

# Economic Regulation of NATS (En Route) plc: working paper on the review of the costs and benefits of space-based ADS-B in the North Atlantic

CAP2351

A large, abstract blue graphic occupies the bottom two-thirds of the page. It features a gradient from light blue on the left to dark blue on the right, with a curved, wave-like shape at the bottom right corner.

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## Chapter 1

# Introduction and Executive Summary

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## Introduction

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1. In response to work undertaken by the International Civil Aviation Organisation (“ICAO”) to enhance safety standards in the North Atlantic Area (the “NAT”), in late 2019, NATS (En Route) plc (“NERL”) introduced space based automatic dependent surveillance (“SB ADS-B”) to provide more accurate and timely aircraft position information for flights crossing the North Atlantic. As part of the Final Decision on the RP3 price control for NERL, the CAA introduced a requirement into NERL’s licence for it to commission a review of SB ADS-B costs and benefits from an independent third party appointed by NERL. At present, the obligation is for NERL to commission this review by June 2022, unless the CAA agrees otherwise.
2. The purpose of this working paper is to provide an update on progress on our work on the review of the costs and benefits of SB ADS-B. It summarises the progress to date and identifies some early conclusions from the information gathered so far. It then proposes next steps in relation to NERL’s licence obligation to conduct the review.

## Background

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3. In its business plan for the current (“RP3”) price control, NERL proposed an allowance in its Oceanic charges for the recovery of the costs associated with providing SB ADS-B.<sup>1</sup> During the RP3 review, the CAA considered NERL’s financial impact assessment of the introduction of SB ADS-B, conducting its own simplified cost-benefit analysis based on a high-level view of the costs to users and a prudent view of the benefits that might be achieved.<sup>2</sup> This conservative view indicated that there would be advantages to introducing SB ADS-B. The CAA also noted the net benefits identified in ICAO’s SB ADS-B business case.
4. Given the scale of the service and its considerable impact on Oceanic charges in percentage terms the CAA proposed an independent review of the benefits of this service after two years, which could influence the regulatory allowance for this new Oceanic service in the final years of the price control.

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<sup>1</sup> “Oceanic charges” are the charges imposed by NERL in relation to the air traffic management services it provides for North Atlantic flights

<sup>2</sup> See CAP1830, UK CAA RP3 Decision Document ([www.caa.co.uk/CAP1830](http://www.caa.co.uk/CAP1830)) at paragraph 11.8ff.

5. In its review of the RP3 price control, the Competition and Markets Authority (“CMA”):
  - agreed with most of the CAA’s approach to the Oceanic services, including its decision to fund the costs of SB ADS-B through NERL’s charges;
  - considered that the CAA should be clearer and more transparent about the methodology, conduct and consequences of the independent review that it would require NERL to conduct; and
  - encouraged us to consult on these matters before the end of 2020 and consider the impact of covid-19 on timing of the review.
6. NERL’s licence requires it to commission this independent review by no later than June 2022 unless the CAA agrees otherwise. However, the circumstances of the covid-19 pandemic mean that traffic in the NAT has been severely reduced since 2020 so that it no longer appears appropriate for NERL to commission the review this year. So, rather than the conduct of the review itself, our work now is focussed on determining the appropriate circumstances for conducting an effective the review, the matters that the review should consider, and who should conduct the review.
7. In December 2020, as part of our consultation on approach to new price controls, we set out the intention to consult stakeholders informally on certain key aspects of the review.<sup>3</sup> We also sought views from stakeholders who attended an earlier workshop we had held on this subject<sup>4</sup>, receiving input from NERL, British Airways (“BA”), IATA and Virgin Atlantic Airways (“VAA”).
8. This working paper sets out the context and progress to date, including a summary our early thinking and considers:
  - what circumstances and air traffic volumes would be necessary before a meaningful review can take place;
  - what metrics should be used to assess the cost and benefits of SB ADS-B; and
  - who should conduct the review.
9. In this light, this paper draws some early conclusions, asks for stakeholders’ views and sets out our next steps.

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<sup>3</sup> See CAP1994, Economic regulation of NATS En Route plc: Consultation on the approach to the next price control review: ([www.caa.co.uk/cap1994](http://www.caa.co.uk/cap1994)).

<sup>4</sup> The CAA held a workshop in January 2020 on potential metrics that would inform the review.

## Summary of early conclusions

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### Conduct of the review

10. While airline stakeholders have suggested that the CAA should commission the review, this would not be consistent with that endorsed by the CMA or NERL's licence and we are not persuaded that this change is appropriate. However, we consider that the CAA should remain very close to the design of the review in order to help set expectations for the review and to monitor progress. This working paper forms part of this approach.
11. As for the third party that should conduct the review, it appears that a party with similar skills to the RP3 Independent Reviewer<sup>5</sup> may be an appropriate.

### Timing of the review

12. Given the ongoing uncertainty over the strength and speed of the recovery of flight numbers from the impact of the covid-19 pandemic, it is currently too early to conduct the review. We consider that annual traffic in the NAT may need to return to at least 80/90% of 2019 levels (and be sustained for a reasonable period) to provide meaningful data to support the review.
13. Clearly, this makes it difficult to be definite about when the review should take place, but the earliest the review can now reasonably begin would be during the NR23 price control period. As a result, we confirm that we do not require NERL to commission an independent review by June 2022, but will monitor the recovery of traffic as well as taking into account stakeholders' views before we settle a suitable time for the review.

### Issues the review should look at

14. Significant work remains to design appropriate metrics. There may be some similarities between candidate metrics proposed by NERL and airlines, but these are not yet fully developed. There also remain important questions over how to weight metrics between such issues as (i) safety, (ii) costs and (iii) service quality as well as, between quantitative and qualitative measures. This also brings with it a challenge over the complexity of the review and whether it will be proportionate to the level of costs in question.
15. To ensure the review design and conduct can be managed in a timely and effective manner when the circumstances are appropriate, we consider there may be merit in appointing a third party at a relatively early stage to assist with the design and development of the review and associated metrics. We welcome

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<sup>5</sup> The Independent Reviewer is an independent party appointed by the CAA to review NERL's performance in relation to its engagement with stakeholders on its proposed capex for the preparation of its "Service and Investment Plans" for the purposes of Condition 10 of its licence.

stakeholders' views on this and whether a party with a similar skillset to the RP3 Independent Reviewer might fulfil this role.

## Structure of this document

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16. The structure of this working paper is as follows:
- chapter 2 sets out more on the context for this review, progress to date and our early internal thinking;
  - chapter 3 addresses the circumstances required for the review can take place, what metrics should be used; and who should conduct the review; and
  - Appendix A seeks to synthesise the candidate metrics suggested by stakeholders for further development and provides some initial views on them.

## Views Invited and Next Steps

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17. We welcome views on all the issues in this working paper and especially on:
- the geographic scope of the assessment, including whether the assessment should include metrics that reflect the success of the use of SB ADS-B in maintaining benefits enabled in another control area for aircraft entering the Shanwick area;
  - the appropriate period (or periods, including seasonal issues) for which data would need to be gathered in order to conduct the review; and
  - the potential performance metrics discussed in Appendix A.
18. In the light of stakeholders' feedback to this working paper, we will consider holding one or more workshops in order to develop these metrics further. We welcome stakeholders' views on this approach and their appetite for attending such workshops. We anticipate that these workshops would commence later in 2022.
19. Please e-mail responses to [economicregulation@caa.co.uk](mailto:economicregulation@caa.co.uk) by no later than 1<sup>st</sup> July 2022. We cannot commit to take into account representations received after this date.
20. We expect to publish the responses we receive on our website as soon as practicable after the period for representations expire. Any material that is regarded as confidential should be clearly marked as such and included in a separate annex.
21. Please note that we have powers and duties with respect to information under Schedule 9 of the Transport Act and the Freedom of Information Act 2000. If you would like to discuss any aspect of this document, please contact James Wynn-Evans ([james.wynn-evans@caa.co.uk](mailto:james.wynn-evans@caa.co.uk)).

## Chapter 2

## Context, early thinking and informal consultation

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### The context for the review

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- 2.1 The management and development of the five Oceanic Control Areas across the North Atlantic is governed by ICAO through the North Atlantic System Planning Group (“NATSPG”) and subgroups. NERL’s proposals for delivering the Oceanic service in RP3 included the introduction of SB ADS-B so that satellites would provide more accurate and timely aircraft position information, compared to the then current procedural approach. NERL said that this would improve flight efficiency, increase capacity and ensure a safe operating environment (including meeting the ICAO safety standard in Shanwick in the context of continuing traffic growth), and would benefit airlines and their passengers through lower costs and the potential for more choice through additional flights.
- 2.2 In developing our RP3 price control proposals, the CAA undertook a simplified cost benefit analysis of NERL’s proposal. This analysis was positive, and our cost envelope for RP3 included an allowance for costs relating to SB ADS-B. This represented a total cost increase of around 50%, compared to RP2. The charges comprised: (i) a core charge equivalent to the existing Oceanic charge and (ii) a SB ADS-B data charge, to reflect the cost of buying in the data to provide the enhanced service. This approach facilitated for transparency of the costs of providing SB ADS-B and allowed differentiated charges to be applied on “Tango routes” that do not use the NAT airspace to the same extent.<sup>6, 7</sup>
- 2.3 SB ADS-B is being provided by NERL on a “user pays” basis utilising “per flight” charges. As part of the RP3 decision, we committed to a review after two years to ensure that the benefits of SB ADS-B continue to outweigh the costs. This was reflected in NERL’s licence in Condition 22, at paragraph 9, which states that:

*“by no later than two years and six months after the licensee has certified it is operating a fully ADS-B based service in the En route (Oceanic) Area, or at a later date agreed with the CAA, the Licensee shall commission an*

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<sup>6</sup> In lay terms, Tango routes are routes that utilise the South East portion of the NAT to facilitate flights from Northern Europe to/from Spain, Portugal and the Canary Island avoiding congested airspace over the Iberian peninsula.

<sup>7</sup> For transatlantic flights, the additional cost charged for ADS-B in 2021 was £33.97 per flight, and for the Tango routes, around £5.08. We note that NERL’s NR23 business plan presents charges for SB ADS-B for 2023 to 2027 that are broadly flat over this period.



*independent review of whether the benefits of providing a fully ADS-B based service outweigh the costs of providing the service.”*

- 2.4 NERL provided its certificate that it is providing an ADS-B based Oceanic En Route Control Service to at least 99% of all users of the En Route (Oceanic) Area that have the correct and functioning equipment, regulatory approval and plan to use it on 19 December 2019. To comply with Condition 22(9) of its licence, NERL would need to commission the independent review described above by mid-June 2022, unless the the CAA agrees a later date.
- 2.5 The CMA’s Final Report noted that, in the light of the impact of the covid-19 pandemic, two years from the introduction of SB ADS-B may be too early to carry out the review. Given the ongoing impact of the covid-19 pandemic on the aviation industry and the reduction in the number of flights, both generally and in the NAT, it is not appropriate to undertake the review of SB ADS-B costs to the original timetable contemplated by Condition 22. In particular, the data and information that is currently available will not:
- fairly represent the benefits of the use of SB ADS-B to support traffic levels of the order of those being managed at the time that the introduction of SB ADS-B was being considered or when the RP3 price control was set; or
  - enable an approximate “like for like” comparison of conditions and performance prior to the introduction of SB ADS-B (and the emergence of the covid-19 pandemic) and reasonably “steady state” post-pandemic conditions.
- 2.6 While recovery of traffic looks promising, the speed of recovery could also have an impact on the outcome of the review and it may be more appropriate to base the review on a period after the initial recovery. We welcome stakeholders’ views but at present we do not propose an alternative date by which NERL should commission the review.
- 2.7 However, we consider that the obligation to commission a review remains an important part of ensuring that the introduction of ADS-B in the NAT brings overall benefits to users. As a result, in the light of the informal consultation and engagement we have undertaken with stakeholders, we have undertaken an initial assessment of criteria that we consider would be appropriate to trigger the review. We have also begun work with stakeholders to determine possible metrics that the review should adopt in order to make the assessment. These matters are dealt with in chapter 3 and Appendix A.

## **Our approach to developing our early thinking**

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- 2.8 We held an informal workshop help with stakeholders in January 2020, which provisionally discussed some initial suggestions for developing metrics. Since then, the impact of the covid-19 pandemic has severely limited airlines’, NERL’s and the CAA’s ability to carry this work forward. However, we have continued to

develop our thinking and conducted some informal consultation with NERL and other stakeholders through March and April 2021. The stakeholders were those who attended our January 2020 workshop and/or responded on the topic in the context of our consultation on next price controls in December 2020.<sup>8</sup>

## Early thinking shared as part of the informal consultation

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- 2.9 Our starting point for the purpose and scope of this review is that we do not envisage that the review should constitute a full cost-benefit analysis of SB ADS-B in terms of fully monetising all the benefits it brings. Rather, we propose to build on the work already undertaken by ICAO, seeking to consider cost effectiveness and other benefits based on experience.
- 2.10 Should the review conclude that the benefits are higher than the costs, no further action would be taken, but periodic monitoring of performance metrics could continue. Should the costs of SB ADS-B to users outweigh the benefits, we would need to:
- consider assessing the availability (and cost effectiveness) of alternative approaches that will ensure UK meets the relevant ICAO safety standards; and
  - reconsider the regulatory allowance for SB ADS-B for the future.

## Responses to our informal consultation

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- 2.11 The informal consultation we have conducted to date focussed on the following:
- the circumstances required for a meaningful review;
  - who should conduct the review, and who should appoint them; and
  - what metrics should be used to underpin the review.
- 2.12 NERL, BA, VAA and IATA responded to our informal consultation. The views expressed by these stakeholders have been used to develop our thinking on the timing of, metrics used for, and identity of the party responsible for conducting the review. Our emerging thinking on these matters is set out in chapter 3.

## NERL's NR23 business plan

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- 2.13 Chapter 8 of NERL's NR23 business plan<sup>9</sup> sets out NERL's plan for the continued use of SB ADS-B to support it delivering an improved service and compliance with the ICAO target level of safety. In support of this approach, it cites evidence from ICAO's North Atlantic Mathematicians' Working Group that

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<sup>8</sup> See CAP1994: [www.caa.co.uk/CAP1994](http://www.caa.co.uk/CAP1994).

<sup>9</sup> See <https://www.nats.aero/nr23>

calculated a 33% reduction in the vertical collision risk for the NAT between 2018 and 2019 and states that NERL expects further demonstrable safety improvements.

- 2.14 Although the impact of reduced traffic in the context of this review was not discussed in NERL's business plan, NERL also presented evidence that service benefits have also been delivered in terms of allowing a greater percentage of flights to be able to fly their preferred route in 2021 than in 2019, and anticipating that the number of aircraft receiving their requested trajectory will continue to rise throughout NR23. The NR23 business plan proposes a target of 90% of suitably equipped flights within the Shanwick area receiving the requested clearance (or operationally equivalent profile), subject to certain caveats.<sup>10</sup>
- 2.15 The NR23 business plan also states that NERL has been able to reduce the minimal horizontal separation between aircraft by over 80% as well as removing speed restrictions as a result of controllers having real-time surveillance of traffic giving the opportunity to allow more requested trajectories and increasing flexibility and capability to support flexibility, for example to avoid weather, reducing disruption and contributing to lower collision risk. In this light, the business plan proposes a target of 80% of flights in the Shanwick area being offered variable speed/mach.
- 2.16 Stakeholders' comments on the NR23 business plan in this area were broadly in tune with the views expressed to us on our informal consultation, and included a desire to see measurable operational safety enhancements and service benefits, while recognising that 2021 cannot be taken as a suitable year for providing data on which the review could be based.

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<sup>10</sup> See the NERL NR23 business plan at page 49.

## Chapter 3

## Conducting the review

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### Introduction

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- 3.1 This chapter considers the circumstances needed before the review can take place, what metrics should be used and who should conduct the review. It sets out stakeholders' feedback on our informal consultation and our views on that feedback.

### The circumstances required for a meaningful review

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#### Stakeholder views

- 3.2 NERL considered that the benefits of SB ADS-B are more readily observable/demonstrable during normally busy traffic situations, so that the review would be more meaningful if carried out once traffic has recovered to reasonable levels. With that in mind, it suggested a threshold that the review should commence:
- once traffic levels return to around 80% of the level seen in 2019; and
  - have been at that level for between four and six months.
- 3.3 NERL also observed that it was continuing to work to enhance its data analytics and reporting capability to improve flight efficiencies within the Oceanic area.
- 3.4 BA agreed that it is currently too early for the review and that it is unlikely that a meaningful review can take place before traffic levels have recovered to a post-pandemic steady state. It did not, however, suggest a specific threshold at which this steady state might be observed.
- 3.5 VAA was not definitive what level of traffic would support the review, but considered that it would be likely to be near to that in the of summer 2019 and was open to being guided by NERL.
- 3.6 IATA wanted the review to be conducted as soon as possible, but did not provide a proposal as to when might be appropriate. It did, however, expect there to be engagement and consultation on details of the review on areas such as the scope and timeline for the review before it is conducted.

#### Our views

- 3.7 We agree with stakeholders that it is too early to do the review, with the currently subdued traffic levels, and that it is not possible to properly assess the benefits

of the introduction of SB ADS-B in the timeframe contemplated by Condition 22 of NERL's licence.

- 3.8 There remains uncertainty over the traffic forecasts for the coming years. STATFOR's October 2021 forecast contained three scenarios with both the 'baseline' and 'high' scenarios showing recovery to 2019 levels during the course of 2023. However, we note that the October 2021 forecasts were published before the emergence of the Omicron variant and related travel restrictions. We now anticipate a new iteration of the forecast in mid-June 2022.
- 3.9 In any event, it appears clear from stakeholder views and the available forecasts that, whichever scenario turns out to be the most accurate, delaying the review will be necessary to allow a reasonable assessment.
- 3.10 Nonetheless, we will continue to keep both STATFOR's forecasts and actual flight data under review to determine current and likely trends and look to set the timing of the review at a point when reasonable comparator data is available. That said, substantive analysis will require data covering a sufficiently long period of time during which traffic was reasonably comparable to 2019. We are also firmly of the view that we should seek to avoid complexity or distortion that might arise from conducting the review earlier during a period when traffic volumes were rising relatively rapidly or before data covering a reasonably representative period have become available.

## **Who should conduct the review and who should appoint them?**

### **Stakeholder views**

- 3.11 NERL said that the review should be conducted by an independent organisation appointed by the CAA with experience of investment appraisal, ideally, with aviation expertise and a technical understanding of air traffic management.
- 3.12 BA said that a suitably qualified independent reviewer should be appointed, using similar governance to that in place to assess NERL's capital and technology projects. It stressed the importance of airlines' contributions to ensure the reviewer understands how airlines use the airspace, and what exactly airline flight planning and flight crew are doing to optimise flights. It also considered that any modelling must be clear and transparent.
- 3.13 VAA said that, if the review requires flight calculations to be undertaken, NERL could engage with a third party, rather than ask individual airlines, to ensure consistency in the approach adopted. Any data output from this activity should be peer reviewed by an independent party and NERL's customers.
- 3.14 Like BA, IATA considered that a suitably qualified and independent third party should be used and that the review should ensure airlines can participate to provide reliable information on flight efficiency benefits.

## Our views

- 3.15 We do not intend to reverse the policy established during the RP3 price control review and supported by the CMA that NERL should appoint an independent organisation to carry out the review.
- 3.16 That said, we agree with stakeholders that the party appointed to conduct the review should have significant aviation expertise, including in relation to air traffic management, and should also have the skills to engage in the required assessment of costs and benefits. Subject to appropriate confidentiality arrangements, we consider that such a party would be well placed to undertake any required analysis in a consistent way and produce a well-reasoned report. In this context, we note that it may be appropriate for NERL to appoint a party with skills similar to those of the CAA's RP3 Independent Reviewer to assess NERL's performance under the capex engagement incentive.

## What costs and benefits should be assessed?

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- 3.17 Both NERL and BA offered a number of specific qualitative and qualitative metrics that they considered would be relevant to the design of the review.
- 3.18 NERL has made clear that Aireon is the only provider of SB ADS-B in the NAT. While it noted that the adoption of SB ADS-B might have led to increases in ANSP costs, for example, from the removal of mandatory speed controls, it considered that the costs that should be considered by the review should be limited to those arising from the data charge for using SB ADS-B and any capex needed to sustain the use of SB ADS-B. It was also very clear in its view that aircraft equipage costs should be excluded as these were costs of meeting mandatory requirements.
- 3.19 NERL considered that the benefits assessed should include both quantitative and qualitative benefits whether already observed or capable of being developed. It considered that these should be based on the "advanced surveillance enhanced procedural separation minima" (ASEPS) developed by the Separation and Airspace Safety Panel (SASP) of ICAO that can be used in airspace where SB ADS-B service is provided. It also suggested that the success criteria of the ASEPs trial conducted by ICAO might be helpful.
- 3.20 NERL was also clear that stakeholder input should be used to establish importance of qualitative benefits. It identified 3 categories or sources of benefits:
- ANSP service provision, including NERL's ability to deliver variable speed/requested clearances/reduced separation;
  - airline behaviours, including airframe choice/equipage/environmental policies; and

- pilot behaviour and operational preferences including scheduling issues/maintaining ATC clearance/responding to offers of variable speed.

- 3.21 It noted that significant elements of these were out of NERL's control, including the impact of decisions by other ANSPs and airline behaviours and so proposed an approach focussed solely on benefits within its control. This would include safety/service performance and enabled benefits, but; exclude those derived from other ANSPs, airlines' or pilots' behaviours.
- 3.22 It also indicated that there may be influencing factors, limitations, and interrelationships between measurements that should be considered when interpreting the metrics. It said that there would be difficulties in seeking to translate metrics into fuel savings, but that this may be possible with some metrics, such as in relation to the time receiving variable speed operations. It suggested that workshops could enable stakeholders to collaborate on designing appropriate indicators and identifying the links between them.
- 3.23 We also note that NERL proposed targets in its NR23 business plan and its proposal to adjust the service performance measurement so that when an aircraft's first requested trajectory is not available, NERL will be measured on its ability to provide an operationally equivalent or better profile in terms of fuel burn and/or time.
- 3.24 BA highlighted that its primary priority is safety so the review would need to show the safety benefits arising from the use of SB ADS-B. It also considered that an appropriate baseline needed to be set against which to conduct the review.
- 3.25 BA noted that the work of ICAO's North Atlantic Systems Planning Group ("NAT SPG") had already resulted in beneficial safety outcomes by enabling trials of ASEPs. That said, BA cautioned against using the removal of the Organised Track System ("OTS") as a benefit arising from SB ADS-B, as this was not fully attributable to its introduction.
- 3.26 BA was clear that any metrics used need to ensure that theoretical safety and operational efficiency benefits actually occur in the operational environment. Care would be needed in assessing the information used, not least because the impacts of covid-19 included bringing forward the retirement of aircraft, changing schedules and lower demand and volumes. In this context, it observed that newer aircraft are now a higher proportion of airlines' fleets and that these aircraft fly above the existing OTS on more efficient/less restrictive routes.
- 3.27 BA considered it might be easier to look at city pairs for a "like for like" comparison, especially if the same aircraft are used before and after the introduction of SB ADS-B.



- 3.28 VAA did not provide any candidate metrics, but considered no meaningful baseline currently existed as well as expressing the view that the benefits of SB ADS-B are linked to pilot behaviours.
- 3.29 IATA stated that the introduction of SB ADS-B had never been mandated by ICAO, so there was no regulatory requirement for SB ADS-B (and the associated charges and cashflow implications for airlines) to have been implemented. It considered that the review should determine:
- retrospectively, whether (i) the charges levied so far were based on recovery of costs for services provided, (ii) the charges outweighed the benefits actually received by the operators (and whether there ought to be any reimbursement); and
  - prospectively, whether the benefits outweighed the costs, having regard to the provision of services and the availability of alternative technologies, and of SB ADS-B services offered by other providers.
- 3.30 While it did not propose the use of any specific metrics, it said that the review must also determine effect of covid-19, including whether it had negatively impacted operators or offered an opportunity for them to remove inefficient or costly technology.

### **Our views**

- 3.31 We are considering the proposals made by NERL in the NR23 business plan in the context of the NR23 price control review and will provide our views on them in our Initial Proposals in the summer of 2022. Our initial observation is that the additional information provided by the NR23 business plan is useful and that the operation of such scheme as is developed for the NR23 period may well provide useful learning to inform the review of SB ADS-B.
- 3.32 As for the candidate metrics proposed for development by stakeholders in the context of the review of SB ADS-B, we note that there are a significant number of areas in which quantitative and qualitative metrics can be developed. However, we need not only to develop suitable metrics, but also assess which ones are best suited to conducting a proportionate review. While there may be some similarities between metrics proposed by NERL and BA (see Appendix A), these are not yet fully developed.
- 3.33 We consider that there is some overlap between the candidate metrics put forward by each of NERL and BA and that some areas of overlap may also be picked up in the metrics that NERL is proposing as part of the NR23 business plan. Using a set of metrics that is long or complicated may not be proportionate: the approach should be to consider the key indicators of whether the costs outweigh the benefits.



- 3.34 In this context, we need to recognise that some of the benefits, while potentially quantifiable, may be more difficult to place a meaningful monetary value on along side other measures.<sup>11</sup> Noting the CAA's "primary" duty under TA00 to exercise its functions so as to maintain a high standard of safety in the provision of air traffic services, further thought and potentially judgment will be needed to place appropriate weight on those benefits in the assessment.
- 3.35 In Appendix A, we have reviewed the candidate metrics provided by each of NERL and BA and have set out a preliminary view of those which we consider may be best suited to further development. We also consider that relevant learning may emerge from NERL's engagement with users on its proposed service performance measurement.
- 3.36 While we agree with NERL's position that aircraft equipage costs should not be taken into account in this review, we are less convinced by its suggestion that the assessment of benefits should be limited to the Shanwick area, since gaining benefits earlier in a flight is preferable and gives greater benefit than gaining them later in the flight, so the extent to which the use of SB ADS-B in the Shanwick facilitates efficiency for the entire route (and maximisation of benefits) appears to be linked to a proper assessment of the benefits of SB-ADS-B. That said, we consider that NERL's challenge that it should not be held responsible for the performance in other control areas appears to have some strength. In this context, we consider that there may be merit in measuring the extent to which NERL facilitates "end to end" routes by ensuring that an approved route initiated in another ANSP's area can be continued in the NAT.

## Other issues raised by stakeholders

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- 3.37 NERL indicated that it is seeking to identify whether there were other ways in which it can improve the efficiency of its operations. This was echoed by a desire expressed by BA for NERL to focus on improving airspace management to provide tangible benefits to users using SB ADS-B because the introduction of SB ADS-B had increased costs for users.
- 3.38 We agree that, given the introduction of SB ADS-B and associated costs for users, the technology should be used in such a manner as to help derive the maximum safety and other benefits from its deployment. We are of the view that the outcomes of the proposed review should help provide some insights into these benefits, thereby enabling them to be built on more effectively.

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<sup>11</sup> In this context, we note that DfT has an established approach to valuing human life which we used in our initial cost benefit analysis for RP3 which we consider is likely to remain appropriate.

## APPENDIX A

# Candidate measures and initial assessment

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## Introduction

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- A1 This Appendix considers the potential measures proposed by NERL and BA in response to our informal consultation. It seeks to draw the links between them in order to support stakeholders' assessment of the potential of these measures as well as providing some initial CAA views on them. To assist in this, it also sets out qualitative and quantitative measures separately.
- A2 In the conduct of the review, we would expect both quantitative and qualitative measures to be taken into consideration and we welcome stakeholders' views not only on the measures themselves and how they might be developed, but also on the comparative weights that should be attributed to qualitative and quantitative measures overall, and each measure individually.

## Quantitative measures

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### Safety

#### Vertical collision risk, measured by ICAO target level of safety

- A3 NERL proposed this measure, considering it to be a well established and understood metric. It is currently calculated for whole of NAT, but NERL could determine figures for Gander/Shanwick airspace.

#### Early identification of large deviations (height and lateral)

- A4 NERL proposed this as a measure of deviations that could otherwise have been missed/identified later if SB ADS-B were not used.

- A5 BA proposed identification of the total lateral events and level busts recorded.

#### Initial assessment

- A6 Each of these measures appears to be appropriate for further consideration. Adopting an approach aligned with that used by ICAO also appears to have benefits in terms of consistency and avoiding duplication of ICAO's work.

### Service provision

#### Demand vs increased capacity

- A7 This benefit was proposed by BA and would indicate benefits of SB ADS-B in increasing capacity.

Percentage westbound flights receiving filed/requested flight level, speed, entry point or operationally equivalent (time/fuel burn)

- A8 NERL proposed this metric to build on ICAO's ASEPs success criteria (cleared vs requested/cleared vs flight planned clearance) to consider realistic operational limitations and equivalent outcomes.
- A9 BA suggested that an appropriate measure would consider more widely whether SB ADS-B had enhanced the ability of ANSPs to grant clearance for the requested (i) full length route (ii) Oceanic entry point and (iii) step climbs.

Percentage of flights within Shanwick area receiving variable mach or number of minutes offered

- A10 NERL considered that this metric would need to be developed taking account of flights where these benefits had been denied by another ANSP.
- A11 BA suggested a metric around the ability to achieve unrestricted and optimum speeds which appears to be related to this, albeit that BA's suggestion was for the metric to cover Oceanic airspace throughout. This appears to be similar to NERL's suggested metric on the percentage flights receiving clearance for variable mach.

Initial assessment

- A12 Each of these measures are appropriate for further consideration. It appears that there may be some overlap between them, and that a simpler set of measures may facilitate the assessment. In each case, it will be important to decide whether it is appropriate for the metric to be used by reference to the NAT as a whole, or the Shanwick area.

**Enabled benefits**

Enabled fuel burn reduction through cost index/variable mach to enable flexible speed calculated on airframe type and time receiving variable mach

- A13 NERL suggested this metric to measure fuel savings to give an environmental and financial benefit to users. Again, NERL considered that it would be appropriate to exclude those flights constrained from receiving variable mach by another ANSP.

Enabled fuel burn reduction through improved service performance, calculated on airframe type and time receiving variable mach

- A14 NERL suggested this metric would measure fuel savings to give an environmental and financial benefit to users.

Enabled reduced fuel uplift through increased predictability

- A15 NERL proposed this metric as potentially facilitating identification of reductions in the fuel a flight would need to carry and would be related to the previous two metrics.

- A16 This appears to be in a similar space to a metric proposed by BA which would assess the ability to avoid inefficient (i) Oceanic entry target times (ii) speed restrictions and (iii) route deviations.

Initial assessment

- A17 A metric that provides as a minimum, a reasonable indication whether the introduction of SB ADS-B has facilitated at least a reduction in the average fuel burned by airlines may provide a significant indicator of the benefits, not only in terms of economics, but also the wider environmental benefits of the use of SB ADS-B. While there are clearly a number of relevant factors to consider, our view is that this is an area where stakeholders should concentrate effort in order to identify and agree an appropriate metric or metrics.

## Qualitative measures

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### Safety

Increased controller awareness through improved coverage

- A18 NERL suggested this benefit as increased awareness of aircraft positions facilitates better contingency management to deal with issues arising from issues such as weather, diversions, turnbacks, search and rescue.
- A19 BA proposed a benefits around the safe resolution of flightpath deviations early and without affecting other users and the ability to accommodate weather related deviation requests .

Initial assessment:

- A20 These benefits merit further consideration, albeit that it will be important to establish an appropriate evidence base and to identify the appropriate weight to give it.

### Service provision and performance

Removal of OTS

- A21 NERL considers that the removal of the OTS system may provide benefits in terms of greater flexibility/reduced fuel burn/emissions.
- A22 BA considered that this, while of benefit to users, was not attributable to the introduction of SB ADS-B as other factors such as the use of different aircraft was also relevant.

Removal or reduction of flight planning rules and norms

- A23 NERL proposed this as a benefit in permitting automation of processes reducing future operational expenditure of airlines on support staff.

Percentage where operator chooses to use variable mach to optimise network flow/reduce fuel burn.

A24 NERL suggested benefits may arise from crew timings/schedules/avoiding re-routing or holding patterns, but that these are hard to measure.

Initial assessment

A25 We do not consider that the removal of the OTS system itself to be a a benefit: rather, it appears to be a function of the success or otherwise of other elements of the introduction of ADS-B, such as the ability to obtain the requested route, height and speed, overall allowing more efficient routes.

A26 As for the other measures proposed, we consider that it may be difficult to establish an appropriate evidence base and/or the realisation of these benefits may depend on airlines and pilots gaining confidence in the other benefits of SB ADS-B such as they are able to take advantage of these benefits. These matters should, however, be considered further in the development of the assessment criteria.

**Enabled benefits**

Enabled fuel burn reduction through improved alternative clearance offered by ATC

A27 NERL suggested that a benefit may arise from facilitating reducing flight times/distances by cutting corners on routes/tracks which may be quantifiable retrospectively. It noted that this might interfere with quantification of the benefit of receiving filed clearances.

Pay as you go pricing for core NAT data services

A28 NERL observed the benefit in the way that SB ADS-B is currently funded as a “pay as you go” charge, in that it protects customers in the event of reduced traffic volumes as at present.

Initial assessment

A29 Clearly, any quantification of the benefits of SB ADS-B used will need to be alive to the possibility of interactions between different benefits. As such, the interactions between benefits will need to be addressed in the detailed development of the metrics to be used.

A30 We do not, however, consider that the manner in which SB ADS-B is paid for can, of itself, be a benefit of SB ADS-B. Rather the way it is currently funded represents the allocation of risk between provider and users.