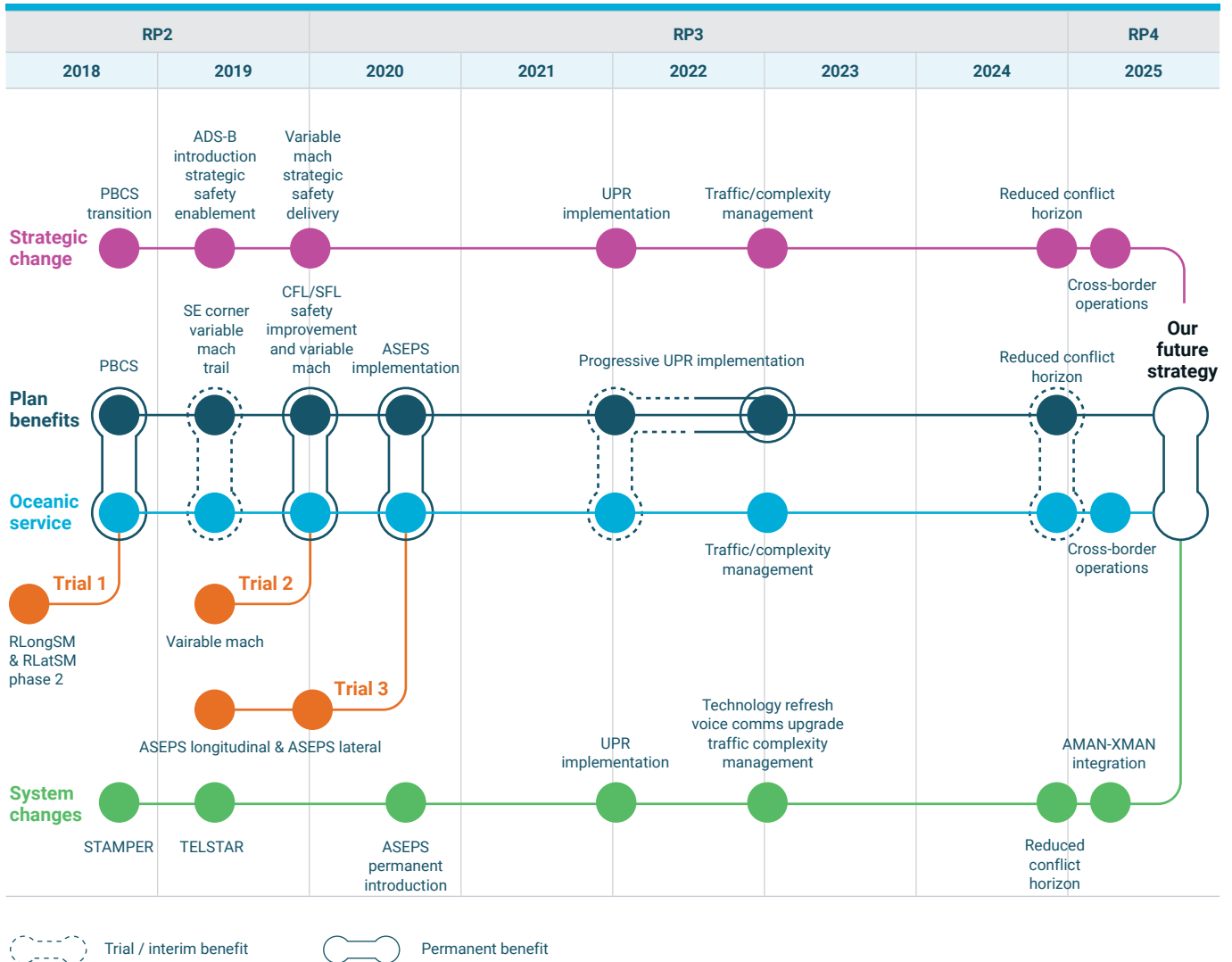
RP2

In early 2018, we implemented reduced, ICAO approved, separation standards which do not rely on satellite surveillance⁸.

In 2019, we will introduce a satellite surveillance and VHF service for the south east corner, working in collaboration with our oceanic service delivery partner, the IAA.

We will also begin the introduction of trials for surveillance enabled operations outside the south east corner. These trials, subject to regulatory oversight and approval, will demonstrate both the deployment of flexible speed control and the introduction of new, even smaller, separation standards⁹, ahead of their formal ICAO publication.

Oceanic development



⁸ Implementation of PBCS separation standards.

⁹ Advanced surveillance enabled procedural separation (ASEPS), based on current work by the ICAO Separation and Airspace Safety Panel.

RP3

In 2020, we will permanently implement our new safety capability and, following successful completion of our speed trials, allow pilots to choose the optimum cruising speeds for their aircraft¹⁰.

We will complete our separation standard trials in late 2020, after the expected formal publication of these separation standards¹¹ by ICAO. This will deliver the much needed additional capacity over the ocean.

From 2022, we will modify the OTS and flight level allocation systems, allowing aircraft even more flexibility on routes and trajectories.

From 2023/2024, we will introduce new tools that will allow us to match our controller resources more closely with predicted workload.

Alternative options

We evaluated the following options to enhance our existing operations through the extended use of current technologies:

- > Strategic lateral offset procedure: We modelled optimising the use of this procedure to achieve the safety benefits of this plan. However, the results indicate that this is not practically achievable, and is not capable of reducing the estimated vertical collision risk to within the NAT target; and
- > Developing ADS-C: Increasing reporting rates for ADS-C delivers no material safety benefit, and the sustainability and service resilience of such rates have not been fully considered or assured by communication service providers. They currently do not assure current ADS-C services, which exclusively support larger separation minima.

As these options are not viable, deployment of ADS-B surveillance is the only credible option consistent with the NAT service development roadmap.

Alignment with key stakeholders

Our plan aligns fully with the ICAO strategy and associated mandates¹². It also fulfills the CAA's requirements on safety improvement, service quality, performance reports, network resilience and environmental performance.

Our strategy is aligned with other NAT ANSPs, such as Nav Canada, IAA and the Federal Aviation Administration. The continuation of the successful operating framework between the IAA and us, and governmental arrangements between the UK and Ireland, will enable its implementation.

During the RP3 customer consultation, Heathrow and Gatwick airports indicated support for our deployment of ADS-B surveillance, and in particular the contribution that this could make to their on-time arrivals programmes.

¹⁰ Variable mach is a term used to describe an environment where flight crews may choose their optimum cruising speed according to airline business/"cost index" priorities in order to minimise fuel use.

¹¹ ICAO Doc.4444 (PANS-ATM).

¹² ICAO strategy is developed by the NAT Systems Planning Group which involves member states, supported by national airspace regulators, ANSPs and airspace users. The NAT2025 vision is the strategy that has been developed by the NAT Implementation Management Group. ICAO mandates include mandates, conclusions and deliverables of agreed regional implementation plans.

Chapter 9: Effective accountability



Chapter 9: Effective accountability

We take our responsibilities for delivering and operating a significant piece of the critical national infrastructure extremely seriously.

We are fully committed to effective accountability now and in the future.

There are many processes through which we discharge our accountability to our customers and other stakeholders, through regular SIP consultations, operational and safety partnership meetings, stakeholder workshops and customer surveys.

In this section we describe how we manage safety within the organisation and discharge our accountabilities under the Licence and price control settlement to airlines, the CAA and the wider group of stakeholders who are affected by our activities and airspace role, including overflow communities and GA.

Governance of safety

Effective management and governance of safety is a key focus for us. The Board provides leadership and direction, and is responsible for ensuring that the NATS group is run safely. The Safety Review Committee Board Sub-Committee supports the Board on their accountability for the safe provision of operational air traffic services. The sub-committee also provides challenge and oversight on behalf of the Board of our safety performance and targets.

We define the lines of safety accountability clearly throughout the organisation, including senior management's direct accountability for safety. We manage, document and communicate safety accountabilities throughout the organisation, with a clear definition of the levels of management that have the authority to make decisions on safety risk tolerability. We assess all changes to safety accountabilities before making them, and notify the CAA's Safety and Airspace Regulation Group.

Airspace modernisation

In order to modernise UK airspace we must transform our concept of operations from a tactically based solution to a systemised and planned operation. Such a large scale modernisation is only feasible if it is designed and implemented as a coherent, integrated single plan, with all parties committing to deliver their respective elements.

In the case of LAMP, our designs largely relate to airspace above 7,000 feet and will fully address, in a transparent way, the requirements of CAP 1616¹. There are 15 airports that will have to take accountability and responsibility for low level changes so the overall modernisation can be achieved. We will be fully engaged with, and supportive of, these airports and their responsibilities under the CAP 1616 process. This includes the priority to identify the optimum design in terms of noise, without compromising, as far as possible, the overall efficiency of the UK airspace modernisation programme.

However, this modernisation process will not succeed without the full and active participation of other key aviation stakeholders. Any stakeholder reluctance towards, or delay to, the required changes will restrict and possibly cause the failure of the overall programme.

Within our wider plan we are proposing to manage, integrate and drive the overall airspace modernisation plan. While the responsibility for low level airspace routes and designs, noise mitigation, options and public consultation rests with each relevant ACP sponsor, it is vital that the sponsors are supported in integrating these elements into the wider programme. It is probable that compromises will be required and these will need to be managed in a transparent and inclusive way.

For this reason we support the reform of the future airspace strategy governance and terms of reference to ensure appropriate senior government and industry oversight and direction of modernisation. Our proposals would make our leadership role and those of the CAA and government explicit, as well as the essential contributions of other parties.

¹ Airspace design: guidance on the regulatory process for changing airspace design including community engagement requirements, issued 2017 and guidance for NERL in preparing its Business Plan for Reference Period 3, issued 2018.

Airspace change consultation

Our approach to consultation on network airspace change will be consistent with the guidance set out in CAP 1616.

GA, airline and community engagement will take place at an earlier stage in the process than previously, to ensure that we understand the views and concerns of members of the public and industry as we evolve the design. We will explain what we expect change to mean for them, as well as for future capacity. Our engagement with communities will continue for longer than before through the change application process. This will also enable us to incorporate the opinions of the travelling public and business to balance the debate appropriately.

In addition, we will work closely with airports, through their established community forums, and more widely in preparation for consultation, to ensure that communities understand how airports' proposals for lower level routes fit with the higher level network. This will also include the general and wider aviation communities through the Future Airspace Strategy Industry Implementation Group (FASIIG).

Governance and assurance for the change portfolio

Our RP3 investment programme is complex and highly technical. It contains a number of critical interdependencies between implementation milestones. The governance of the programme must be fit for purpose and proportionate so as to reduce the risk of introducing delays and additional cost to its implementation. We know that effective governance and assurance are of key importance to our customer, regulators and other major stakeholders such as airports.

The Arup and Helios Phase 1 Report in 2014 noted: "NERL has shown it has the capability to effectively manage the delivery of the plan. NERL's internal management processes and systems were found to be consistent with good practice". The report contained a number of recommendations that we have drawn upon, along with customer feedback, to improve the governance and assurance processes of our programme in RP2.

The improvements and innovations we have introduced include:

- > A P30 that provides stronger management of the overall portfolio with a clear focus on delivering agreed benefits to costs and timescales;
- > Enhancing our approach to supply chain management and strengthening our approach to value for money;
- > An enhanced approach to benefits tracking and management;
- > Delivering more detailed airspace and technology plans to describe the RP2 investment programme;
- > Supplementing the SIP report with a formal report document providing transparent reporting against the detailed airspace and technology plans;
- > Introducing a programme of customer deep-dive workshops on specific topics, facilitating more informal engagement and discussion to build understanding;
- > A regular SIP update to airports and the wider stakeholder community through FASIIG; and
- > Welcoming the appointment of the CAA's independent reviewer to provide assurance to customers and regulators on the accuracy of reporting against the plan.

These innovations and improvements have been well received by our customers, according to our 2018 SIP and 2017 customer survey. This created a new baseline for planning and reporting, which the CAA has endorsed. A subsequent review by PwC found that we have addressed the Arup and Helios recommendations. However, following feedback and discussion at the RP3 customer consultation, we propose a number of further enhancements to the SIP process in RP3. See below for more details.

We intend to retain and build on these developments to increase the quality and frequency of reporting, and will consult customers on investment or delivery options wherever possible. We also support an enhanced role for the independent reviewer. This approach will provide stakeholders with a transparent process, and clarity on how they can expect to be involved.

In CAP 1625 the CAA offers us the opportunity to "build on the shared governance approach we adopted for RP2" and we fully support this as the right way forward. We intend to build on the improvements we have already made to ensure that customers continue to have improved visibility and oversight of our plans, and confidence in our on-going assurance and reporting.

We will continue the RP2 actions above, and supplement them with:

- > An annual update to the C10 report to provide additional programme detail as it becomes available;
- > Continuation of the annual SIP process with full and interim SIP consultations each year, including a formal report tracking updates against the C10 report together with a supporting slide pack;
- > Regular deep-dive sessions to cover subjects of key interest to customers, most likely linked to the SIP timetable;
- > Six-monthly updates to airports and other key stakeholders through the FASIIG meeting framework;
- > An enhanced role for the independent reviewer, with regular quarterly review meetings based around our portfolio dashboard, and continued engagement with the planning and SIP process. After the review of our portfolio dashboard, we will publish it to customers and the CAA;
- > Annual review with customers, as part of the interim SIP, to discuss effectiveness of the process and lessons learned to improve the framework;
- > Customer consultation, where possible, on investment or delivery options through the SIP process. We will continue to provide full justification for our decisions to ensure customers have assurance in the programme governance; and
- > Our proposal, following feedback about the SIP consultation, to enhance the process by pre-agreeing key programme milestones that will be tracked. Where changes are required to these, outside agreed materiality thresholds, we will discuss these with customers in line with pre-defined engagement principles. We will also discuss any proposed redeployment of investment funds and if agreement cannot be reached, we will follow the agreed process of escalation. See Appendix L for more details.

Customer engagement

Our relationship with our customers is key to our success. We are constantly looking for ways to improve our service by listening to their needs and welcoming feedback. To do this, it is essential that we understand what drives their businesses and what is important to them in terms of delivering both an excellent ATC service and value for money.

We aim to achieve this by continuing to develop effective relationships with our customers. We supplement this with regular multilateral customer forums on a wide range of subjects to suit their needs. Our customer affairs department acts as a focal point and single point of contact for airline customers, business and GA.

Customer consultation at a strategic and operational level is an integral and essential part of our business. We offer all of our customers a range of formal and informal consultation channels and events, including:

- > Regular customer account meetings at the request of customers;
- > Bi-lateral customer meetings on specific subjects at the request of customers;
- > Our operational partnership agreement, typically pre and post-season, giving customers the opportunity to engage with our operational managers, with a focus on the next year's operation;
- > Our safety partnership agreement with airline safety specialists, focused on jointly agreed safety improvements;
- > Our Lead Operator and Carrier Panel which works with airlines and industry on the standards for airspace design and ensuring flyability of designs;
- > Bi-annual SIP consultation inviting written and verbal comments and questions. We also offer bi-lateral consultation on the SIP during the published consultation period. The SIP covers both domestic and oceanic investments and is supplemented by a plan required under Condition 10 of the Licence. We consult with airports and GA on SIP through FASIIG;
- > Specific stakeholder workshops on projects such as significant airspace programmes, and ATM enhancements such as LAMP and ExCDS, noting that in RP3 these will also include consideration of plans for airspace and technology transition delay and related allowances;
- > Annual charges consultations on UK en route (managed by the DfT), London Approach, oceanic and North Sea helicopter services;
- > Our customer website, including reports on operational performance and details and materials for all multilateral customer meetings; and
- > An annual airline customer survey on all aspects of our business, with results reported in our annual customer report.

We will continue this approach to customer engagement during the rest of RP2 and into RP3, learning from customer feedback to continue to evolve our approach. In particular, our focus in RP3 will be on engaging customers in our change programme and transition planning for major changes, including DP En Route, DP Lower and LAMP.

Community and consumer engagement

We are already undertaking a number of activities related to consumer engagement that are within the scope of our RP3 business plan. We expect to continue these in RP3.

We have recently conducted a FAS funded survey on attitudes to airspace modernisation and PBN and, during RP3, will carry out further work with consumers and local communities to understand more fully their views about airspace modernisation.

We will continue to support airport community noise forums and consultative committees for all major airports, and are planning further outreach to local government and their local communities. We are also a member of Sustainable Aviation which works as an industry coalition to ensure we are in step with wider customer expectations of aviation.

We work in accordance with the DfT aviation and noise policy on consultation and community engagement on specific projects within the business plan. In addition, airspace projects are subject to the CAP 1616 ACP process, which has extensive requirements for community engagement and consultation.

We are also planning a programme of quantitative and qualitative social research outside of the CAP 1616 process to ensure that we continually understand the views of different communities. This will include benchmarking and tracking public opinion through a survey approach. It will be supported by qualitative techniques, including focus groups and more deliberative approaches, to understand more fully the views of consumers and communities. The outputs of these research activities will be used to inform our operations and the wider business.

We are proposing that we take a leading role in the co-ordination of airspace change in the UK through the creation of the AMOG. It will co-ordinate ACP activities, including airports' and our community consultation and engagement. We will support the CAA and DfT airspace management governance, which includes communications activities, many of which will be aimed at communities and consumers.

Our plan is designed over time to create the capacity and generate service levels that will enable airlines to offer their passengers flights unimpeded by air traffic control shortages and delays. We therefore believe that it is well aligned with the interests of passengers and other end users.

We note the CAA's Consumer Panel's advice to the CAA on our business planning process for RP3. In relation to its concerns about the potential divergence of interests between airlines and passengers and the requirement for more consumer-focused outcomes, we have limited ability to mitigate any relative unfavourable treatment of different groups by airlines or to ensure the delivery of consumer outcomes.

This is because, as an upstream supplier, we have no access to passenger information and cannot identify any such groups for the purposes of consultation or otherwise. Nor do we have any say over the service that airlines offer to their customers.

In the event of disruption that results in a prolonged reduction in airspace capacity, we will manage traffic regeneration in accordance with established and published procedures. In these circumstances the allocation of reduced capacity across market segments will be independently managed through the National ATM Crisis Management Executive chaired by the CAA and including the DfT, industry representatives and ourselves.

In relation to airlines trying to increase their market power by limiting investment in capacity at an airport, this is mitigated by the CAA's requirement to consult airports on our investment plans under Condition 10 of our Licence. To this end, airports have been involved for the first time during our RP3 customer consultation and we will continue to include airports in our SIP consultation through the rest of RP2 and into RP3.

Corporate governance

Our highest priorities under the PPP structure are safety and Licence compliance. We must also follow best practice corporate governance through compliance with the UK Corporate Governance Code.

The CAA made an extensive review of the structure and associated governance during RP2, resulting in the additional appointment of NATS group non-executive directors, and, in particular, those appointed under the government public appointment process (partnership directors), as statutory directors of NERL.

These arrangements were reflected in a change to our Licence that also requires that we should appoint further independent directors to our Board if, at any time, there are less than two partnership directors. While this did not change the existing rights and obligations of the group directors to ensure that we comply with our Licence, the new arrangements brought a higher level of transparency and an element of future proofing to our governance.

Both before and after this change to the Licence, all the directors in the NATS group observe strict undertakings to ensure that nothing is done by any group company that might lead to a breach of the Licence. Our Board receives reports, and provides challenge, on safety and operational performance.

The directors also consider for approval annual certificates of adequate resource for forthcoming 24-month periods. The Board takes these certifications seriously and the Audit Committee of the NATS group examines the underlying evidence in detail, with the assistance of internal audit where appropriate.

Governance of pension schemes

Both our defined benefit and defined contribution pension schemes are governed by independent trustee boards. We nominate trustees and actively participate through them on these boards along with appropriately regular engagement and consultation. While in our role as sponsoring employer we are able to inform trustees' decision-making, we do not have the ability to control those decisions.

In our dealings with trustees we seek to ensure that:

- > The schemes are managed and governed effectively;
- > Trustees are made aware of the interests of our customers to inform decision making;
- > Investment and other risks are actively managed;
- > Valuation assumptions align with market practice; and
- > Trustees give appropriate consideration to our recommendations for reforms that reduce the costs and risks of the schemes.

Governance around NERL and NSL boundaries

There are three principal areas in which NERL and NSL interact on a commercial basis. The first is access to NERL data and facilities. The second is the performance of commercial services by NSL on behalf of NERL. The third is where NERL and NSL have adjacent activities in the ATM sphere.

Access to NERL data and facilities

Pricing for access to NERL data and facilities is based on established policies, procedures and systems to ensure that these are priced on a fair, commercial and arms-length basis consistent with Licence Condition 9 which prohibits cross-subsidies. In practical terms these policies reflect robust accounting principles overlaid with common sense governance that ensures pricing and access decisions are made by individuals who are not personally accountable or incentivised by the commercial aspects of those decisions.

Assurance on the pricing of NSL access to NERL resources is provided through the obligation on NERL not to cross-subsidise under Condition 9 of its Licence and through the Licence Condition 5 certificates that it provides to the CAA annually and through internal audits conducted as part of an overall work programme. The CAA also conducts an external audit of NERL's cost allocation every five years in respect of each reference period to ensure that costs are reasonably allocated between NERL and NSL.

As far as access to the same data and facilities for NSL competitors or potential competitors is concerned, NERL places reliance on NSL's financial covenant, professionalism and safety culture when deciding what facilities NSL should gain access to, which might, if abused, have an adverse effect on NERL's licence accountabilities. NERL welcomes commercial proposals from third parties that would fulfil the same pre-conditions for access to NERL resources.

Commercial services performed by NSL

As far as the delegation of NERL's services is concerned, as set out in the section on operational resilience in Chapter 4, NERL's primary concern is to provide a safe and resilient operation in compliance with its Licence duties. It will only consider delegation consistent with that primary concern.

The functions delegated by NERL to NSL are limited to those that were established at the time of the privatisation in 2001 together with a few rational extensions of them (for example the Farnborough LARS service). As such, NERL's relationship with NSL in terms of the Licence services NSL performs on behalf of NERL is based on an around 18 year history of safe and reliable service provision, and arose because of the proximity of the relevant en route airspace and the airport airspace in which NERL and NSL respectively provided air traffic control services at the time of privatisation.

NSL has, since the privatisation, reliably performed those operations and over time that reliability has formed a significant part of the business case for continuation of that delegated service. NERL keeps such delegations under constant review to assure itself that the rationale behind the case for the delegation is still sound and that benefits to customers in terms of value for money continue to be provided.

To date, NERL has continued to consider it appropriate to delegate these services to NSL. If in the future NERL concludes that the case for delegation no longer exists or, it no longer represents value for money or, where changes to the future operating environment in which the delegations take place mean that the case for delegation is not expected to continue into the future, then NERL will make provision for the reversion of performance of the service to NERL in its plans for the delivery of these services.

Adjacent ATM activities

The structure of the PPP intended to separate the pre-existing licensable activities of NATS to be performed by NERL, and pre-existing and future commercial activities to be performed by NSL. This division of responsibilities continues today except that where NERL is able to perform relevant commercial services at low risk with a consequent contribution to the regulatory single till, such activities will be undertaken by NERL rather than NSL.

The mainstay and original NSL commercial activity at PPP was the provision of UK airport air traffic business, performed on behalf of UK airport customers and won on a competitive basis. Inevitably, this leads to adjacent services with NERL such as operating the approach services in the London TMA for airports such as Heathrow and Stansted where NSL provides the tower services. The pricing of such adjacent services is established through distinct and separate mechanisms.

The service levels provided by NERL to NSL-operated towers, are based on network-wide protocols and procedures which are designed solely to promote the efficiency of the UK network in accordance with NERL's licence obligations.

On a practical level, that requirement is sufficiently complicated already that the introduction of discriminatory behaviours or practices in favour of NSL-operated towers would be difficult both to operate and to conceal. The reality (as concluded in the CAA Oberon investigation) is that there is no such discrimination and there is further supporting evidence in the continuity of service excellence provided to Gatwick airport both before and after transition from NSL to a competitor.

Beyond its early PPP role in UK airports, NSL continues to evolve and develop its business model with investments and services it perceives as likely to provide supplementary revenues at commercial returns.

One such example was a recent decision by NSL to acquire an interest in Aireon LLC, the satellite ADS-B surveillance provider which NERL wishes to use to provide safer ATM services over the North Atlantic. As described above, governance was applied throughout the acquisition to ensure separation of people and knowledge between the NERL team negotiating for ADS-B data services and the NSL acquisition team. On an on-going basis, the governance structure of the ANSP-led shareholding in Aireon is such that there is no scope for higher individual pricing for NERL data services compared to other Aireon customers.

A further example of involvement in the future of ATM by NSL is its participation and aspirations in the UTM market. In this respect, NERL anticipates that any licence accountabilities it takes on (see Chapter 5) will be to develop and maintain infrastructure which is available on an open source basis to competitors in the UTM services arena. As such NSL would be able to access any NERL data and resources on the same basis as NSL's competitors and, unlike the concerns expressed above on the risks to NERL's Licence, NERL does not anticipate material pre-conditions being applied to access any future NERL UTM capabilities that might otherwise favour NSL.

Similarly, in any future airspace change co-ordination work taken on under the Licence and led by NERL, NSL will have no special status, and any airport requesting an ACP will be free to appoint NSL or any other ACP consultants to assist them with their submission.

CAA and EC requirements in relation to our business plan

The remainder of this chapter summarises relevant guidance provided by the CAA in relation to our business plan and describes the status of draft EC regulations and the development of EU-wide targets.

At the outset of the business planning process, we set out the assumptions we proposed to underpin our plan to the CAA in September 2017. At the time, we requested that, if, during the course of reviewing our business plan, the CAA considered any assumptions to be inappropriate, that they inform us at the earliest opportunity. As such, the assumptions in this business plan have formed a key consideration in the formulation of our proposed targets, costings and pricing, as well as the feasibility of the performance of the plan itself.

If during the course of the RP3 process, there is good reason to believe that one or more assumptions may no longer be appropriate, we will need to revisit these and their implications for the business plan as a whole. Key examples include assumptions relating to the traffic forecast, the applicable regulatory framework for RP3, requirements to contribute to EU-wide targets adopted by the EC and expected actions that must be taken in order for us to properly be able to perform the wider functions that we propose to adopt, such as the CAA making the appropriate modifications to our Licence.

Ultimately these assumptions are a critical part of our plan. Any subsequent assessment of our performance during RP3, including in relation to compliance with our Licence obligations, must take account of these assumptions and the trade-offs between capacity, environment and cost they give rise to in setting our prices.

See Appendices N and O for more details.

CAA expectations and requirements

The CAA set out their guidance to us in CAP 1625. This continued the themes described in previous draft guidance (CAP 1593²) and a discussion paper on strategic outcomes for RP3 (CAP 1511³). The CAA followed up this guidance with two letters in May and September 2018, that gave feedback on our business plan. They are available on the CAA's website.

We addressed the feedback through material provided to the CAA and customers during the consultation process, as well as in this business plan, where appropriate and possible to do so.

As directed by the CAA, in developing this plan we have considered the needs of our customers, other relevant stakeholders and the requirements of CAA/DfT policies, as well as the SES regulatory framework. Our plan covers our regulated activities under our Licence: UK en route, London Approach and oceanic.

We have followed the CAA's requirements in developing our plan, using a building block approach to establish the levels of revenue to cover the cost of our service and presenting cost information clearly, transparently and consistently.

See Appendices H and I for more details.

Strategic objectives

The CAA's key objective is that we are accountable for delivering the plan. This is underpinned by the expectation that we should "own and justify the key assumptions" of our business plan, and "determine how it can best meet the needs of its stakeholders, in particular its customers, the airlines, but also more broadly airports, passengers, cargo owners and overflow communities". This includes explaining how we would best respond to unknown or changing circumstances and needs.

Our plan should also set out potential trade-offs between differing stakeholder interests in an "evidence based way". This underpins the CAA's three strategic outcomes:

- > "Effective accountability - in particular, in the context of better business planning and delivery, and providing for a leading role for us in respect of modernising the UK airspace architecture (in spite of the reservations of certain airline stakeholders that an independent entity might be better placed)";
- > "Efficient prices"; and
- > "Service quality improvement - in particular in respect of resilience and a broader view on the environment".

Two track approach

The CAA proposed that we adopt a "two track approach", which would allow us to develop our business plan while taking account of the possible impact of wider issues that are less certain:

- > Core: A baseline business plan incorporating known and expected requirements, for example, delay targets; and
- > Wider: Supplementary information setting out incremental effects on costs and performance of less certain requirements and possible future developments, for example, the use of drones.

They also described the different circumstances under which requirements could be considered part of the wider plan. These included uncertainties that could be clarified before our business plan or UK RP3 National Performance Plan is finally submitted, and uncertainties that may continue into RP3. In addition, the CAA required us to propose, and test with our customers, potential scenarios to accommodate uncertainty.

We have reflected on this, and have presented both our core and wider plans in earlier chapters.

Range of options

The CAA expects us to set out where there are a range of options to deliver capacity, resilience, environmental and safety performance. In doing so, we should identify whether requirements and costs are core or wider, together with our preferred option.

We should clearly explain how we have selected our preferred option, by quantifying customer benefits, and, by assessing the business case, how it will ensure a resilient service and whether it is deliverable.

We have considered what options we can offer customers in our business plan, and set out our approach and justification in Chapter 6.

Outcomes and outputs

The CAA provided detailed guidance on what they consider to be core and wider requirements for a range of areas including: safety, capacity, technical resilience, operational resilience, environment, noise, airspace, cyber security and new technologies. We reflected on this as we developed our plan, and have included our responses.

The CAA also recommended that we propose incentive arrangements to support efficient and timely delivery of our service to our customers and wider stakeholders. In particular, they suggested that we could consider opportunities to strengthen and broaden the incentives framework, aligning our incentives better with customer and wider stakeholder benefits, taking into account cost elasticity.

See Appendix O for our proposed incentive arrangements, and Appendix I for analysis of our cost elasticity.

² Guidance for NERL in preparing its Business Plan for Reference Period 3: consultation document, issued 2017.

³ Strategic outcomes for the economic regulation of NERL 2020-2024, issued 2017.

Costs

The CAA emphasised that our plan should contain forecasts for efficient costs, and set out proposals for shared governance and incentives. They stressed that we should justify our proposals and provide evidence to explain them. They also requested that we show the impact on our service quality, resilience and delivery plans if we are required to deliver DUC reductions in line with the values consulted on by the PRB.

See Chapter 3 and Appendices H and I for how we address the CAA's points on cost.

Financeability

The CAA provided guidance on financeability.

See Appendices P and Q for how we address this, including the cost of capital and regulatory depreciation, along with evidence that demonstrates the financeability and efficiency of our plan. We also outline the procedures undertaken to demonstrate that the financial model meets best practice standards for a model used for regulatory price control purposes, including appropriate levels of assurance around its logical integrity and usability.

Customer consultation

In CAP 1625, the CAA emphasised that we should focus on delivering high quality and meaningful engagement with customers during our RP3 customer consultation. In support of this objective, we developed a customer consultation plan and working arrangements to meet customer requirements and the CAA's expectations.

We launched our RP3 customer consultation in early May 2018 and completed it in September 2018 after extensive discussion on all elements of our proposed plan. In a report to the CAA, the co-chairs expressed their view that the RP3 customer consultation process addressed the CAA's objectives and mandated questions to the extent possible. The CAA stated during the final meeting that it was much impressed by the maturity of the debate, the professionalism, the depth of expertise and the commitment by all parties to the process.

Brexit

We have prepared our business plan under the existing SES regulatory framework. In line with the CAA's guidance, we aim to deliver our strategic objectives irrespective of whether or not the institutional arrangements change or the UK is under the European or domestic legislative framework.

Depending on the outcome of discussions between the UK and EU, Brexit could have a material impact on our regulatory framework and business in RP3.

EC requirements

When we developed this plan, the EC had not yet confirmed the performance and charging regulations for RP3 and, therefore, we have assumed that the current RP2 European regulatory framework is applicable for RP3.

Our plan seeks to deliver a service that performs in line with customer priorities as well as CAA guidance and feedback. However, it may be necessary to adapt the plan when the RP3 regulatory framework and EU-wide targets become known with greater certainty.

If we consider that such changes will have a material impact on the deliverability of our plan and the outcomes that our customers expect, then we will advise the CAA and seek guidance from them on how to take account of this in the UK performance plan.

Acronyms

ACE	ATM cost effectiveness	EC	European Commission
ACP	Airspace change proposal	EU	European Union
ADS-B	Automatic dependent surveillance – broadcast	ExCDS	Extended computer display system
AIP	Aeronautical information publication	FASIIG	Future Airspace Strategy Industry Implementation Group
AMOG	Airspace modernisation organisation	FASI-N	Future Airspace Strategy Implementation North
AMS	Airspace management strategy	FASI-S	Future Airspace Strategy Implementation South
ANSP	Air navigation service provider	FIR	Flight information region
ATC	Air traffic control	FRA	Free route airspace
ATCO	Air traffic control officer	FTE	Full time equivalent
ATM	Air traffic management	FUA	Flexible use of airspace
BVLOS	Beyond visual line of sight	GA	General aviation
CNS	Communications, navigation and surveillance	GDP	Gross domestic product
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation	IAA	Irish Aviation Authority
CPI	Consumer price index	IATA	International Air Transport Association
CPI-X	A method of setting prices using the CPI index of inflation, less a constant percentage each year	ICAO	International Civil Aviation Organisation
CSU	Chargeable service unit	INEA	Innovation and Networks Executive Agency
DfT	Department for Transport	IFR	Instrument flight rules
DP	Deployment point	IPA	Independent parallel approaches
DSESAR	Deploying Single European Sky ATM Research	IS	Information solutions
DUC	Determined unit cost	ITIL	Information technology infrastructure library
DVOR	Doppler very high frequency omni-directional radio range	KEA	Key performance environment indicator based on actual trajectory
DME	Distance measuring equipment	KPI	Key performance indicator
		LAMP	London Airspace Management Programme

LoS	Loss of separation
MOD	Ministry of Defence
NAT	North Atlantic
NOTAM	Notice to airmen
NPV	Net present value
OCA	Oceanic control area
OTS	Organised track system
PBCS	Performance based communication and surveillance
PBN	Performance based navigation
PCP	Pilot Common Project
PI	Performance indicator
PMO	Programme management organisation
PPP	Public private partnership
RAB	Regulatory asset base
RAT	Risk analysis tool
RPI	Retail price index
RTA	Required time of arrival
SES	Single European Sky
SIP	Service and Investment Plan
SOC	Security operations centre
TBS	Time based separation
TMA	Terminal manoeuvring area
TTA	Target time of arrival
UTM	Unmanned aircraft system traffic management

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