



New horizons: The case for public sector drone investment



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1. Executive summary

Commercial drones have landed, and new horizons have dawned for the possibilities they bring to public services. Not only does the UK Government have a unique role to play in developing regulation, infrastructure, and incentives to support increased uptake of drones, this technology has the potential to fundamentally transform the way the public sector operates.

New research from Baringa reveals that harnessing drones to support the delivery of different public services will deliver impressive cost, time, and environmental savings. The key findings of our analysis show that:

- **The total number of drones in the UK will increase by 75.8%** to nearly **700,000 drones by 2035**. Total uptake of drones by **commercial and public sector organisations is expected to increase by around 420%**, from 45,400 in 2024 to **235,700 in 2035**.
- **Law enforcement could save £22.6m a year** by transitioning certain National Police Air Service (NPAS) operations from helicopters to uncrewed aircraft systems (UAS) and drone-in-a-box technology – a **55.4% cost saving** compared to current operations. This generates environmental savings of up to 6.1m kg CO₂e per year, which is equivalent to saving emissions from 1,458 petrol-powered cars driven for a year. Between 2027 and 2035, law enforcement could save **£187.6m in operating costs** and generate **environmental savings valued at £5.5m**, producing a total of **£193.1m in benefits**.
- Deployment of drones by **Network Rail and the British Transport Police could generate £56.3m** per year of benefits by reducing delay time to passengers and reducing payments by Network Rail to train operators for delays. **Total benefits could amount to £593m** from 2024 to 2035.
- Drone deliveries could unlock a total of **£44.1m in savings for the NHS**, including **£42.9m in operating costs** and **£1.2m in environmental savings**, between 2027 and 2035. **Blood Transfusion Services could save £4.1m and free up 145,000 working hours each year** by using drones to deliver blood samples. **NHS logistics providers could save £2.0m and free up 127,000 working hours per year** by using drones to deliver pathology samples. These use cases also generate **environmental savings of 16.6m kg CO₂e** from 2024 to 2035, which is equivalent to the carbon sequestered by 19,381 acres of forest in a year.



- The **Maritime and Coastguard Agency (MCA)** could save **£1.6m a year** by transitioning appropriate operations to drones, including support and search missions. This would **reduce emissions by 8.8m kg CO₂e** from 2024 to 2035, equivalent to 1,148 homes' energy use for a year. Between 2027 and 2035, **operational cost savings amount to £11.9m** and **environmental savings are equivalent to £891,000**, generating **total benefits of £12.8m**.
- Drones could generate **up to £720m between 2027 and 2035 in cost savings** for the public sector if we look solely at quantified use cases across healthcare, public safety, and infrastructure. The overall benefit of drones is likely to be much higher than this estimate, as there are additional benefits we have not covered in this paper that organisations stand to realise.



In this paper, we explore select use cases where public sector organisations across public safety, infrastructure, and healthcare stand to gain clear, tangible benefits from drone technology. These results only begin to uncover the plethora of use cases available to public sector organisations. Making the most of drone technology will allow the public sector to build resilience, operate more effectively, and improve outcomes for citizens.

Our research arrives at a critical juncture for the public sector. As a challenging fiscal environment continues to exert significant funding constraints, organisations must demonstrate that the projects and programmes they pursue can generate cash savings and measurable outcomes. By drawing on economic modelling techniques, supported by qualitative methods, we provide valuable insight into the likely operational costs of drones and the savings they can deliver against business-as-usual costs. We also explore potential blockers to progress and share practical steps that public sector organisations can take today to build a compelling case for drone investment.

If the UK Government is serious about seizing the advantages of drones, it cannot afford to wait. Drone technology is growing more sophisticated and cost-effective by the day. The regulatory roadmap is in place to allow routine Beyond Visual Line of Sight (BVLOS) operations by 2027. Meanwhile, commercial organisations are scaling up investments and testing new use cases. Drones are here to stay – it's up to the public sector to decide whether it will be driving the change, and maximising the benefits, or playing catch up.

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2. Introduction

As drones take off in rising numbers, they won't just transform our skies. Drones have the potential to revolutionise how the public sector operates – saving money, making work safer, and speeding up the delivery of vital services. To reap these rewards, public services organisations must start building a business case and scaling up investment now. Otherwise, they risk lagging behind this transformative current of change.

Increased uptake of drones, also known as unmanned aircraft systems (UAS), advanced air mobility (AAM), and electric vertical take-off and landing (EVTOL) technology, brings unique advantages to multiple parts of the UK public sector. They can be used to help search-and-rescue teams complete missions faster, connect remote communities with vital medical supplies, and reduce the risks of inspecting infrastructure like high-voltage lines and railways.

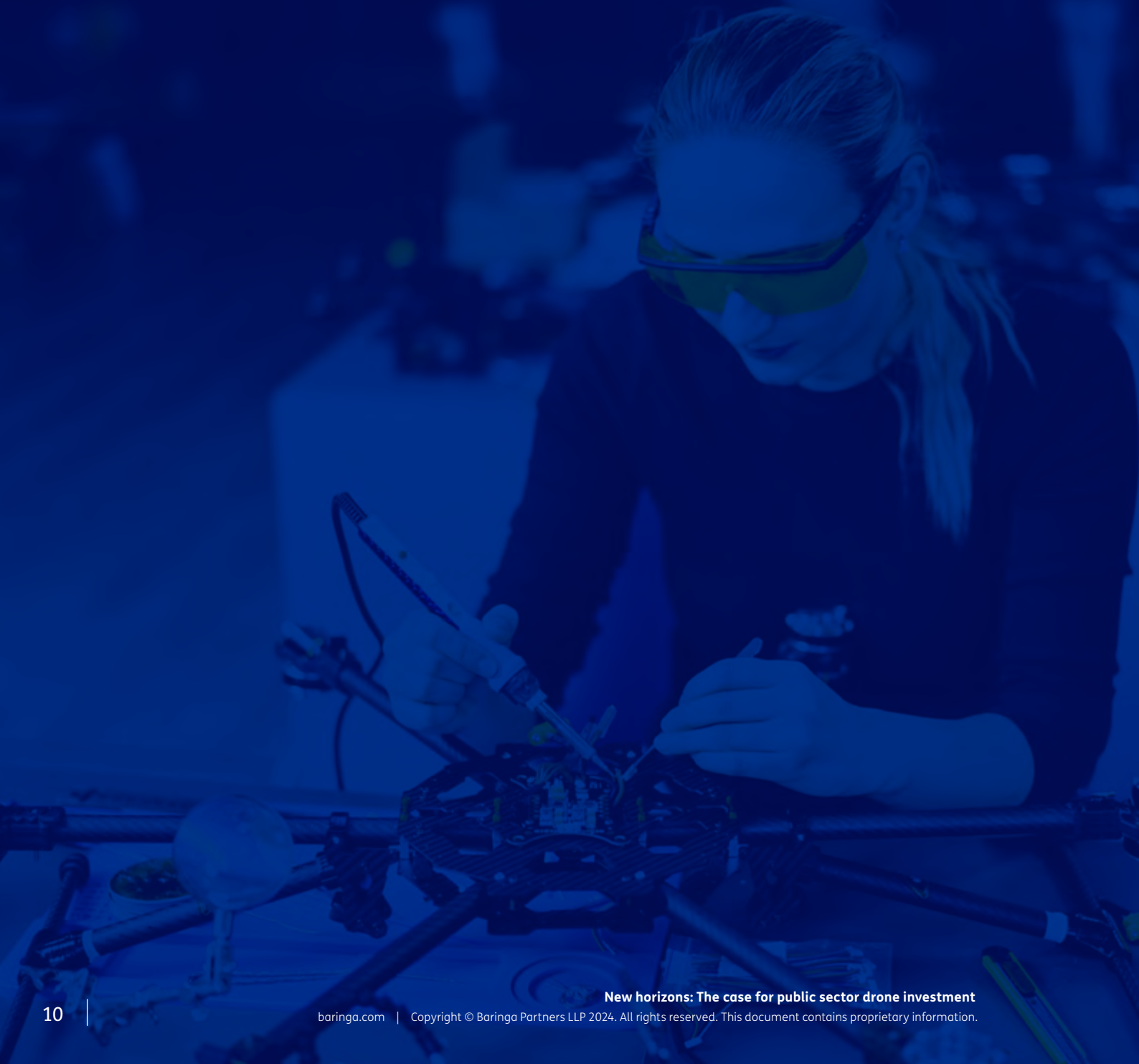
While many industry reports have highlighted the macroeconomic potential and qualitative benefits of drone use, there is still a gap in making a compelling case for investment at an organisational level within the public sector. Our paper aims to bridge that gap by examining the opportunities, challenges, and economic value of drone technology within the UK public sector. By exploring specific use cases where drones stand to deliver measurable impact, we provide tangible evidence of how this technology can help public services organisations save money, work more safely and efficiently, and shape better experiences for citizens.

This paper is split into three parts. Firstly, we explore the case for investment through providing forecasts for the future of the drone market, the current blockers to innovation and the steps organisations and government should take to realise the benefits of drones. Our paper then explores specific public sector use cases, quantifying the benefits and identifying specific blockers for deployment. Finally, we provide additional details on the analysis and research within the technical annex.

The UK public sector is already deploying drones to some extent. Today, most police forces have introduced some sort of visual line of sight (VLOS) capability, which is used activities such as surveillance and missing person searches. In healthcare, there have also been multiple trials involving drone-assisted medical deliveries.



Part I: The case for investment



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3. Drones: a market ready for take off

3.1 Market development

Following a thorough analysis of the drone market in the UK and registration data from the CAA, Baringa believes that the industry will experience healthy growth in the coming years.³ Our central forecast shows **the total number of drones in the UK increasing by 75.8%** from 2024 to 2035 to nearly **700,000 drones**.

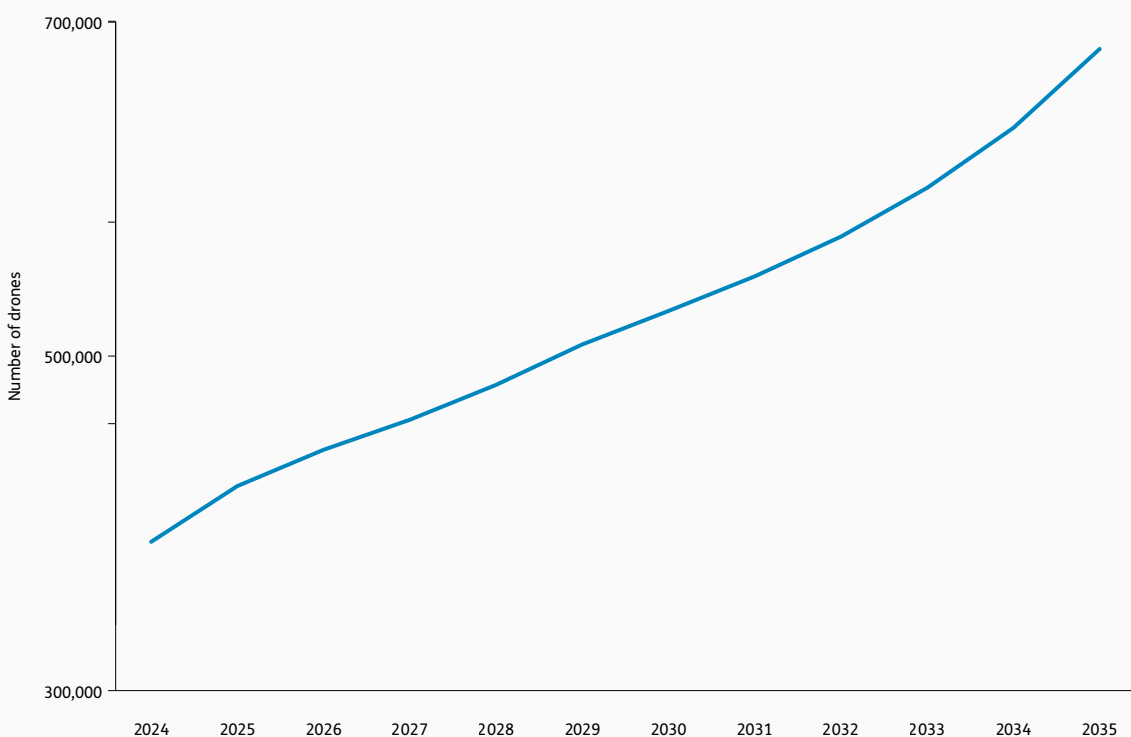


Figure 1: Forecast of total drones (2024 – 2035)

We expect this growth to be driven primarily by the uptake of drones by commercial and public sector organisations as the benefits of autonomous and BVLOS operations are unlocked. We believe the growth of drones by leisure users in the UK will begin to slow down as the market reaches saturation, mirroring other drone markets in Europe.

³ Civil Aviation Authority 'Annual Safety Review 2023', September 2024 – available at: [Annual Safety Review 2023 \(caa.co.uk\)](https://www.caa.co.uk)

As there is uncertainty over the drone market's growth trajectory, we have synthesised a wide range of data sources to produce a range of potential forecasts of the uptake of drones by organisations up to 2035, including scenarios for high and moderate adoption. Our central forecast estimates that the total **uptake of drones by commercial and public sector organisations is expected to increase by around 420%**, from 45,400 in 2024 to 235,700 in 2035. We forecast an upper limit of nearly **620,000 commercial and public sector drones by 2035**.

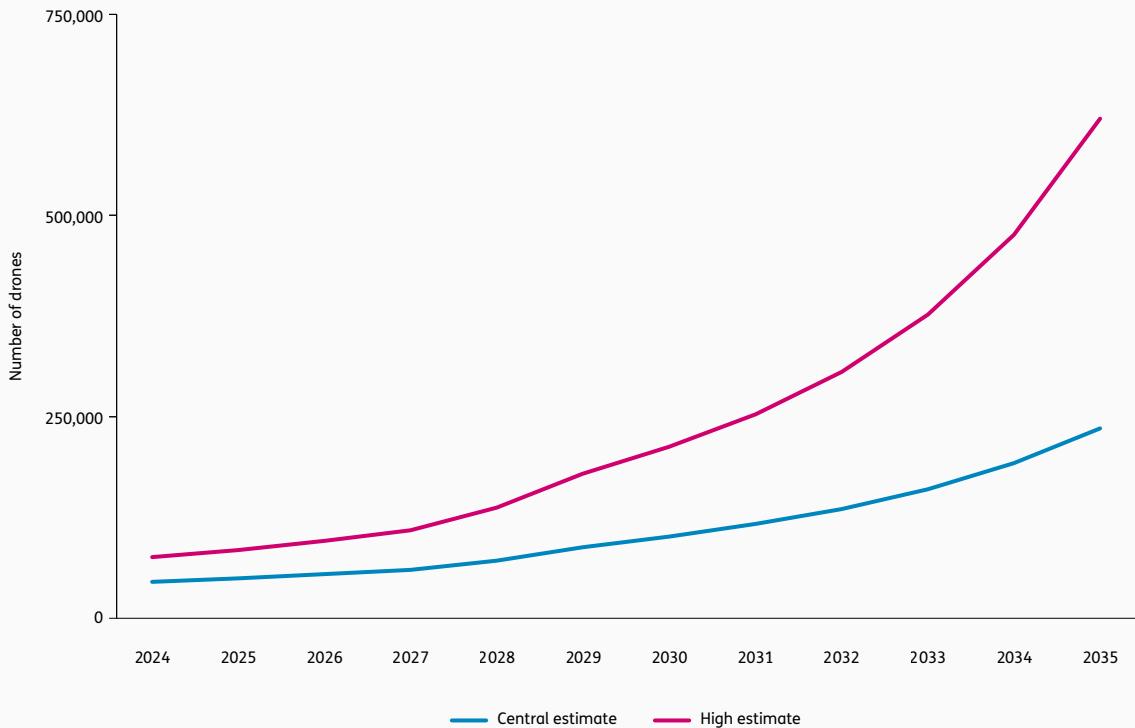


Figure 2: Uptake of drones by public and commercial organisations (2024 – 2035)

3.2 Drivers of drone growth

Future of Flight

The UK Future of Flight Action Plan, published by the UK Department for Transport (DfT), provides the roadmap to a regulatory and operational environment that promotes new aviation technologies. This includes supporting BVLOS drone operations in integrated airspace at scale from 2027. Unlocking BVLOS operations will facilitate the growth of the drone market by making it more practical and cost-effective for the private and public sector to take advantage of drones. Driven by these advances in the regulatory framework, we forecast that **the commercial and public sector drone market will expand by 70%-95%** from 2027 to 2030.

Technological advancements

Drones have undergone significant technological advancements in recent years. They now have a higher payload, meaning they are able to transport heavier items and support higher-quality camera systems. Their geographical range is increasing, allowing them to travel and transport goods across further distances. This enables expanded operations at lower cost. Drones are also becoming more weather-resistant, reducing the need for users to rely on contingency systems during adverse weather conditions.



Transition towards automation

As the technological and regulatory environment evolves, organisations will be able to deploy one-to-many drone operations, whereby one person controls and monitors the automated flights of several drones simultaneously. This will significantly cut costs per flight. One-to-many use cases support a range of commercial applications, for example, a single operator monitoring a fleet of drone deliveries.

Net zero ambitions

By replacing existing modes of transport (e.g. vans for deliveries and helicopters for search and rescue missions), drones have great potential to reduce emissions. As drones are powered by batteries, they produce very limited emissions during operation, if any. The UK's drive towards net zero may encourage public and commercial organisations to increase their uptake of drones to capture these environmental benefits.

Cost savings

Switching from traditional technologies to drones stands to deliver significant cost savings. The financial benefits are already substantial enough to warrant greater uptake of drones by public and private sector organisations. The potential savings will increase further as the operational and regulatory environment develops to support BVLOS and automated drone operations.

Safety

Use of drones can deliver significant safety improvements by minimising the risk of people being injured in accidents. This applies in cases where drones replace crewed aircraft operations and avoid the need for people to carry out dangerous activities, such as National Grid employees scaling power lines or Network Rail workers inspecting railway tracks. Of course, this requires drones to be tested to the highest safety standards in trials.

Speed and flexibility

The use of drones provides private and public sector organisations with greater operational flexibility. As an example, an NHS trust may decide to deploy drones to deliver pathology samples if they anticipate highly congested roads. Drones can generate further operational efficiencies as they're typically faster than motor vehicles.

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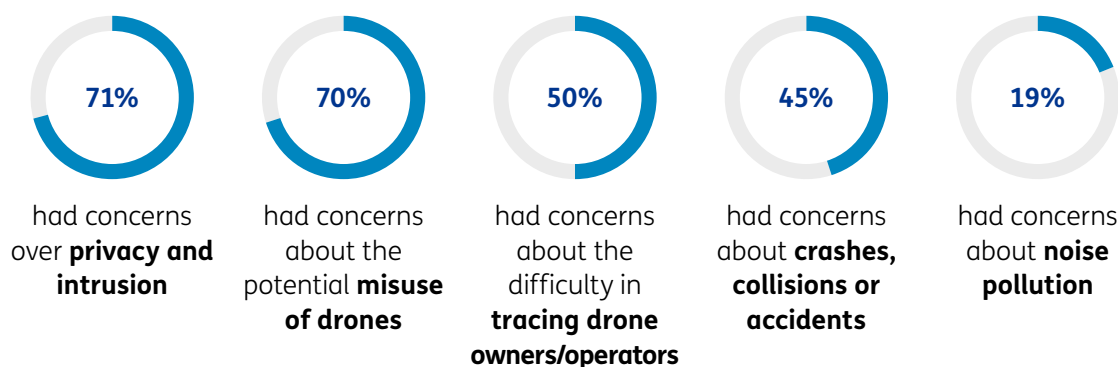
4. Blockers to innovation

While commercial drones present huge opportunities for positively impacting operations across the public sector, significant barriers still need to be overcome before the UK can realise the full potential of this new technology. Through our engagement with industry and government organisations, Baringa has identified six key blockers to the widespread adoption of drones in the UK.



Public perception

According to the DfT's Transport Technology Tracker,⁴ 61% of survey respondents had at least one concern about drone use. Of this percentage:



Many of these concerns relate to security. Even with current drone regulation and legislation, some drones are used for illegal purposes such as smuggling items into prisons, harassment, and infringing sensitive sites. There have been over 18,000 reports to the police in relation to drones since November 2020.⁵

⁴ Ipsos 'Technology Tracker: Wave 9', November 2022 – available at: UK Government Department for Transport, Technology Tracker: Wave 9, November 2022

⁵ Civil Aviation Authority 'Review of UK Unmanned Aircraft Systems (UAS) Regulations, November 2023 – available at: Review of UK DRONE Regulation Consultation v1.0_Final_2ndedition.pdf (caa.co.uk)

Although the public's attitude to drone operations may not have a direct impact on innovation, it may influence the decisions of government and regulators and reduce investment into the industry. These concerns should be taken seriously and addressed by government and industry in partnership, not only to tackle the misuse of drones but also to highlight the immense benefit they can bring to society; this could be done in many ways such as public information campaigns which aim to educate the public on the benefits of measures.



Difficulty obtaining approvals for operations and trials

Many of the organisations with which we engaged during the development of this report highlighted the issue of obtaining approvals for testing and trials. Timely approvals and transparent processes will be key to enabling innovation within the industry, and proving the safety of drone equipment and supporting systems. The CAA has been taking action to combat this issue by:⁶

- Establishing a test and evaluation team.
- Issuing a Remotely Piloted Aircraft System (RPAS) modification policy.
- Collaborating with the Ministry of Defence over the use of its estate and facilities for testing.

The CAA also plans to go further by:

- Creating a pre-defined risk assessment (PDRA) for RPAS testing.
- Developing a list of test sites to make it easier for industry to identify appropriate sites and commence testing.



Unclear requirements for the future of drone operations

Both drone manufacturers and their clients are eager to begin operations, from testing to full-scale deployment. However, industry finds itself ahead of the regulatory curve. Until the exact regulatory requirements are clear, industry cannot be fully prepared or begin deployment. This is causing uncertainty within the market, which may lead to reduced investment. In addition, supporting BVLOS at scale demands further development of technology, protocols, and systems required to integrate lower airspace, such as Electronic Conspicuity, Detect and Avoid, Unmanned Traffic Management, Ground Infrastructure and C2 Links. The delivery and integration of these components is a complex challenge for government (DfT, DSIT), CAA, local authorities, non-aviation regulators and industry. The CAA is making progress in this area with:

- Publication of its Technical Strategy Delivery Model which sets out the roadmap for delivering scalable BVLOS in the Specific category.⁷
- Introduction of UK SORA, with the UK SORA Policy coming into force in 2025. This will provide the main application risk assessment framework for the Specific Category, with further work underway to digitise the process; streamlining applications.⁸

⁶ Civil Aviation Authority 'CAA consultation on test site requirements for aviation innovators', August 2024 – available at: 22736 (caa.co.uk)

⁷ Civil Aviation Authority 'Delivering Scalable UAS BVLOS in the Specific Category', September 2024 – available at: Delivering Scalable UAS BVLOS in the Specific Category (caa.co.uk)

⁸ Civil Aviation Authority 'UK Specific Operations Risk Assessment (UK SORA) Consultation', July 2024 – available at: 22548 (caa.co.uk)

- Recent consultation on Detect and Avoid – setting out the policy concept for the assurance of DAA systems. These systems will be a critical enabler for BVLOS operations and the safe integration of RPAS into the wider airspace environment.⁹



Lack of infrastructure investment

To enable effective drone operations at scale, infrastructure such as charging stations and vertiports will need to be planned and built. However, a lack of clear action and direction from government around requirements and planning has resulted in limited infrastructure investment to date. Given the long lead times needed to establish such infrastructure, this issue must be resolved swiftly, otherwise the UK risks unnecessary delays in unlocking the benefits of drones. Further ground infrastructure may also be required to fully integrate the airspace; however, this must be developed in parallel with the deployment of other BVLOS technologies to ensure interoperability.



Disjointed implementation plans

UK public sector organisations need to produce clear implementation plans and business cases – otherwise, they run the risk of failing to generate the required investment to take advantage of drones.

In Baringa's view, public sector organisations would be best placed to develop a Green Book business case that examines:

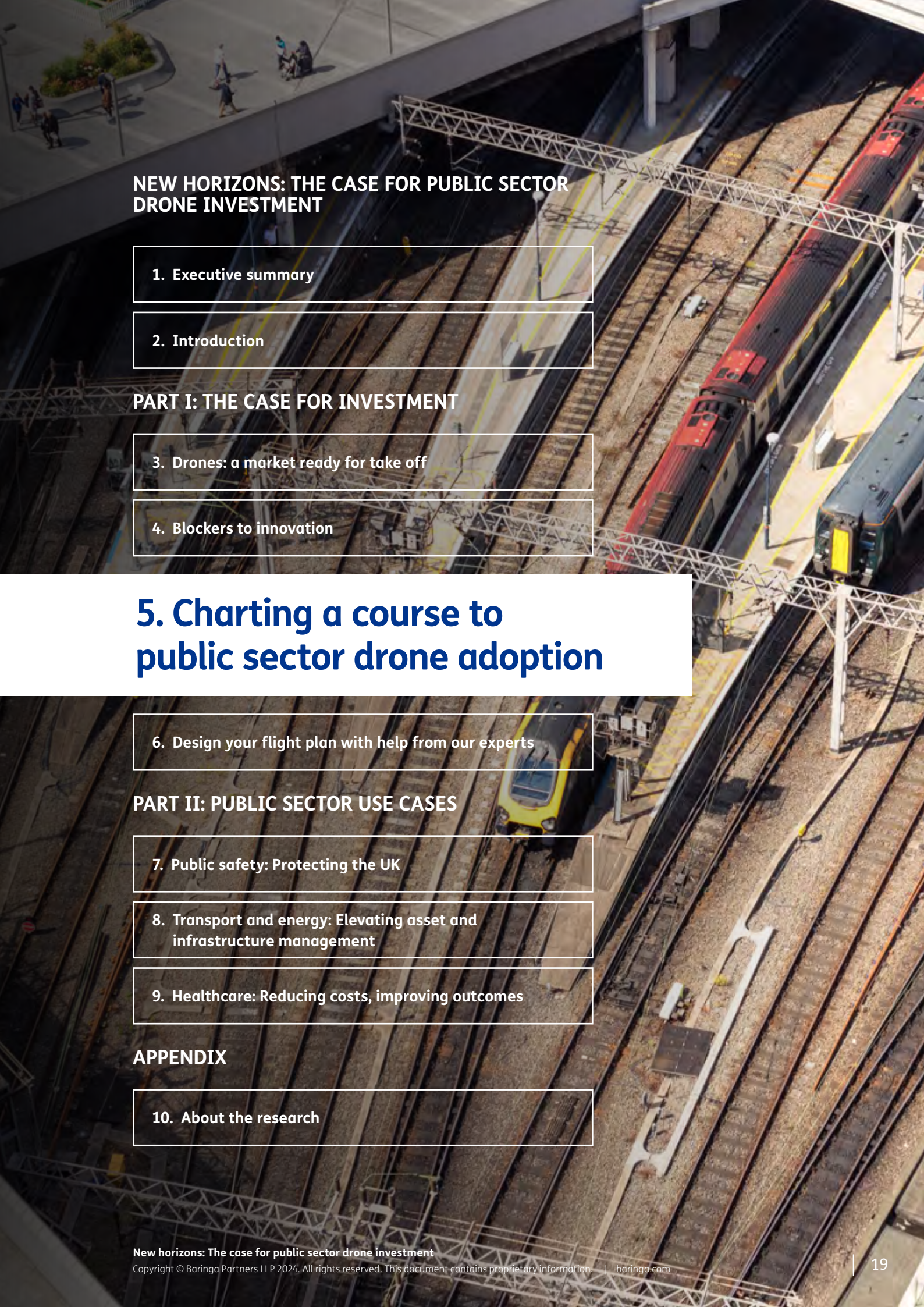
- Use cases and strategies for drone adoption.
- The financial case for investment.
- The appropriate commercial model (in-house or external).
- Associated supply chain and infrastructure changes that might be required (especially for drones used for delivery purposes).
- Capital investment (selecting the best-value drones with the right specifications to complete an organisation's desired use cases).
- Potential contingency plans (e.g. use of alternative transport methods when drones cannot be used, such as during particularly adverse weather).
- Existing assets that would need to be phased out (i.e. helicopters).



Funding pressures

Today's tough fiscal climate is causing significant funding pressures for the public sector. Most new projects and programmes must include cash-releasing benefits in order to secure investment. This means that public sector organisations will need to develop strong business cases that clearly demonstrate the savings and tangible benefits that can be achieved through use of drone technologies.

⁹ Civil Aviation Authority 'Detect and Avoid Policy Concept Consultation Document', July 2024 – available at: [CAP3015 Detect and Avoid Policy.pdf \(caa.co.uk\)](https://www.caa.co.uk/~/media/CAA/Images/Supporting%20Information/2024/07/07/072407015-Detect-and-Avoid-Policy.pdf)



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5. Charting a course to public sector drone adoption

Use of drones in the public sector reduces costs, improves efficiency, and delivers significant societal benefits. That's already true today, and these gains will only grow as time progresses and technology develops.

Yet, against the backdrop of ongoing funding pressures, simply acknowledging this potential will not be enough to unlock the funding needed to support drone deployment. Public sector organisations must make a compelling business case to demonstrate the value for money of transitioning to drone operations.

Here, we outline some of the most important steps for building a strong case for investment:

- 1 Identify specific use cases and build robust business cases.** Organisations should start by pinpointing the specific operations they wish to support with drone technologies. For each, they should create business cases that outline the potential benefits, costs, and risks associated with transitioning to drone operations. Organisations should also consider the societal benefits that can be achieved through the use of drones.
- 2 Develop commercial strategies for drone operations.** Organisations should think about which commercial model will be best for supporting drone deployment and operations. This could involve in-house capabilities, external partnerships, or service-based models. These commercial models should also outline the potential benefits of using drones, such as cost savings, improved service delivery, and enhanced data collection capabilities.
- 3 Consider supply chain and regulatory constraints.** Organisations will need to consider the impact on other parts of the supply chain when using drones for tasks like just-in-time delivery, infrastructure inspection, and surveillance. The timing of drone deployment will also be dependent on the lifespan of current technologies and the regulatory framework governing drone operations. Therefore, public sector organisations need to work closely with regulatory bodies to address any constraints and ensure compliance with safety and privacy regulations.
- 4 Don't neglect infrastructure.** Besides business case development, the public sector needs to invest in supporting infrastructure for drone operations. This includes the establishment of vertiports for take-off and landing, as well as charging stations for drone batteries. The development of a robust infrastructure will be essential for the seamless integration of drones into existing public sector operations and will contribute to the overall value of transitioning to drone operations.

Besides making the case for investment, there is still work for the government, CAA, and industry to do in order to enable routine BVLOS in the UK. The CAA has published a roadmap to delivering scalable UAS BVLOS in the Specific Category, that considers the approach in three phases – Demonstrate, Scale and Sustain:¹⁰

Demonstrate

- **Objective:** Facilitates demonstrations of use cases to support research, development, and small commercial applications.
- **Role of regulators:** Develop policy strategies that set direction on key domain areas with specific requirements for industry to explore during operational trials.
- **Role of industry:** Operators and service providers must build business cases with consumers for target operations and develop operating procedures and technology to support the corresponding safety case.

Scale

- **Objective:** Facilitates significant scaling of use cases to support commercial applications.
- **Role of regulators:** Publish the 2nd iteration of policy within the Rulemaking Framework. Develop new processes, technology, and skills to support new capabilities. Implement tailored oversight to monitor industry progress.
- **Role of industry:** Operators and service providers begin early initial operations to build an initial customer base, based on operating procedures and safety cases developed in the Demonstrate phase.

Sustain

- **Objective:** Facilitates sustainable development of use cases led primarily by industry.
- **Role of regulators:** Implement the 3rd iteration of policy, managing all stakeholders as business as usual. Establish a sustainable, robust funding model for the regulator.
- **Role of industry:** Operators and service providers continue operations and develop further operations as business-as-usual.



¹⁰ Civil Aviation Authority ‘Delivering Scalable UAS BVLOS in the Specific Category’, September 2024 – available at: [Delivering Scalable UAS BVLOS in the Specific Category \(caa.co.uk\)](https://www.caa.co.uk)



The integration of diverse users into the UK's compact and complex airspace, particularly for Beyond Visual Line of Sight (BVLOS) operations, is a strategic objective of the Airspace Modernisation Strategy (AMS). One key challenge is addressing midair collision risks in non-segregated airspace, which will be initially mitigated by using Atypical Air Environments (AAE) where conventional aircraft are minimal due to ground infrastructure proximity. The focus is on developing a regulatory framework that incorporates new technologies like Detect and Avoid (DAA), Electronic Conspicuity (EC), and advanced air traffic management services in low-level airspace. This involves using regulatory sandboxes, such as the Temporary Reserved Areas (TRA) Sandbox, and other test evaluations to inform policy, while learning from international best practices. The regulatory landscape must also address gaps in existing safety systems, such as safety reporting and managing legislative breaches. The primary areas of work for BVLOS operations in the Specific Category include Operational Authorisations, Flightworthiness, Pilot Competency, and Airspace Integration, all underpinned by considerations of environmental impact, safety, physical security, and cybersecurity. This effort is a collaborative one, involving industry, academia, and government.

CAA primary areas of work for BVLOS operations

1. Operational authorisations:

- **Application process:** A digital application process for UAS Operational Authorisations has been launched, streamlining the approval process.
- **SORA-based authorisations:** Aligning with the JARUS Specific Operations Risk Assessment (SORA), whilst tailoring it to UK airspace, to ensure a standardised approach to risk assessment.

2. Flightworthiness:

- **Design and testing:** Reviewing evidence related to the design, build, and testing of UAS to ensure they meet safety and performance standards.

3. Pilot competency:

- **Certification schemes:** Implementing certification schemes such as the A2 Certificate of Competency (A2 CofC) and the General Visual Line of Sight Certificate (GVC) to ensure remote pilots possess the necessary skills and knowledge.

4. Airspace integration:

- **AMS alignment:** All BVLOS activities must align with the AMS, which provides a roadmap for airspace development up to 2040.
- **Advanced air traffic management:** Incorporating advanced air traffic management services to facilitate the safe integration of UAS into low-level airspace.

Technical and security challenges

1. Physical security:

- **Remote pilot stations:** Ensuring the security of remote pilot stations and operation control centres.
- **Aircraft security:** Implementing measures to protect UAS from physical threats.

2. Cybersecurity:

- **Safety-critical systems:** Ensuring the confidentiality, integrity, and availability of safety-critical systems to mitigate cybersecurity risks.

The CAA, government and industry all have a role to play in enabling routine BVLOS operations at scale; engagement and participation from all parties will be key to achieving this over the coming years.

Organisations should seize the moment to develop their business cases and secure investment to realise the benefits outlined in this paper. The timing of deployment may differ from organisation to organisation and from use-case to use-case, the deployment could be:

- Imminent through current authorisations and trials (BVLOS and VLOS).
- Once BVLOS is enabled.
- Once a move to one pilot to many drones has been made.

Nevertheless, organisations should seek to understand at what point their deployment should take place and begin the process for securing funding, gaining necessary approvals and providing the correct resource and training, to ensure the maximum benefits can be realised through timely and smooth deployment.



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Baringa is a leading consultancy firm with a proven track record in developing Green Book business cases across the public sector and delivering the necessary changes to technology, processes, and people. We have a breadth of expertise across central government, regulators, and delivery bodies, including health, transport and policing. On top of this, we bring expertise in business case development, public sector commercial strategies, and supply chain management. We are ready to support public sector organisations in exploring applications for drones, building robust business cases, and successfully implementing change.

Cross-sector experience



Health sector: We support the NHS across all levels to deliver better value outcomes for patients. We are experts in end-to-end transformation from developing Green Book business cases through to commercial and programme delivery. Baringa helped build the business case and procurement roadmap for the NHS's largest non-clinical contract and we have provided years-long support to the Commercial division. We work with multiple local NHS organisations at the provider and system level, covering complex transformation agendas, including frontline digitisation, new service delivery models, and commercial efficiencies. This experience puts us in a strong position to help healthcare organisations explore the potential of drones for delivering medical supplies, conducting remote diagnostics, and supporting emergency response efforts.



Transport sector: Our experience in optimising logistics and delivery services can be applied to develop comprehensive plans for integrating drones into transport networks and supply chains. We operate across Road, Rail and Aviation, bringing together a combination of industry experts who know how these systems really work, with cross industry insight and innovation. We have rolled out cutting edge operational IT capability across the national rail estate, operated at the intersect of energy and transport to drive EV charging rollout and supported investment decisions around sustainable transport infrastructure and new ways of operating. The application of drones within transport networks is no longer conceptual. The potential use cases are both numerous and clear, and the opportunity to radically rethink how our transport networks are operated and maintained through the use of drone technology is now.



Home Affairs and public safety: Baringa has been working in UK Home Affairs for a number of years where we have had over 150 consultants delivering across Border Security, Immigration Control, and Law Enforcement programmes. Our work plays a crucial role in ensuring national security, managing immigration, and overseeing emergency management. We have worked with senior stakeholders across Home Affairs and supported their work cross-Government, presenting our work directly to Ministers. Our projects have

included the mobilisation of Immigration Accommodation centres and developing Operating Models across law enforcement, requiring a deep understanding of processes at the ground level. We are recognised as experts because we invest time working closely with officers on the frontlines—at ports, delivery centres, and within law enforcement agencies—to ensure our solutions are practical and aligned with the needs of those executing them. Additionally, we have been involved in critical decision-making, providing strategic insights that shape future operational frameworks across government functions.

Our support can help organisations in UK Home Affairs integrate these innovative solutions into existing systems to enhance capabilities. Our conversations are already offering numerous applications that can enhance the efficiency and effectiveness of Home Affairs operations.



Technology sector: We work with clients across Central Government, Health, Transport and Policing to deliver meaningful change, enabled by Digital and AI technologies. For a large central Government client, we put in place £1.3bn worth of new commercial arrangements to overhaul IT infrastructure supporting citizens and businesses around the UK, generating £80m in savings on the commercial contracts. We worked with a public body responsible for resolving disputes between consumers and businesses to adopt AI and automation to efficiently route cases to the most suitable caseworkers, improving first-time resolution rates and overall workflow efficiency through continuous learning and optimisation. We are well-positioned to help organisations understand the commercial viability of drones and deploy these technologies in a way that best meets their operational objectives.



Commercial and supply chain expertise: Operating across the public sector, our teams regularly advise on commercial strategies and supply chain optimisation. We know how to empower organisations to develop best-in-class procurement strategies and ensure seamless integration of drone technologies across their operations and supply chain network.



Robust business case development: Baringa has extensive experience in developing compelling business cases that align with organisational goals and stakeholder expectations. We have many Better Business Case accredited consultants, experienced in deploying Green Book methods to make a strong case for projects and programmes and secure the necessary investment.

Prepare for liftoff

At a time when government must grapple with an incredibly tight fiscal climate, while demands on public services continue to grow exponentially, public sector organisations face immense pressure to deliver more for less. Drone technologies offer a unique opportunity to rise to the occasion, unlocking efficiencies and savings that are potentially worth millions of pounds to public services.

From healthcare to infrastructure, there is a strong, quantifiable case to be made for transitioning to drones—and Baringa is ready to support the public sector in shaping it. If you're seeking a partner who can help you confidently navigate the complexities of drone investment and unlock the full potential of this transformative technology, please reach out to the authors of this report to take your next steps.

Part II: Public sector use cases

Drones have the power to make a huge impact across wide swathes of the public sector, from healthcare to transportation. This section explores the impact of drones in key sectors, with select use cases illustrating their transformative potential.

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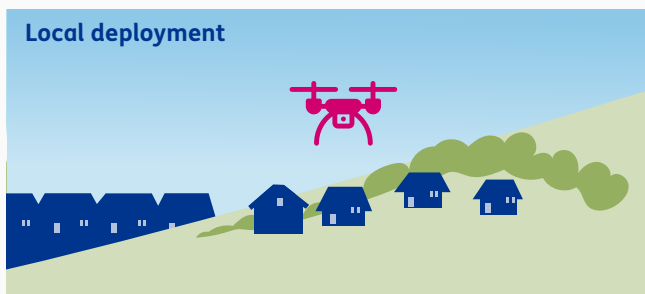
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7.1 Aerial police operations

UAS BVLOS and drone-in-a-box deployments¹¹ offer powerful new ways to help police forces operate more effectively. Our forecasts project that replacing existing National Police Air Service (NPAS) aircraft operations with UAS and drone-in-a-box deployments could generate **operational cost savings of up to £22.6m per year** by 2035.

Police drone operations



Local deployment

Local area capability

VLOS & BVLOS Tactical Drone Deployments



Short range deployment

Town/city capability

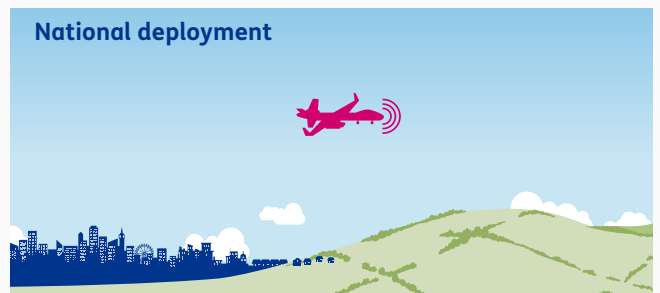
BVLOS Drone as First Responder (DFR)/Drone in a Box



Long range deployment

Force/regional capability

BVLOS VTOL/Drone in a Box



National deployment

National capability

BVLOS Replacement of Conventional Aircraft

Figure 3: Different types of police drone operations¹²

¹¹ A drone-in-a-box is a form of UAS technology, which uses drones that deploy from and return to self-contained landing boxes.

¹² National Police Chiefs' Council 'NPCC Drone Portfolio Update', July 2023 – available at: PowerPoint Presentation (npcc.police.uk)

BVLOS uncrewed aircraft systems in policing

What can drones make more efficient and why?

NPAS provides air support to police forces across England and Wales from a national network of bases. The organisation currently operates a fleet of 19 rotary helicopters (15 Airbus EC135 and 4 EC145) and four fixed wing aircraft. They are used to respond to a range of time-sensitive incidents, such as searching for high-risk missing people, apprehending suspects, and supporting vehicle pursuits. In addition, NPAS aircraft are regularly deployed to assist police officers in observing large public events and containing crime scenes.

In August 2024, NPAS announced that it will be embarking on “the UK’s most ambitious trial of uncrewed aircraft in support of policing” in partnership with National Air Traffic Services (NATS) and the CAA.¹³ The trial will assess the feasibility and safety of using UAS BVLOS alongside traditional police helicopters in delivering air support to police forces.

Operating UAS BVLOS brings significant efficiencies to police air support, primarily because the technology can stay airborne for more than six hours, compared to just two hours for helicopters. This means the UAS can remain in the air, transiting from one job to another, rather than requiring aircraft to be re-mobilised for every task – reducing costs and accelerating response times.

Drones will speed up police response to incidents, all with less cost, risk, and environmental impact

Our forecasts project that replacing existing NPAS aircraft with UAS could generate **operational cost savings of up to £19.7m per year** by 2035, with **total savings of £164.4m** from 2027 to 2035.

In addition to operational cost savings, the use of UAS generates significant environmental benefits: helicopters are not as energy efficient as UAS and use aviation-grade fossil fuels. Considering the types of aircraft within the NPAS helicopter fleet, we have estimated a weighted average for the kg CO₂e per hour of an NPAS helicopter operation.¹⁴ An example of a UAS that NPAS could use to replace helicopter tasks is the Tekever AR5, which is already used for surveillance by the UK Border Force.¹⁵ This UAS **produces 86.7% less CO₂e per hour** compared to NPAS helicopters. Replacing NPAS helicopter tasks with drone operations could generate maximum savings of **51.4m kg CO₂e from 2027 to 2035, equivalent to £5.2m**. Furthermore, UAS generate significantly less noise pollution than helicopters, helping to reduce the impact on communities and wildlife.

While infrequent, there were 13 accidents involving emergency helicopter services between 1987 and 2013;¹⁶ in 2022, the Air Accidents Investigation Branch reported a fatal helicopter

¹³ National Police Air Service ‘NPAS to trial uncrewed aircraft’, August 2024 – available at: Press releases | National Police Air Service (npas.police.uk)

¹⁴ Table 1 – Cross-cutting assumptions

¹⁵ UK Parliament ‘Written evidence submitted by James Cowan MBE (CHA0056)’, November 2020 available at: UK Parliament Written Evidence

¹⁶ Chesters A, Grieve PH, Hodgetts TJ. ‘A 26-year comparative review of United Kingdom helicopter emergency medical services crashes and serious incidents’, April 2014 – available at: A 26-year comparative review of United Kingdom helicopter emergency medical services crashes and serious incidents – PubMed (nih.gov)

incident.¹⁷ UAS are significantly safer for operators than helicopters as there is no person flying in the aircraft. As part of the NPAS UAS trials, the CAA has awarded NPAS a position in the CAA's BVLOS Integration Sandbox to ensure the technology development upholds the highest safety standards.¹⁸

What are the potential blockers?

The policing service will need to overcome several obstacles in order to unlock the benefits of drone technology:

- **Investment required:** Procuring a fleet of UAS will require a long-term planning horizon, given that the existing fleet of helicopters and aircraft have a long asset life. This would require a decision on whether to decommission these aircraft early or taper investment in drones as the assets reach end of life.
- **Optical capability:** Helicopter crews currently provide 80% of the identification of missing persons instead of cameras. Uncrewed aircraft systems will need to have the same optical capability as existing technologies to ensure the service delivers intended results.
- **Public acceptance:** Securing public acceptance of UAS will be required to facilitate widespread adoption. While public acceptance of drones for emergency services is likely to be high, greater privacy concerns may exist for police use.

The National Police Chiefs' Council (NPCC) has established a drones portfolio, which aims to support police forces in delivering a safe, efficient, and sustainable drone capability. As part of its activities, the organisation is conducting a feasibility study into replacing conventional police helicopters with UAS.¹⁹ This study should provide the police with a better understanding of what capability gaps exist, so appropriate action can be taken to promote uptake of UAS.



¹⁷ Air Accidents Investigation Branch 'Annual Safety Review 2022', April 2023 – available at: [AAIB Annual Safety Review \(publishing.service.gov.uk\)](https://www.aaib.gov.uk/publications/annual-safety-review-2022)

¹⁸ National Police Air Service 'NPAS to trial uncrewed aircraft', August 2024 – available at: [Press releases | National Police Air Service \(npas.police.uk\)](https://www.npas.police.uk/press-releases)

¹⁹ National Police Chiefs' Council 'NPCC Drone Portfolio Update', July 2023 – available at: [PowerPoint Presentation \(npcc.police.uk\)](https://www.npcc.police.uk/presentations)

Drone-in-a-box operations

What can drones make more efficient and why?

Drones are increasingly becoming a crucial tool for police forces across the UK, with 19,000 drone-assisted operations taking place in 2023.²⁰ The NPCC's National Review for the same year found that every police force in the UK is either operating drones or is looking to commence drone operations in the future.

In 2024, the NPCC published its BVLOS Pathway Programme Overview, which included their plans to push the boundaries of drone-in-a-box operations.²¹ This involves police drones being flown from an automated drone deployment system (ADDS). As part of the BVLOS Pathway Programme, drone-in-a-box trials have been conducted with the Hampshire and Isle of Wight Constabulary, Thames Valley Police, and the Norfolk Constabulary to test the concept of Drones as a First Responder (DFR)^{22,23}. DFR sees police drones launched and piloted remotely to provide a fast response to incidents, returning real-time information to police control rooms and operational units.

Furthermore, police often deploy helicopters to provide surveillance and to contain potential crime scenes. Helicopters are also used to observe large public gatherings (e.g. protests and football matches) and scan for public order incidents. DFR could be a cheaper, safer, and more environmentally friendly option for these activities.



Saving millions of pounds annually and providing better support to police forces

We forecast that replacing existing NPAS aircraft operations with drone-in-a-box operations could generate **operational cost savings of up to £1.8m per year**, with **total savings equalling £18.9m from 2024 to 2035**. These savings could be increased if there was less downtime due to poor weather, as 98.5% of costs are driven by requiring contingency NPAS aircraft deployments. If there were advancements in the drone technology enabling a reduction in the downtime from 19% to 5%, this would increase operational cost savings by up to 17.3%.

The overall impact of introducing one-to-many BVLOS operations is that the estimated drone-in-a-box cost per hour falls by 87% from £52.18 to £6.40 between 2024 and 2035, which is nearly **300 times less expensive than NPAS helicopters**.

²⁰ NPAS Annual Report 2022/23 – FINAL VERSION

²¹ National Police Chiefs' Council 'BVLOS Pathway Programme Overview', 2024 – available at: PowerPoint Presentation (npcc.police.uk)

²² National Police Chiefs' Council 'First trial of innovative police drone technology', July 2024 – available at: First trial of innovative police drones technology (npcc.police.uk)

²³ National Police Chiefs' Council 'Drones as First Responder trials underway in Norwich', August 2024 – available at: Drone as First Responder trials underway in Norwich (npcc.police.uk)

Additionally, we have estimated that **drone-in-a-box operations generate nearly 3,340 times less CO₂e emissions than helicopters**. In total, replacing helicopters would produce **3.5m kg CO₂e savings** from 2024 to 2035, equivalent to nearly £340,000.

In most cases, the DFR would arrive on the crime scene before officers, enabling the police to capture evidence up front and receive information about the incident to inform the response. Understanding the risks involved in an incident and gathering evidence at the earliest opportunity is critical for enabling officers to apprehend suspects, locate missing people, and provide vital intelligence to police that arrive on the scene. Furthermore, DFR can provide an aerial overview of an incident without exposing police officers to direct danger, enhancing safety.



What are the potential blockers?

Transitioning drone-in-a-box operations to DFR presents several challenges for police forces:

- **Regulatory hurdles:** The police will need to work with the regulator to support the development of BVLOS regulation and legislation to enable the rollout of drone-in-a-box operations. The introduction of UK Specific Operations Risk Assessment (SORA) will support in overcoming this hurdle.
- **Integrated network of DFRs:** Significant coordination between the command and control of drone units, ground forces, and call handlers will be required to set up an integrated network of DFRs.
- **Operational challenges:** The police will need to change the way they conduct operations with the addition of drones, ensuring officers are trained in using the technology to maximise its capability.

To address these potential blockers, the NPCC's BVLOS Pathway Programme has been set up to introduce robust governance, standardisation of activities, and data-sharing agreements to share resources and knowledge with a network of experts. As part of the BVLOS Pathway Programme, the NPCC have set up a Centre of Excellence to create a coordinated approach to setting up advanced drone operations for police forces across the country.²⁴

Holistic view of all aerial police operations

We can provide a holistic view of the cost savings available to the police for all aerial operations. Our forecasts project that replacing existing NPAS aircraft operations with UAS and drone-in-a-box deployments could generate **operational cost savings of up to £22.6m per year** by 2035.

More specifically, we forecast that replacing NPAS helicopter operations related to containing crime scenes and surveying public order incidents can generate **£1.5m in annual operational**

²⁴ National Police Chiefs' Council 'NPCC Drone Portfolio Update', July 2023 – available at: PowerPoint Presentation (npcc.police.uk)

cost savings on average. These operational cost savings are modest as only 5% of all NPAS tasks are made up of crime scene containments and public order incidents. However, when we consider the uptake of uncrewed aircraft systems and one-to-many BVLOS drone-in-a-box operations, **operational cost savings could reach £22.6m** by 2035. Overall, we estimate that **the police could save up to £191.8m over the next 12 years** if they are able to leverage advancements in drone technology to assist with aerial police operations.

In addition, replacing NPAS helicopter tasks with uncrewed aircraft systems and drone-in-a-box operations could generate **environmental savings of up to 6.1m kg CO₂e per year** by 2035, valued at £741,000. The CO₂e saved is the same as taking 1,458 petrol-powered cars off the roads for one year.²⁵ Further environmental savings could be made if more operations are replaced by UAS. Our estimates highlight this as NPAS helicopter operations to complete remaining tasks contribute to 38.6% of emissions despite making up only 7.4% of flight hours.

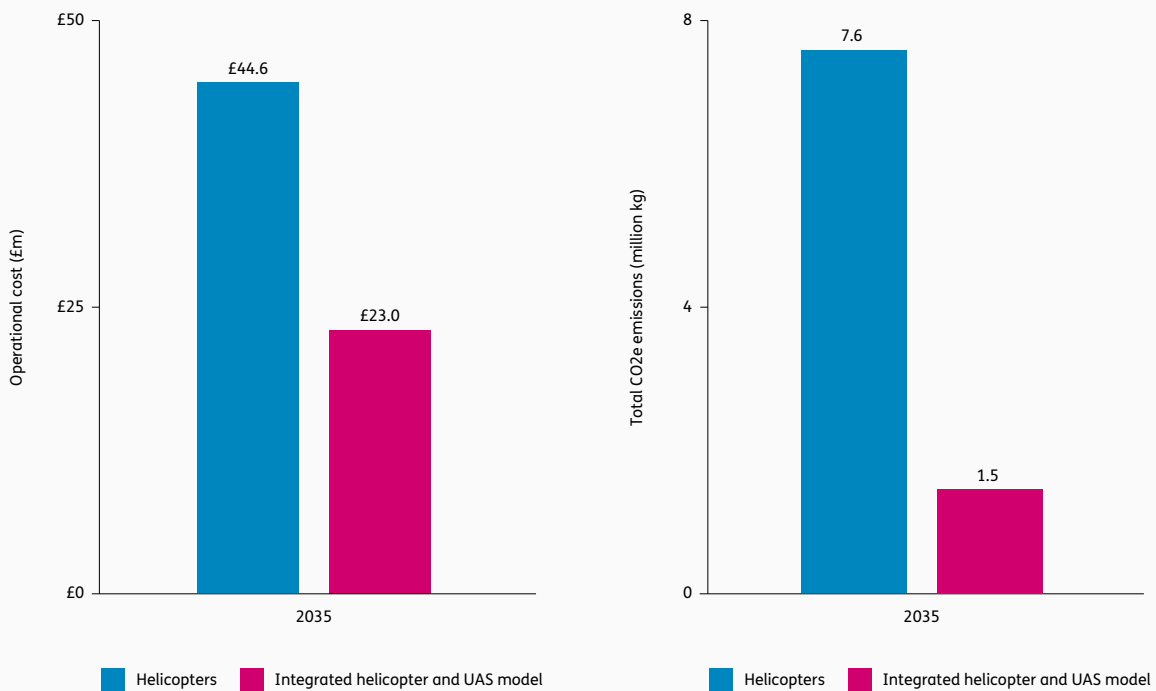


Figure 4: Change in operational cost and CO₂ emissions from replacing NPAS helicopter tasks with UAS and drone-in-a-box operations

7.2 Maritime and Coastguard Agency search and rescue

Operating BVLOS uncrewed aircraft systems and helicopters in a blended search and rescue model creates significant benefits for the Maritime and Coastguard Agency (MCA). There is an opportunity to replace 1,100 helicopter tasks with UAS BVLOS, generating **operational cost savings of up to £1.4m per year** by 2035.

²⁵ US Environmental Protection Agency 'Greenhouse Gas Equivalencies Calculator', January 2024 – available at: [Greenhouse Gas Equivalencies Calculator | US EPA](#)

What can drones make more efficient and why?

The MCA provides a 24-hour maritime and coastal search and rescue emergency coordination and response service for the UK. The organisation delivers all search and rescue helicopter services in the UK from ten bases under the UK Search and Rescue Helicopter Service (UK SAR-H).²⁶ Last year, the UK SAR-H conducted 2,588 search and rescue helicopter missions, with 15% taking place at sea, 38% at the coast, and 46% on land.²⁷

In July 2022, the MCA awarded a new contract for the UK Second-Generation Search and Rescue Aviation programme, known as UKSAR2G. The contract is worth £1.6 billion and will last for 10 years, using a fleet of 18 state-of-the-art helicopters, six fixed wing aeroplanes, and UAS.²⁸ Included in the contract is the procurement of the Schiebel S-100 drone system, which can remain airborne for over six hours, reach speeds of up to 185km/h, and has a maximum payload of 50kg, providing the MCA with versatile technology to assist with search and rescue operations.²⁹

Adopting UAS BVLOS to conduct appropriate search and rescue tasks presents the MCA with similar benefits to NPAS, including operational cost savings, reduced environmental impact, and increased safety. In addition, UAS will enable the MCA to undertake more complex operations as these systems have the capability to gather information on the incident and determine what support is required, reducing the risk of dangerous taskings.

Drones: More cost-effective and environmentally friendly than helicopters

We forecast that replacing existing SAR-H operations with UAS could **generate operational cost savings of up to £1.4m per year** by 2035. The operational cost savings are lower than the savings available to NPAS, as we estimate that the MCA would be able to replace around 13,300 fewer helicopter tasks per year. Nonetheless, our forecast is that the MCA could **save up to £11.9m** from 2027 to 2035.

Beyond the operational cost savings, there are environmental benefits associated with the use of UAS, as the technology produces lower emissions than helicopters. We estimate that reducing the number of MCA helicopter tasks would **reduce emissions by 8.8m tonnes of CO₂e from 2027 to 2035, equivalent to £891,000**. This is because the Schiebel S-100 uncrewed aircraft system produces 99% less CO₂e emissions per hour on average than an MCA helicopter.³⁰ Moreover, reducing the use of helicopters will generate less noise pollution, lessening the impact on coastal wildlife and ecosystems.

Another significant advantage of deploying UAS to support SAR-H operations is that these aircraft can be flown into dangerous areas to gather information to assess the risk of the operation before attempting a rescue. This presents significant safety benefits for search and rescue teams, while arming them with more the information about the surrounding environment, increasing the chance of a successful rescue.

²⁶ Maritime and Coastguard Agency 'Maritime and Coastguard Agency Annual Report and Accounts', July 2023 – available at: [MCA_Annual_Report_and_Accounts_2022-23_V2_print_ready.pdf](https://publishing.service.gov.uk) (publishing.service.gov.uk)

²⁷ Department for Transport 'UK Search and rescue helicopter statistics: interactive dashboard', September 2024 – available at: [UK Search and rescue helicopter statistics: interactive dashboard](https://dft.gov.uk) (dft.gov.uk)

²⁸ Maritime and Coastguard Agency 'Government contract uses the latest technology for search and rescue', July 2022 – available at: [Withdrawn] Government contract uses the latest technology for search and rescue – GOV.UK (www.gov.uk)

²⁹ Schiebel 'Specifications', September 2024 – available at: [CAMCOPTER® S-100 System – Schiebel](https://www.schiebel.com)

³⁰ See Table 1 – Cross-cutting assumptions

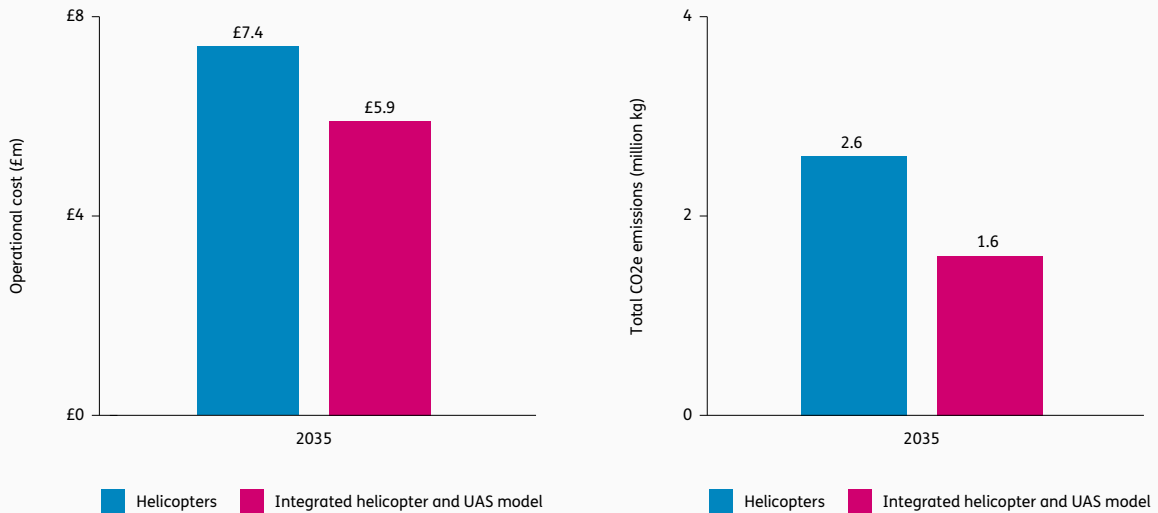


Figure 5: Change in operational cost and CO₂ emissions from replacing MCA helicopter tasks with UAS

What are the potential blockers?

The MCA faces several blockers in the adoption of UAS:

- **Helicopter asset portfolio:** MCA helicopters are valued at £267.0m, compared to £12.9m for other surveillance aircraft.³¹ Increasing investment in UAS technology will take time and may be difficult under budgetary constraints and existing commitments to longstanding contracts.
- **Coordinated response:** Creating an effective search and rescue approach will require integration between different technologies.
- **Data overload:** During SAR tasks, gathering accurate and appropriate data is critical to the success of the operation. UAS technology produce high volumes of data, meaning operators will need to be sufficiently trained to prioritise the right data at the right time.
- **Public perception:** There is evidence to suggest that people respond positively to seeing large search and rescue assets (i.e. helicopters and lifeboats) as they can see support is on its way. The public will need to be informed that UAS are being deployed to support SAR operations as otherwise, people may take further risks if there is a lack of awareness of the technology.
- **Robust testing:** SAR operations are often required during extreme weather conditions. UAS must undergo robust testing procedures to ensure the technology can withstand high winds, precipitation and fog, in order to prepare for all eventualities.

Despite this, there are encouraging signs that change is afoot. The UK Second-Generation Search and Rescue Aviation programme has included the procurement of UAS. In addition, the MCA has already hosted UAS trials over the last few years and is now including the technology in its training exercises alongside other emergency response teams.³²

³¹ Maritime and Coastguard Agency 'Maritime and Coastguard Agency Annual Report and Accounts', July 2023 – available at: [MCA_Annual_Report_and_Accounts_2022-23_V2_print_ready.pdf](#) (publishing.service.gov.uk)

³² HM Coastguard UK 'Drone joins HM Coastguard air, land and sea rescue teams', July 2021 – available at: [Drone joins HM Coastguard air, land and sea rescue teams](#) | HM Coastguard UK

7.3 Other public safety use cases



Fire Service

Drones can serve a first responder, inspecting the scene whilst other units are en route, providing valuable intelligence to allow for a faster response once crews arrive. This intelligence can also support teams in making better-informed decisions in terms of prioritisation and response size. Not only would this create cost efficiencies, but it would also lead to operational improvements that could save lives.

Once on site, drones can be used to provide further information on the incident. For instance, drones can supply thermal imaging camera footage that helps teams to better assess the severity of an incident and direct first responders more effectively and safely. As with policing, the Fire and Rescue Service may also respond to missing person reports, with drones and thermal imaging allowing larger areas to be covered more quickly and completely.

Many fire services have already adopted drones. Essex County Fire and Rescue Service (ECFRS) have introduced state-of-the-art drone capabilities to their firefighting response, including thermal imaging to identify the source of the fire, aerial imagery to provide intelligence on the fire, and loudspeakers to give instructions to members of the public.³³

In 2022, there were over 44,000 wildfires in the UK, representing an increase of 72% on the previous year. To combat this growing threat, Lancashire Fire and Rescue Service (LFRS) are testing autonomous UAS that have thermal and optical imaging for automatically detecting fires. The drones can carry 100kg of fire retardant, enabling them to respond to the fire without human involvement, generating significant safety and cost benefits.³⁴



Border Force

The UK Border Force is already using drones, including the Tekever AR5 UAS, to patrol UK borders. Thermal imagery cameras are able to detect illegal border crossings and act as a deterrent.³⁵ As the technology develops, the adoption of UAS will help the Border Force achieve operational improvements and potential cost savings compared to using helicopters and boats for border patrols. In addition, there is also potential to leverage drone technology on land at border checkpoints (e.g. at ports) to provide greater security to these sites.

³³ Essex County Fire and Rescue Service 'Fire Service introduce an 'eye in the sky' drone to support firefighters at incidents', June 2023 – available at: [Fire Service introduce an 'eye in the sky' drone to support firefighters at incidents](https://www.essex-fire.gov.uk/news/fire-service-introduce-an-eye-in-the-sky-drone-to-support-firefighters-at-incidents) | Essex County Fire and Rescue Service ([essex-fire.gov.uk](https://www.essex-fire.gov.uk))

³⁴ Lancashire Fire and Rescue Service 'Lancashire Fire and Rescue Service tests drones with Windracers for wildfire prevention', August 2024 – available at: [Lancashire Fire and Rescue Service tests drones with Windracers for wildfire prevention](https://www.lancsfireandrescue.org.uk/news/lancashire-fire-and-rescue-service-tests-drones-with-windracers-for-wildfire-prevention) | Lancashire Fire and Rescue Service ([lancsfireandrescue.org.uk](https://www.lancsfireandrescue.org.uk))

³⁵ UK Parliament 'Written evidence submitted by James Cowan MBE (CHA0056)', November 2020 available at: [UK Parliament Written Evidence](https://www.parliament.uk/written-evidence/cha0056)

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8. Transport and energy: Elevating asset and infrastructure management

8.1 Rail trespassing incidents

Trespassing on railway tracks is a major issue facing Network Rail and the British Transport Police (BTP). Around 19,000 incidents are recorded each year, roughly one incident for every mile of track in the country.³⁶ Drones can be deployed to provide a bird's eye view of the railway, which can help to detect trespassers quickly, keep people safer and minimise delays. Our forecasts project that using drones to identify trespassers could **save the UK rail industry and wider economy up to £56.3m per year** by 2035.

What can drones make more efficient and why?

Network Rail is responsible for owning, repairing and developing the railway infrastructure in England, Scotland and Wales, which includes 20,000 miles of railway track.³⁷ They work alongside the BTP to run a safe, reliable, and efficient railway service. A major component of this work involves identifying and responding to trespassing incidents.

Over the last five years, the number of railway trespassing incidents in Britain has increased by 40.7% from 13,500 to 19,000 incidents.³⁸ There are significant cost implications associated with trespassing incidents as trains are forced to wait while the operator locates the trespasser. Responding to trespassing incidents is incredibly time consuming, with each incident taking nearly 40 minutes to resolve on average. Delayed and cancelled trains due to trespassing incidents create passenger dissatisfaction and require train operators to provide financial compensation to affected travellers, at significant cost. In addition, Network Rail is forced to pay compensation to train operating companies to compensate lost revenue due to delays.

Network Rail and the BTP have started using drones to find trespassers faster, with the aim of keeping railways safer and minimising delays to train services.³⁹ Drones have cameras with high-quality zoom and thermal imaging to speed up the process of locating a trespasser before they come to harm. Deploying drones to respond to trespassing incidents should be prioritised to save lives, improve the safety of railway operations, improve passenger satisfaction, and reduce costs associated with lost minutes of service.

³⁶ Network Rail 'Network Rail and British Transport Police issue warning ahead of expected surge in trespass incidents across the rail network', March 2024 – available at: [Network Rail and British Transport Police issue warning ahead of expected surge in trespass incidents across the rail network \(networkrailmediacentre.co.uk\)](https://www.networkrailmediacentre.co.uk)

³⁷ Network Rail 'Who we are', September 2024 – available at: [Who we are – Network Rail](https://www.networkrail.co.uk)

³⁸ Network Rail 'Reducing the number of Trespass Incidents and their impact on the railway', August 2019 – available at: [Reducing the number of trespass incidents and their impacts on the railway \(networkrail.co.uk\)](https://www.networkrail.co.uk)

³⁹ Network Rail 'Network Rail and British Transport Police using drones to track down trespassers', October 2022 – available at: [Network Rail and British Transport Police using drones to track down trespassers \(networkrailmediacentre.co.uk\)](https://www.networkrailmediacentre.co.uk)

Saving millions, reducing delays, and making railways safer

Deployment of drones by **Network Rail and the British Transport Police** could generate **£56.3m** per year of economic benefits by reducing delay time to passengers and reducing payments by Network Rail to train operators for delays. Our forecasts project that total costs to the rail industry could be reduced by an enormous **£593m over the next 12 years**.

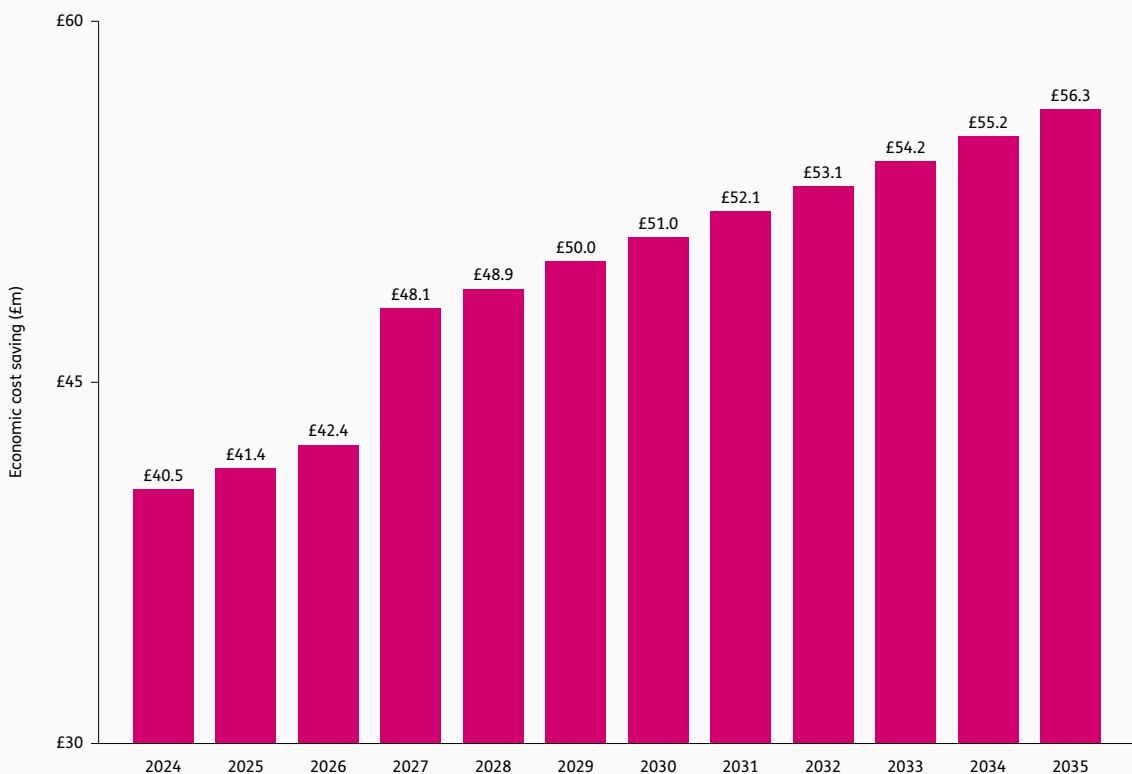


Figure 6: Economic cost savings from using drones to respond to trespassing incidents on the railway

Our forecasts of economic cost savings increase significantly by 13.3% in 2027 due to the introduction of one-to-many BVLOS operations. This is because the operational cost per hour of deploying a BVLOS operation is 71.9% lower than a VLOS drone operation, and the time saved in responding to a trespassing incident increases from 50% to 55%. Introducing automated one-to-many BVLOS drone operations and increasing response efficiency causes **drone operational costs for Network Rail and the BTP to fall by 89.5%**, from £864,000 today to £91,000 by 2035.

Our estimate of the operational costs fluctuates depending on how frequently trespassing incidents occur over the course of a day. For example, if a UAS mission commander is only able to target two trespassing incidents simultaneously, compared to six incidents, operational costs would increase by 54.7%. Network Rail report that the incidence of trespassing increases significantly during the school spring and summer holidays, meaning they will need to ensure drones teams have greater capacity during these periods.

Beyond these economic cost savings, a more effective response to trespassing incidents could potentially save lives and improve the safety of the public, passengers, and railway workers by alerting train drivers to incidents more promptly. This is a serious issue that deserves attention as there were 10 fatal accidents involving trespassing on UK mainline railways between April 2023 and March 2024.⁴⁰ Based on Transport Analysis Guidance from the DfT, the economic cost of 10 fatal accidents is estimated at £26.5m.⁴¹ Drones equipped with AI software can automatically detect abnormal behaviour (i.e. someone walking near the tracks) and subsequently send alerts to railway control centres, allowing trains to stop in time to prevent accidents.

What are the potential blockers?

Use of drones in response to trespassing incidents currently operates on a small scale as there are a range of challenges faced by Network Rail and the BTP:

- **Drone capability investment:** Investing in dedicated drone flying teams across all routes and regions will be needed to establish an effective service, which can be on standby to respond to incidents on the railway.
- **Regulatory approvals:** Collaboration with the regulator may be required to obtain authorisations to routinely conduct BVLOS operations above the railway tracks to support effective surveillance and operational cost savings.



8.2 Other asset and infrastructure management use cases

Drones can lend vital support across publicly owned and operated infrastructure, such as highways, railways, ports, and the energy grid. In some instances, drones are already being used to inspect assets across many of these types of infrastructure.

⁴⁰ Office of Rail and Road 'Rail Safety', September 2024 – available at: [Rail safety | ORR Data Portal](#)

⁴¹ Department for Transport 'TAG data book', May 2024 – available at: [tag-data-book-v1.23-may-2024.xlsm \(live.com\)](#)

The development of regulations to allow higher-risk operations and BVLOS will unlock an increased capability for organisations to make use of drones. This will likely come at a reduced cost, as organisations will be able to phase out the use of helicopters for such tasks.

Drone-assisted asset and infrastructure inspection also offers important safety benefits, reducing the need for people to climb and fly close to assets. Meanwhile, on highways, drones are already being used to analyse and improve congestion with VLOS. This can be expanded and made more efficient with the eventual introduction of BLVOS operations.⁴²



Network Rail asset inspection

Network Rail already uses drones to monitor their 20,000 miles of track and 30,000 bridges, tunnels, and viaducts—but with a limited range due to a lack of BVLOS operations. The scale of Network Rail drone operations and their efficiency will increase as regulations progress, providing the potential for significant cost savings.⁴³



National Grid asset inspection

National Grid is increasingly using drones for asset inspection. A new project that began in 2023 with Manchester University aims to use drones to inspect the electric field of high voltage overhead line insulators for defects. Estimates suggest that if deployed after the initial research project, this use case could **save the National Grid £2.8m over a 15-year period**.⁴⁴



Environment Agency use cases

The UK Environment Agency (EA) already deploys drones in support of several activities. Advances in regulation and technology will allow the organisation to increase the number and capability of these operations. Here, the main use cases include:

1. Inspection of regulated industries and illegal waste activities in industrial areas.
2. Agricultural use cases, where the EA plays an advisory/regulatory role in encouraging farmers to avoid pollution and soil runoff by identifying bare soils.
3. Asset inspection, such as the inspection of culverts (drains under railways and urban structures) and surveying inside tunnels.

⁴² Highways Magazine 'Highways – Situation Critical', October 2024 – available at: [Highways Magazine \(pagesuite-professional.co.uk\)](https://www.highwaysmagazine.com/pagesuite-professional.co.uk)

⁴³ Network Rail 'Drones or Unmanned Aircraft Systems (UAS)', September 2024 – available at: [Drones or Unmanned Aircraft Systems \(DRONE\) – Network Rail](https://www.networkrail.co.uk/drones)

⁴⁴ National Grid 'National Grid and University of Manchester pilot drone-mounted electric field sensors for pylon inspections', March 2023 – available at: [National Grid and University of Manchester pilot drones-mounted electric field sensors for pylon inspections | National Grid Group](https://www.nationalgrid.com/uk/news/national-grid-and-university-of-manchester-pilot-drones-mounted-electric-field-sensors-for-ylon-inspections)



National Highways use cases

National Highways is actively leveraging drone technology to enhance road maintenance, safety, and efficiency across the UK's road network. Drones provide several key benefits for inspecting and monitoring infrastructure, for instance, drones can inspect hard-to-reach areas (e.g. bridges, tunnels and overpasses) more quickly, safely and efficiently than traditional inspections, which often require lane closures and heavy machinery. As the resource requirements are less intensive, drones enable more frequent inspections, which can help to detect faults earlier.

In addition, using drones to survey hazardous areas, such as roads susceptible to landslides and flooding, National Highways can gather critical data to inform decision-making for road repairs without exposing workers to dangerous conditions. Drones can be deployed to monitor live traffic conditions and respond to incidents more efficiently. They can capture high-resolution images and videos in real-time, providing traffic management teams with better situational awareness, helping to clear incidents more quickly. All of this could help National Highways to improve the efficiency of road network management, reducing costs and enhancing safety while minimising traffic disruptions.



Ports Authority use cases

The adoption of drones presents efficiency, safety, and security benefits to maritime ports. In the Netherlands, the Port of Rotterdam Authority has been exploring the use of drones for various applications, including infrastructure inspection, monitoring of port activities, and environmental surveillance. Drones have been utilised to provide real-time aerial footage of the port, enabling authorities to assess the condition of infrastructure and detect potential safety hazards. Similarly, in Germany, the Hamburg Port Authority has been leveraging drones for tasks such as surveying, mapping, and monitoring port facilities. Drones offer the capability to access hard-to-reach areas and provide valuable data for port management and maintenance.

These initiatives in Rotterdam and Hamburg demonstrate the potential of drones to revolutionize the UK's port operations. Drones offer cost-effective and innovative solutions for a wide range of tasks, ultimately contributing to the overall efficiency and safety of port activities.



NEW HORIZONS: THE CASE FOR PUBLIC SECTOR DRONE INVESTMENT

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APPENDIX

10. About the research

9. Healthcare: Reducing costs, improving outcomes

There are specific healthcare use cases where drone deliveries could result in millions of pounds in cost savings and alleviate pressure on the UK's healthcare system. We estimate that such interventions could **save the NHS a total of 2.65 million hours of delivery time** and **£42.9m in operational costs** from 2027 to 2035. What's more, drone deliveries could **reduce greenhouse gas emissions by 16.6m kg CO₂e** from 2024 to 2035, which is valued at £1.57m.

In this section, we will explore how adopting a drone delivery model can generate significant time, environment and operational cost savings for healthcare systems delivering blood, platelets, pathology samples, systematic anti-cancer therapy drugs and radionuclides for Positron Emission Tomography.

9.1 Blood transfusion services

The adoption of drones to deliver packs of blood and platelets to hospitals can bring considerable efficiencies for blood transfusion services across the UK, which is critical for these time-sensitive operations. Our forecasts show that switching from delivery vans to drones where possible could save up to **145,000 hours of delivery time** annually for routine and ad-hoc deliveries, while **completing emergency deliveries 3.7 times faster** than traditional emergency response services.

In addition, we estimate that blood transfusion services could **cut operational costs by £4.1m annually** by 2035. Transitioning deliveries to drones could generate environmental savings of between **728,000 and 843,000 kg CO₂e** emissions per year for blood transfusion services.

What can drones make more efficient and why?

The UK operates four blood transfusion services – NHS Blood and Transplant (NHSBT) for England, the Scottish National Blood Transfusion Service (SNBTS), the Welsh Blood Service (WBS) and the Northern Ireland Blood Transfusion Service (NIBTS).⁴⁵

In August 2024, NHSBT in collaboration with medical logistics company Apian, used drones to successfully transport ten units of packed blood cells 68km between Wansbeck Hospital and Alnwick Infirmary in Northumbria. The trial was a ground-breaking step forward in the development of drone medical deliveries. The blood packs were delivered using BVLOS and the results indicated that the deliveries did not influence the blood's quality or longevity. The trial has demonstrated that drones are a viable solution to delivering blood packs safely and quickly, which is critical considering the time-sensitive nature of blood transfusions. A similar trial for platelets is currently being planned.⁴⁶

⁴⁵ European Blood Alliance 'United Kingdom', September 2024 – available at: United Kingdom – European Blood Alliance

⁴⁶ NHS Blood and Transplant 'Drones successfully fly blood packs in longest ever 'beyond visual line of sight' flights in UK first', August 2024 – available at: Drones successfully fly blood packs in longest ever 'beyond visual line of sight' flights in UK first – NHS Blood Donation

Blood transfusion services operate within a complex supply chain. Logistics services collect blood from donation centres, which is then packaged and finally delivered to hospitals based on patient demand. Our report focusses on the delivery of packs of blood and platelets via drones versus traditional delivery methods (i.e. vans).



Drones get vital medical supplies where they're needed, faster and cheaper than vans

Delivering samples of blood and platelets via drones could create significant benefits for blood transfusion services over traditional van-based deliveries. In 2035, we estimate that delivering via drones could **save nearly 145,000 hours per year for routine and ad-hoc deliveries**, equating to **1.15 million hours** from 2027 to 2035. Time savings increase by 90% from 2027 to 2035 as drones can transport a greater number of blood and platelet packs per delivery due to technological advancements.

These time savings are crucial to improving the efficiency of blood transfusion services and subsequently patient outcomes. Delivering packs of blood and platelets to hospitals quicker means that the donations have a longer shelf life,

helping to reduce shortages and ultimately saving lives. Furthermore, time savings will enable blood transfusion services to dedicate more resources to collecting samples to reduce shortages. In addition, blood transfusion services will have more resources available to invest in research and development to drive innovation to improve transfusion outcomes.

Adopting drones offers similar time savings for emergency deliveries. As drones are faster than vans and can fly on a direct path to their destination, we estimate that **drones can complete emergency deliveries 3.7 times faster than existing emergency deliveries**. These time savings could make the difference between life and death in emergency situations.

As well as significant time savings, our forecasts project that drone deliveries could generate **operational cost savings of up to £4.1m per year** by 2035 for blood transfusion services across the UK, equating to **£28.7m in total savings** from 2027 to 2035. Currently, it is not commercially viable to replace existing transportation methods with drone deliveries for blood transfusion services. Using drones to deliver blood and platelet packs in the current operational and regulatory environment would cost 68.8% more than existing van deliveries. However, unlocking routine BVLOS operations from 2027 stands to **reduce total drone operational delivery costs by £14.6m**, making it 21% cheaper to deliver via drones rather than vans.

The introduction of BVLOS one-to-many drone operations has the potential to **reduce routine drone delivery costs by 85.7% from 2024 to 2035**. For emergencies, the case for drone delivery exists today, even without BVLOS operations. Our estimates indicate that emergency drone deliveries are 69.3% less expensive than emergency van deliveries. This is because existing emergency deliveries are delivered via blue light services, which have an average cost of £249 per operation.⁴⁷

⁴⁷ Department of Health and Social Care 'NHS injury costs recovery scheme: tariff and charges from 1 April 2024', April 2024 – available at: NHS injury costs recovery scheme: tariff and charges from 1 April 2024 – GOV.UK (www.gov.uk)

As well as operational efficiencies, the use of drones rather than delivery vans generates significant environmental benefits. Currently, drones emit 97.3% less CO₂e emissions per mile than delivery vans due to being battery powered and consuming lower energy overall.⁴⁸ We have estimated that drones could save blood transfusion services **9.4m kg CO₂e emissions** from 2024 to 2035, **valued at £894,000** by the UK Emissions Trading Scheme.⁴⁹ In the drone delivery model, over 87% of CO₂e emissions are from contingency tax when there is bad weather. If technological developments could reduce the operational downtime from 19% to 5%, environmental savings would increase to **11.6m kg of CO₂e emissions**.

Even when accounting for the introduction of lower-emissions delivery vans, we estimate that the **drone delivery model would produce 80.3% less CO₂e than delivery vans** by 2035, due to the increase in the number of packs that can be delivered per drone. If we remove deliveries completed by contingency tax, we estimate that drone deliveries would produce 38,600 kg CO₂e emissions in 2035, which is **95% less** than the 766,000 kg CO₂e produced by delivery vans. Replacing vans with drones to deliver blood and platelet samples will likely produce further environmental savings from reducing traffic flow, especially for hospitals that are in busy city centres.

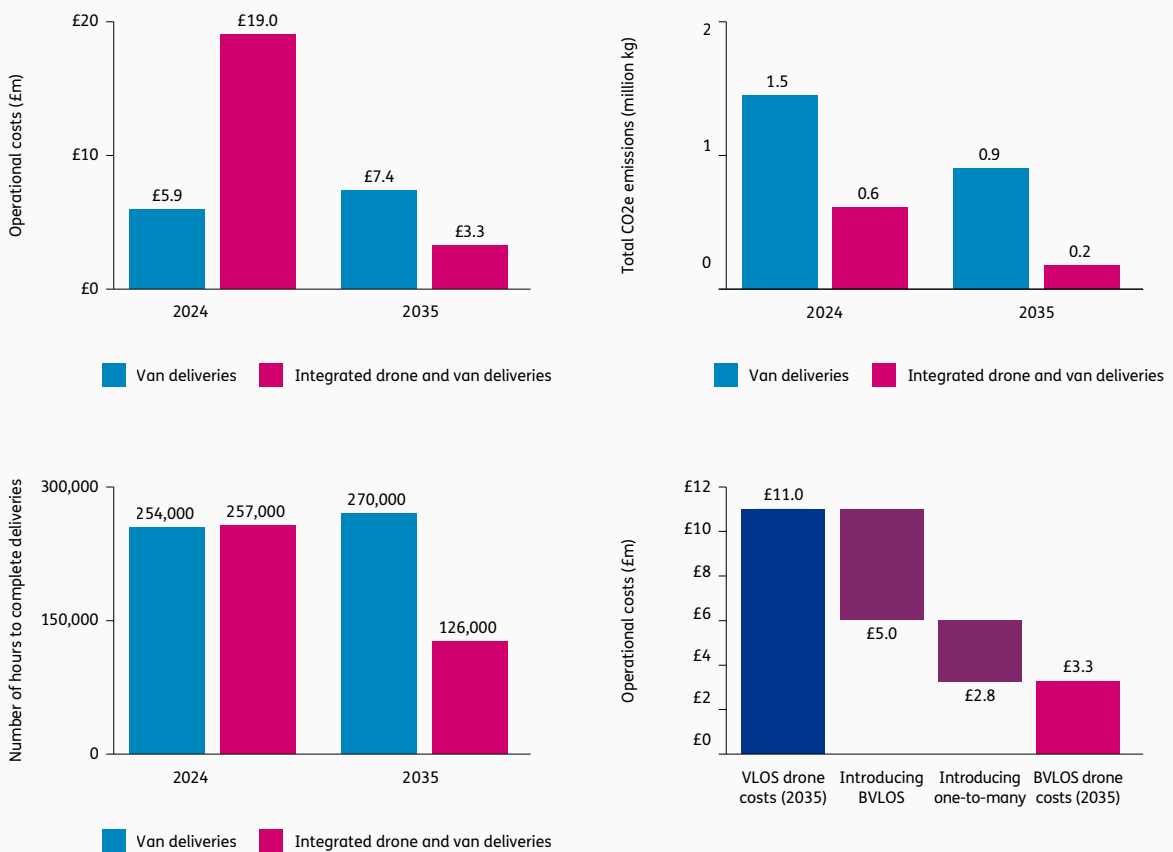


Figure 7: Benefits of using drones to deliver blood and platelets compared to vans (2024 and 2035)

⁴⁸ See Table 1 – Cross-cutting assumptions

⁴⁹ Department for Energy Security and Net Zero ‘Traded carbon values used for modelling purposes, 2023’, November 2023 – available at: Traded carbon values used for modelling purposes, 2023 – GOV.UK (www.gov.uk)

What are the potential blockers?

There are several challenges associated with achieving a large-scale rollout of drone deliveries to support blood transfusion services:

- **Regulatory complexities:** Healthcare organisations will need to work closely with the appropriate regulators (both in health and aviation) to secure the required authorisations to ensure that operations are safe and compliant, especially when delivering regulated items such as blood.
- **Technological hurdles:** The time-sensitive nature of blood transfusion makes reliability of drone delivery technology a must. Given that drones are estimated to have a downtime of 19%,⁵⁰ robust contingency plans will be required to ensure deliveries can take place on a 24/7 basis, as is the current situation.
- **Integration with existing healthcare systems:** Fragmentation of the NHS system means significant investment and coordination between healthcare providers and drone operators will be required to establish a network of delivery drones that can integrate into the existing complex supply chain. However, the adoption of drones creates the opportunity for the NHS to develop a more efficient blood distribution supply chain, enabling the sharing of resources between blood distribution units and reducing the need for duplicative infrastructure.

9.2 Delivery of pathology samples

Leveraging drone technology can help to deliver pathology samples for testing sooner, enabling faster diagnosis and treatment of patients. We estimate that the NHS could generate **time savings of 127,000 hours annually** and **reduce operational costs by £2.0m per year** by adopting drones to deliver pathology samples from GPs where possible. Making this switch could also generate environmental savings of between **489,000 and 805,000 kg CO₂e emissions** per year.

What can drones make more efficient and why?

Within the NHS supply chain ecosystem, logistics providers transport pathology samples from GPs to laboratories to diagnose illnesses. The NHS has been exploring the adoption of drone deliveries to improve the efficiency of this process. The advantage of drone deliveries is that they are typically quicker than existing transportation methods, meaning samples can be tested sooner, enabling faster diagnosis and treatment of patients. This is especially crucial in time-critical scenarios, where an early diagnosis could potentially be lifesaving.

In August 2024, NHS laboratory specimens were delivered by drones for the first time in Scotland. Transporting laboratory samples by road between NHS Borders and NHS Lothian currently takes five hours, as delivery vans make multiple pick-ups. **Drones reduced the delivery time by 88% to 35 minutes.**⁵¹ The trials have demonstrated that transporting pathology samples by drone is a viable solution for accelerating clinical decision-making, helping healthcare providers move closer to same-day diagnosis and treatment.

⁵⁰ See Table 1 – Cross-cutting assumptions

⁵¹ NHS Lothian ‘NHS laboratory specimens delivered by drone for first time by Project CAELUS’, August 2024 – available at: [NHS laboratory specimens delivered by drone for first time by Project CAELUS – News & Media](https://www.nhs.uk/news/2024/08/nhs-laboratory-specimens-delivered-by-drone-for-first-time-by-project-caelus) (nhslothian.scot)

Supplying samples with significantly lower cost, effort, and environmental impact

The main advantage of using drones to deliver pathology samples is the significant reduction in time and resources required for deliveries compared to traditional transportation methods. We have estimated that deploying an integrated drone and van delivery model could **save logistics services nearly 127,000 hours annually in delivery time** by 2035. Between 2024 to 2035, this could save **a total of up to 1.5 million hours**.

Achieving these potential time savings will be critical to improve patient outcomes. Delivering pathology samples to laboratories sooner will help to increase the quality of the samples tested, leading to a higher chance of detecting diseases. Early detection enables timely intervention, which often leads to more effective, less expensive and less invasive treatments. In addition, drones can easily reach GPs that are difficult to access by road, improving the healthcare services located in rural areas. Furthermore, drones will help to reduce road traffic, which will be especially beneficial in congested urban areas where traditional transport could face delays, potentially leading to pathology samples expiring before reaching testing sites.

Another advantage of leveraging drones is that they can deliver pathology samples to people's homes directly rather than patients needing to collect them in person. This will help to reduce footfall at healthcare facilities, freeing up resources for more urgent medical care. Reducing the need for in person visits presents particular benefits for elderly individuals or those with mobility issues, as they can avoid the physical strain of travelling and face less exposure to infections.

Transporting pathology samples is not currently commercially viable as deploying an integrated drone and van delivery model would currently cost £7.2m more than van delivery operational costs. However, the introduction of routine BVLOS operations from 2027 has the potential to **reduce annual operational costs by £7.8m**, making the integrated delivery model £0.8m less expensive than van delivery costs. By 2035, operational cost savings **could increase by 169% to £2.0m per year**, due to advancements in automation. We estimate that **total savings could equal £14.2m** from 2027 to 2035.

We have estimated that drones could save NHS logistics providers **7.2m kg CO₂e emissions from 2024 to 2035, equivalent to £673,000**. Delivery vans currently produce 1.0m kg CO₂e emissions, which is nearly five times more than our estimate for the integrated drone and van delivery model. By 2035, the introduction of more electric delivery vans will reduce CO₂e emissions to 636,000 kg CO₂e. However, this is still 76.9% more than our estimate for using an integrated drone delivery model. If we remove deliveries completed by contingency taxis, we estimate that drone deliveries would produce 54,500 kg CO₂e emissions in 2035, which is **90% less** than the 544,000 kg CO₂e produced by electric delivery vans.



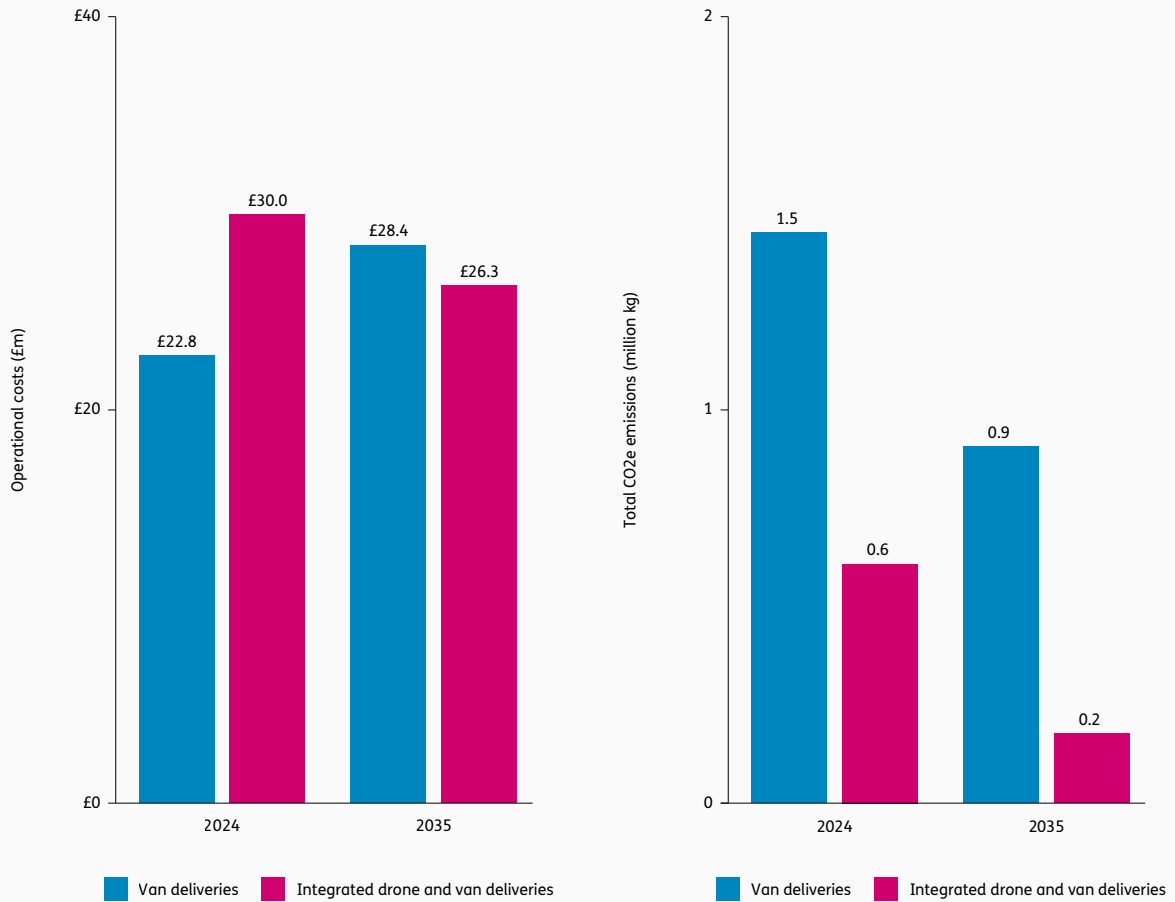


Figure 8: Operational cost savings and environmental savings from using drones to deliver pathology samples (2024 and 2035)

What are the potential blockers?

The NHS faces several challenges in using drones to deliver pathology samples:

- **Regulatory blockers:** Safety regulations surrounding BVLOS operations, flying over congested areas, and flying at night pose a significant barrier to using drones to deliver pathology samples. Approvals from different regulators in both healthcare and aviation will be required. This issue is exacerbated by the fragmentation of the NHS system, as individual NHS Trusts will be required to apply for authorisations. Pathology samples could also be considered hazardous items, requiring extra protocols to be in place.
- **Technical limitations:** Drones have limited payload capacity, which means that they may not be able to carry large or heavy pathology samples. In addition, drones have limited range and flight time, which may restrict their ability to deliver samples over long distances.
- **Patient privacy:** Pathology samples contain sensitive patient information, and there is a risk that this information could be compromised during the delivery process. Ensuring the security and privacy of patient data is crucial to the delivery of pathology samples.

9.3 Other healthcare use cases



Delivery of systematic anti-cancer therapy drugs

The NHS uses systematic anti-cancer therapy (SACT) drugs, such as chemotherapy and immunotherapy, to treat patients with cancer. Last year, the NHS administered nearly 2.8m doses of SACT drug treatments in England.⁵² With the Royal College of Radiologists estimating that demand for SACT treatments will increase by 6-8% annually, there will be significant pressure on the NHS to deliver up to 6.5m doses of SACT drug treatments by 2035.⁵³

Drone-assisted delivery could play a vital role in easing this pressure, as trials have already shown. In 2022, the Isle of Wight NHS Trust successfully used drones to transport chemotherapy drugs across the Solent strait. The trial indicated that **drones could cut delivery times from four hours to 30 minutes** – making deliveries more than 85% faster on average.⁵⁴ This helps to reduce wastage and waiting times for treatments, driving down costs and improving patient outcomes. As demand for SACT drug treatments increases, leveraging drone technology will be essential to ensuring that patients receive their medication on time, particularly for those in remote areas.



Delivery of radionuclides for Positron Emission Tomography

Positron Emission Tomography (PET) uses radioactive tracers to detect abnormal changes in tissue, typically cancers.⁵⁵ PET requires radionuclides often with very short half-lives (2-110 minutes) to enable faster and more sensitive diagnosis for more patients.

The short half-life of these products presents challenges for healthcare services, as the time between production and clinical use must be minimised to ensure effectiveness. Either these radionuclides are produced on-site, using a particle accelerator (cyclotron), or in nearby facilities and couriered (via road) to the hospital. Couriering via vans is problematic as it is susceptible to delays, which can result in unusable products on delivery. To counter this issue, greater quantities of radionuclides are shipped, which increases costs and radiation risk.

Using drones to deliver radionuclides would enable faster and more reliable delivery of radionuclides to increase the effectiveness of PET scans. This will increase early detection of cancers, meaning more patients can be treated sooner. In addition, using drones increases the safety of the deliveries as there is less exposure to the radiation risk. Development of a regional delivery network, which utilises several hospitals and institutes will enable a greater range of radionuclides to be shipped to more hospitals, increasing the reach of diagnosis and treatment.

⁵² NHS England 'Systematic Anti-Cancer Therapy Activity Dashboard', September 2024 – available at: [SACT Activity Dashboard \(shinyapps.io\)](#)

⁵³ The Royal College of Radiologists 'The SACT capacity crisis in the NHS', 2023 – available at: [rcr-policy_policy-briefing-the-sact-capacity-crisis-in-the-nhs.pdf](#)

⁵⁴ NHS England 'Drone deliveries of vital chemotherapy to the Isle of Wight', September 2024 – available at: [Greener NHS » Drone deliveries of vital chemotherapy to the Isle of Wight \(england.nhs.uk\)](#)

⁵⁵ NHS England 'PET scan' March 2024 – available at: [PET scan – NHS \(www.nhs.uk\)](#)

Appendix

10. About the research

10.1 Stakeholder engagement

Throughout the development of this paper, we have consulted with stakeholders across the public sector, including central government departments, regulators, infrastructure operators, healthcare providers, and police forces. We also worked with universities and private sector companies, including drone developers and manufacturers.

10.2 Economic method of quantifying costs

Our default approach was to quantify costs using economic modelling techniques, which allowed us to estimate the operational costs of using drones to deliver public services. For certain areas where there was insufficient data to support a quantitative analysis, we have provided a qualitative assessment.

In the analysis, we have compared the cost of using drones to business-as-usual activities to deliver the relevant public service. For use cases where drones are not able to replace all existing business-as-usual activities, we have estimated the cost of operating a blended delivery model.

In areas where costs could be quantified, we used a set of parameters and assumptions to conduct the analysis. To maintain uniformity in our assessment, we consistently applied parameters and assumptions that are common across use cases. The table below displays these parameters:

Table 1: Cross-cutting assumptions^{56,57}

Parameter	Baseline Value
Van delivery driver pay per hour ⁵⁸	£12.57
Van loader / unloader pay per hour ⁵⁹	£10.26
Van mileage cost per mile, including insurance, vehicle tax, depreciation, fuel, tyres, maintenance and overheads ⁵⁹	£0.46
Van g CO ₂ e per mile ⁶⁰	305.6 g CO ₂ e

⁵⁶ All costs are in 2024 prices

⁵⁷ CO₂e emissions have been converted into miles and use Worldwide Light Vehicle Test Procedure (WLTP)

⁵⁸ Indeed, 'Delivery driver salary in England', July 2024 – available at: [Delivery driver salary in England \(indeed.com\)](#)

⁵⁹ Oakey, A., Grote, M., Smith, A., Cherrett, T., Pilko, A., Dickinson, J., and Aitbihiouali, L 'Integrating drones into NHS patient diagnostic logistics systems: Flight or fantasy', December 2022 – available at: [Integrating drones into NHS patient diagnostic logistics systems: Flight or fantasy? | PLOS ONE](#)

⁶⁰ Department for Transport, 'CO₂ emission performance standards for new passenger cars and light commercial vehicles,' March 2024 – available at: [CO₂ emission performance standards for new passenger cars and light commercial vehicles – GOV.UK \(gov.uk\)](#)

Parameter	Baseline Value
Average speed of delivery vans ⁶¹	23.7 mph
UAS mission commander pay per hour ⁵⁹	£50
UAS safety pilot (spotter) pay per hour ⁵⁹	£50
UAS loader / unloader pay per hour ⁵⁹	£10.26
Electricity cost per kWh ⁵⁹	£0.17
Maintenance cost per hour ⁵⁹	£0.41
Insurance cost per flying hour ⁵⁹	£2.28
Average speed of a drone ⁶²	68 mph
Drone g CO ₂ e per mile ⁶³	8.4 g CO ₂ e
Downtime in drone operations due to poor weather ⁵⁹	19%
Cost per hour of using taxis as contingent delivery services ⁶⁴	£27.56
Average speed of contingency taxis ⁶¹	23.7 mph
Contingency taxi g CO ₂ e per mile ⁶⁵	185.2 g CO ₂ e
Airbus EC135 helicopter kg CO ₂ e per hour ⁶⁶	610 kg CO ₂ e
Airbus EC145 helicopter kg CO ₂ e per hour ⁶⁷	770 kg CO ₂ e
NPAS helicopter kg CO ₂ e per hour (weighted average) ⁶⁸	638 kg CO ₂ e

⁶¹ Department for Transport, 'Travel time measures for local 'A' roads: January to December 2022 report', March 2023 – available at: Travel time measures for local 'A' roads: January to December 2022 report – GOV.UK (www.gov.uk)

⁶² NHS Blood and Transplant 'Drones successfully fly blood packs in longest ever beyond visual line of sight flights in UK first', August 2024 – available at: Drones successfully fly blood packs in longest ever 'beyond visual line of sight' flights in UK first – NHS Blood Donation

⁶³ Gaia Consulting 'Potential Benefits of Drone Deliveries in Helsinki', 2021 – available at: cccdb99966ab71d08af-6b990e4e3ff687751122130934f82f55f960ecfcf75a987ec36a5ae4be130c482824eeb0febcb6790d8346a3a707508165c045c2c74436 (googleusercontent.com)

⁶⁴ DfT transport analysis guidance (TAG), May 2024 – available at: tag-data-book-v1.23-may-2024.xlsm (live.com)

⁶⁵ Department for Transport, 'CO₂ emission performance standards for new passenger cars and light commercial vehicles,' March 2024 – available at: CO₂ emission performance standards for new passenger cars and light commercial vehicles – GOV.UK (www.gov.uk)

⁶⁶ Conklin & de Decker 'CO₂ Calculator – Airbus Helicopters EC135', September 2024 – available at: CO₂ Calculator for Aircraft – Conklin & de Decker (jetsupport.com)

⁶⁷ Conklin & de Decker 'CO₂ Calculator – Airbus Helicopters EC145', September 2024 – available at: CO₂ Calculator for Aircraft – Conklin & de Decker (jetsupport.com)

⁶⁸ NPAS operates a fleet of 19 helicopters (15 Airbus EC135 and 4 EC145). We have used these details to estimate a weighted average of an NPAS helicopter kg CO₂e per hour.

Parameter	Baseline Value
Tekever AR5 kg CO ₂ e per hour ^{69,70}	85.1 kg CO ₂ e
Drone-in-a-box operation kg CO ₂ e per hour ⁷¹	0.19 kg CO ₂ e
Leonardo AW189 helicopter kg CO ₂ e per hour ⁷²	1250 kg CO ₂ e
Leonardo AW 139 helicopter kg CO ₂ e per hour ⁷³	1240 kg CO ₂ e
Sikorsky S-92As helicopter kg CO ₂ e per hour ⁷⁴	1710 kg CO ₂ e
MCA helicopter kg CO ₂ e per hour (weighted average) ⁷⁵	1323 kg CO ₂ e
Schiebel S-100 kg CO ₂ e per hour ^{76,77}	13.3 kg CO ₂ e

Baseline costs have been inflated each year using inflation estimates provided by the Office for Budget Responsibility.^{78,79} Forecast costs have been presented in nominal prices and have not been discounted. We have used population growth rates from the Office for National Statistics as a proxy to forecast the number of operations required in future years (e.g. number of helicopter tasks).

In addition to estimating operational cost savings, we have estimated the potential environmental benefits of using drones in the public sector. Currently, it is estimated that delivery drones produce 97.3% less CO₂e emissions compared to traditional vans as they are powered by batteries rather than fossil fuels and reduce congestion on the roads. However, the

⁶⁹ Frazer-Nash Consultancy 'Decarbonising General Aviation', September 2022 – available at: [Decarbonising general aviation: understanding the carbon footprint of general aviation \(publishing.service.gov.uk\)](#)

⁷⁰ BEIS and Defra 'UK Government GHG Conversion Factors for Company Reporting', September 2022 – available at: [ghg-conversion-factors-2022-flat-format.xls \(live.com\)](#)

⁷¹ Baringa analysis of University of Technology Sydney 'Empirical Power Consumption Model for UAVs', 2018 – available at: [google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjKgqu-reOIAxU2TKEAHd03I4YQFnoECBcQAQ&url=https%3A%2F%2Fopus.lib.uts.edu.au%2Frest%2Fbitstreams%2F30e4d4a8-2d55-4be5-b262-a21b0a8f6972%2Fretrieve&usg=AOvVaw007WkPimPzyfRMGteM0SnU&opi=89978449](#)

⁷² Conklin & de Decker 'CO₂ Calculator – Leonardo Helicopters AW189', September 2024 – available at: [CO₂ Calculator for Aircraft – Conklin & de Decker \(jetsupport.com\)](#)

⁷³ Conklin & de Decker 'CO₂ Calculator – Leonardo Helicopters AW139', September 2024 – available at: [CO₂ Calculator for Aircraft – Conklin & de Decker \(jetsupport.com\)](#)

⁷⁴ Conklin & de Decker 'CO₂ Calculator – Sikorsky Helicopters S-92A+', September 2024 – available at: [CO₂ Calculator for Aircraft – Conklin & de Decker \(jetsupport.com\)](#)

⁷⁵ MCA operates 12 helicopter bases (6 AW189, 4 AW139 and 2 S-92As). We have used these details to estimate a weighted average of an MCA helicopter kg CO₂e per hour. Information on helicopter bases available at: [SAR2G_News_letter_mar_2024.pdf \(publishing.service.gov.uk\)](#)

⁷⁶ Schiebel 'CAMCOPTER S-100 Unmanned Air System Specifications', September 2024 – available at: [CAMCOPTER® S-100 System – Schiebel](#)

⁷⁷ BEIS and Defra 'UK Government GHG Conversion Factors for Company Reporting', September 2022 – available at: [ghg-conversion-factors-2022-flat-format.xls \(live.com\)](#)

⁷⁸ Office for Budget Responsibility 'Economic and fiscal outlook', March 2024 – available at: [Economic and fiscal outlook – March 2024 – Office for Budget Responsibility \(obr.uk\)](#)

⁷⁹ Office for Budget Responsibility 'Fiscal risks and sustainability', July 2023 – available at: [Fiscal risks and sustainability – July 2023 – Office for Budget Responsibility \(obr.uk\)](#)

UK Government has set out its plan for zero emission vehicles by 2035, so we can expect to see the introduction of more environmentally friendly delivery vans over the next decade.⁸⁰ In our analysis, we did not want to overestimate the potential CO₂e emission savings from transitioning to drones. Therefore, we have used the UK targets for reducing CO₂e emissions – a 15% reduction for cars and vans between 2025 and 2029, plus a 37.5% reduction for cars and 31% reduction for vans from 2030.⁸¹ Despite the targets to reduce emissions, we estimate that drones will produce 95.3% less emissions than vans by 2035.

10.3 Overall results

Table 2 shows the quantified operational costs for business-as-usual activities compared to drone operations in 2024. As expected, replacing traditional delivery methods with VLOS drone operations in the healthcare sector generates higher operational costs, because the existing supply chain network of vans is relatively cost-effective.

However, drones can deliver medical products 3.7 times faster than traditional delivery methods. This is because drones are able to travel faster than vans and have less distance to cover as they are able to fly directly to a destination. The increased speed may justify the higher costs for the highly time-sensitive use cases (e.g. delivering pathology samples, blood and platelets) to ensure patients receive a higher quality of care.

For public safety and infrastructure use cases, replacing NPAS helicopter tasks with drone-in-a-box operations and using drones to monitor trespassing incidents generates immediate cost savings.

Table 2: Summary of costs in 2024

Use case	Business-as-usual	Drone Operations	% Cost Saving
NHS Pathology sample delivery	£22.8m	£30.0m	-31.6%
NHS Blood Transfusion Services	£5.9m	£19.0m	-222.0%
Police operations	£36.7m	£35.4m	3.5%
Railway trespass incidents ⁸²	£82.4m	£41.8m	49.3%
MCA Search and Rescue ⁸³	£5.9m	£5.9m	0%

⁸⁰ GOV.UK 'Pathway for zero emission vehicle transition by 2035 becomes law – GOV.UK (www.gov.uk)', January 2024 – available at: Pathway for zero emission vehicle transition by 2035 becomes law – GOV.UK (www.gov.uk)

⁸¹ Department for Transport, 'CO₂ emission performance standards for new passenger cars and light commercial vehicles,' March 2024 – available at: CO₂ emission performance standards for new passenger cars and light commercial vehicles – GOV.UK (www.gov.uk)

⁸² We have estimated the overall economic cost of trespassing incidents impacting the railway

⁸³ Uncrewed aircraft systems do not impact MCA's operational costs before 2027

As per the government's UK Future of Flight Action Plan, we assume that BVLOS operations will come into force from 2027. Enabling BVLOS operations in 2027 cuts blood transfusion service costs by 17.5% relative to business-as-usual operations. The introduction of UAS stands to produce even greater cost efficiencies for NPAS aircraft operations and MCA search-and-rescue missions due to their 50% lower hourly run rate.

Table 3: Summary of costs in 2027

Use case	Business-as-usual	Drone Operations	% Cost Saving
NHS Pathology sample delivery	£24.3m	£23.5m	3.3%
NHS Blood Transfusion Services	£6.3m	£5.2m	17.5%
Police operations	£39.1m	£20.0m	48.8%
Railway trespass incidents	£87.7m	£39.7m	54.7%
MCA Search and Rescue	£6.3m	£5.1m	19.0%

The case for deploying drones in the public sector presents the greatest benefits at the end of the appraisal period in 2035, due to advancements in technology and increased automation potential. As an example, we forecast that in our healthcare case studies, a drone mission commander will be able to monitor a network of 20 UAS autonomously in 2035, compared to only one UAS in 2024 and four UAS in 2027. Increasing the number of UAS flown per mission commander from one UAS to 20 UAS reduces the operational cost per hour of a UAS flight by over 600%.

Overall, the operation of UAS and advancements in BVLOS flights could potentially generate up to **£86.6m of cost savings per year** in our quantified use cases, demonstrating that drones bring tangible cost benefits to a range of public sector activities.

Table 4: Summary of costs in 2035

Use case	Business-as-usual	Drone Operations	% Cost Saving
NHS Pathology sample delivery	£28.4m	£26.3m	7.4%
NHS Blood Transfusion Services	£7.4m	£3.3m	55.4%
Police operations	£45.8m	£23.2m	49.3%
Network Rail and British Transport Police trespass incidents	£102.6m	£46.3m	54.9%
MCA Search and Rescue	£7.4m	£5.9m	20.3%

10.4 Technical Annex

This section provides details on the data, assumptions, and methodologies used to estimate the potential savings for each of the quantified use cases that feature in the report.

10.4.1 BVLOS uncrewed aircraft systems in policing

We have forecasted the potential cost savings of using UAS BVLOS instead of helicopters for appropriate tasks. With trials commencing in 2025, we forecast that NPAS will have an operational fleet of UAS from 2027, in line with the UK Government's Future of Flight Action Plan.

In 2023, NPAS aircraft completed a total of 15,262 tasks, for a total of 11,177 flying hours.⁸⁴

The table below provides a breakdown of our forecasted type of tasks and whether UAS would be appropriate to complete the operation.

Table 5: Forecast number of NPAS aircraft tasks

Type of task	Is UAS capable of/suitable for completing the task? (✓/✗)	Baseline	2027	2035
Suspect search	✓	3,781	3,869	4,022
Vehicle search	✓	4,317	4,417	4,592
Missing person search	✓	3,067	3,138	3,263
Injured person/concern for welfare	✓	1,922	1,967	2,045
Containment of scene	✗*	544	557	579
Public order incident	✗*	206	211	219
Thermal imagery request	✓	436	446	464
Vehicle follow	✗	255	261	271
Other	✗	734	751	781
Total		15,262	15,616	16,235

*Containment of scene and public order incidents NPAS tasks are replaced by drone-in-a-box operations

We forecast that UAS could potentially replace an upper limit of 89% of NPAS aircraft operations. In this analysis, we present the feasible limit of the quantified cost savings that could be achieved by replacing helicopters with UAS. It should be caveated that NPAS does not

⁸⁴ National Police Air Service 'Annual Report 2023/23', 2023 – available at: NPAS Annual Report 2022/23 – FINAL VERSION

intend on replacing their fleet of existing aircraft, as they aim to deliver a highly capable air support service that leverages the appropriate technology depending on the task at hand. The table below provides the assumptions used to conduct the analysis:

Table 6: Cost per hour of NPAS operations

Parameter	Baseline	2027	2035
NPAS helicopter cost per hour ⁸⁵	£3,200	£3,331	£3,748
Estimated NPAS UAS cost per hour	–	£1,666	£1,874

10.4.2 Drone-in-a-box operations

In 2023, there were a total of 750 NPAS aircraft tasks related to containing crime scenes and surveying public order incidents.⁸⁶ Considering poor weather conditions, we have assumed that drone-in-a-box operations could replace 81% of these NPAS aircraft tasks.

In 2024, we assume that BVLOS operations will still be in their infancy, meaning only one drone-in-a-box operation can take place per UAS mission commander, with a UAS safety pilot (spotter) required to observe the drone flight. From 2027, we project that the cost-per-operation will fall, as the police can deploy BVLOS drone-in-a-box operations without the need for a UAS safety pilot. By 2035, we assume that one UAS mission commander can control an upper limit of six drone-in-a-box operations at once. This is a lower estimate than in our healthcare case study as policing requires greater oversight of UAS activity.

We have a baseline estimate of 19,402 drone operations if we combine the existing number of operations with the number of NPAS aircraft tasks replaced by drone-in-a-box operations. Our estimate is that the operational cost for these 19,402 drone operations is £1.01m in total or £52.18 per operation. The introduction of one-to-many BVLOS operations could reduce the overall cost to £132,000 by 2035. This works out as £6.40 per operation under our estimate of 20,638 drone-in-a-box operations in 2035, which is an 87.7% reduction in operational costs compared to our baseline estimate.

10.4.3 Maritime and Coastguard Agency search and rescue

We have estimated the potential operational cost savings available to the MCA by using UAS BVLOS instead of helicopters for appropriate search and rescue tasks. In line with our approach to estimating cost savings for NPAS, we have assumed that the MCA will be able to roll out an operational fleet of UAS from 2027. In 2023, the UK SAR-H completed a total of 2,588 search and rescue helicopter tasks. The table below provides a breakdown of our forecast type of taskings and whether UAS would be appropriate to complete the operation.

⁸⁵ West Yorkshire Police 'FOI Ref 1124/21 NPAS Costs', March 2021 – available at: [March 2021 FOI 1124-21 NPAS Costs \(westyorkshire.police.uk\)](https://www.westyorkshire.police.uk)

⁸⁶ National Police Air Service 'Annual Report 2023/23', 2023 – available at: [NPAS Annual Report 2022/23 – FINAL VERSION](#)

Table 7: Forecast number of MCA Search and Rescue aircraft tasks

Type of tasking	Is the uncrewed aircraft system capable to complete the task type? (✓/✗)	Baseline	2027	2035
Rescue and recovery	✗	1,319	1,350	1,403
Support	✓	544	557	579
Search only	✓	465	476	495
Pre-arranged transfers	✗	260	266	277
Total		2,588	2,648	2,753

We forecast that UAS could potentially replace an upper limit of 39% of UK SAR-H operations. This technology is suitable for supporting search and rescue missions by locating casualties quickly, mitigating the risk and reducing the cost of using expensive SAR assets. In addition, the MCA can inform its SAR capability by leveraging UAS technology to gather information on local factors which may impact an incident, including the state of the tide and weather. UAS will not replace the crucial role of helicopters rescuing individuals from compromising situations, as human involvement is required.

In 2023, the MCA had an operating expenditure of £5.9m on search and rescue helicopters.⁸⁷ Therefore, our baseline operating cost estimate per SAR-H operation is £2,280. From our discussions with government and industry partners, we estimate the cost of operating UAS BVLOS to be roughly half the cost of operating helicopters due to lower labour and fuel costs. The table below provides the assumptions used to conduct the analysis:

Table 8: Cost per operation of NPAS operations

Parameter	Baseline	2027	2035
MCA helicopter cost per operation ⁸⁸	£2,280	£2,373	£2,670
Estimated MCA uncrewed aircraft cost per operation	–	£1,187	£1,335

⁸⁷ Maritime and Coastguard Agency 'Maritime and Coastguard Agency Annual Report and Accounts', July 2023 – available at: [MCA_Annual_Report_and_Accounts_2022-23_V2_print_ready.pdf](#) (publishing.service.gov.uk)

⁸⁸ Maritime and Coastguard Agency 'Maritime and Coastguard Agency Annual Report and Accounts', July 2023 – available at: [MCA_Annual_Report_and_Accounts_2022-23_V2_print_ready.pdf](#) (publishing.service.gov.uk)

10.4.4 Rail trespassing incidents

We have forecasted the potential cost savings of using drones to reduce the service delays associated with railway trespassing incidents. In 2019, Network Rail released a report, stating that vandalism and trespass incidents contributed to 1.04 million minutes of disruption to railway services, amounting to £55m of performance delay costs.⁸⁹ Performance delay costs can be defined as the payment by Network Rail to train operators for not being able to generate revenue due to their services being delayed.

Using these estimates, we have assumed that our baseline performance delay cost per minute of disruption is equal to £52.78. The number of trespassing incidents per year has increased from 13,500 in 2019 to 19,000 in 2024. Using these values, we estimate that 0.74 million minutes were lost due to trespassing incidents in 2024. Therefore, our baseline estimate is that trespassing incidents generate a performance delay cost of nearly £39m.

In addition to the performance delay costs, there is an economic cost associated with passengers' time being lost due to delayed and cancelled trains. The DfT estimates the economic value of railway passengers' time lost due to disruption at £15.53 per hour.⁹⁰ We have used passenger data from the Office of Rail and Road to estimate that an average of 227 passengers travel per train journey.⁹¹ Overall, our baseline estimate for the total economic cost of train passengers losing time due to delays and cancellations is £43.4m. In total, the cost to the rail industry associated with trespassing incidents is equal to a considerable £82.4m.

There is an opportunity for Network Rail and the BTP to significantly reduce the cost of trespassing incidents. From our discussions with rail industry partners, it is estimated that the deployment of drones could reduce the time it takes to respond to trespassing incidents by 50 – 55%. In 2024, we assume that BVLOS operations are still in their infancy, meaning that Network Rail and BTP can achieve a maximum of 50% reduction in delays through deploying VLOS drones.

However, we assume that delays could be reduced by 55% from 2027 due to the deployment of BVLOS drones, which have the capability to view a larger area and subsequently identify the trespasser. The capability required to identify trespassers is comparable to drone-in-a-box surveillance operations. Therefore, we have used the same operational cost assumptions to estimate the cost for Network Rail and the BTP to use drones to identify trespassers and reduce train service delays.



⁸⁹ Network Rail 'Reducing the number of Trespass Incidents and their impact on the railway', August 2019 – available at: [Reducing the number of trespass incidents and their impacts on the railway \(networkrail.co.uk\)](https://www.networkrail.co.uk)

⁹⁰ Department for Transport 'TAG data book', May 2024 – available at: [tag-data-book-v1.23-may-2024.xlsm](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/123456/tag-data-book-v1.23-may-2024.xlsm) (live.com)

⁹¹ Office for Road and Rail 'Passenger rail performance', May 2024 – available at: [Passenger rail performance – January to March 2024 \(orr.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/123456/passenger-rail-performance-january-to-march-2024.pdf)

10.4.5 Blood transfusion services

Blood transfusion services operate within a complex supply chain. Logistics services collect blood from donation centres, which is then packaged and finally delivered to hospitals based on patient demand. Our report focusses on the delivery of packs of blood and platelets via drones versus traditional delivery methods (i.e. vans).

In 2023, blood transfusion services in the UK delivered over two million units of blood and platelets, with NHSBT delivering 76% of these units in England.^{92,93} In all, NHSBT made 86,700 routine deliveries between collection centres and hospitals, 40,700 ad-hoc deliveries (when there was a surge in patient demand), and 2,200 emergency deliveries.⁹⁴ We have used the number of blood and platelets delivered by other blood transfusion services and population statistics from the ONS to forecast the total number of deliveries across the UK.

We have assumed that the number of packs of blood and platelets delivered depends on the type and mode of delivery. As routine deliveries are planned between collection centres and hospitals, we assume that blood transfusion services maximise the number of packs of blood and platelets per delivery. However, ad-hoc and emergency deliveries are more sporadic based on patient demand, meaning blood transfusion services are not able to pre-plan the deliveries and instead service the demand at the point of request.

Drones have a lower payload than delivery vans, so they deliver fewer packs of blood and platelets per routine delivery. However, as the technology develops over time, we assume that drones will be able to transport a higher number of units of blood and platelets per routine delivery than today. Table 9 provides our assumptions on the number of units of blood and platelets delivered, depending on the type and mode of delivery.

Table 9: Number of deliveries of blood and platelets units

Type of delivery	Number of packs delivered per van delivery			Number of packs delivered per drone delivery		
	Baseline	2027	2035	Baseline	2027	2035
Routine deliveries	17	17	17	4	6	10
Ad-hoc deliveries	2	2	2	2	2	2
Emergency deliveries	1	1	1	1	1	1

⁹² NHS Blood and Transplant 'Five-year Blood Service Strategy', 2023 – available at: [31573-0251nd-blood-supply-strategy.pdf](https://www.nhs.uk/consult/condemned/31573-0251nd-blood-supply-strategy.pdf) (nhsbt.dbe.blob.core.windows.net)

⁹³ European Blood Alliance 'United Kingdom', September 2024 – available at: [United Kingdom – European Blood Alliance](https://www.eba.europa.eu/en/uk)

⁹⁴ NHS Blood and Transplant 'Five-year Blood Service Strategy', 2023 – available at: [31573-0251nd-blood-supply-strategy.pdf](https://www.nhs.uk/consult/condemned/31573-0251nd-blood-supply-strategy.pdf) (nhsbt.dbe.blob.core.windows.net)

The higher the number of packs supplied per delivery, the lower the cost of the delivery, meaning that routine deliveries are cheaper than emergency deliveries. Table 10 provides our assumptions for the operational cost of a drone delivery and the cost components for van deliveries.

Table 10: Operational cost of delivery vans versus drones⁹⁵

Delivery mode	Baseline	2027	2035
Van mileage cost per mile	£0.46	£0.48	£0.54
Van delivery driver cost per hour	£12.57	£13.09	£14.72
Van loader / unloader cost per hour	£10.26	£10.68	£12.02
Contingency taxi cost per hour	£27.60	£28.73	£32.32
Operational cost of drones delivery per hour	£113.12	£26.55	£17.80

In 2035, we have assumed that a drone mission commander can oversee an upper limit of 20 drone deliveries at once due to advancements in automation. The overall impact of introducing one-to-many BVLOS operations is that the estimated drone delivery cost per hour falls by 84% from £113 to just below £18.

10.4.6 Delivery of pathology samples

We have estimated the potential cost and time savings of replacing traditional delivery vans with drones to transport pathology samples from GPs to testing laboratories. In our analysis, we have used results from a 2022 study by Oakey et al. to estimate our baseline costs.⁹⁶ This study estimated the costs of using drones versus delivery vans to deliver pathology samples to laboratories from GPs in Southampton. We have extrapolated these estimates to forecast total operational costs for all GPs in the UK.

Using results from the study and our cross-cutting assumptions (table 1), we have formulated the following parameters, on which we have calculated our baseline estimate for business-as-usual delivery costs.



⁹⁵ See Table 1 – Cross-cutting assumptions

⁹⁶ Oakey, A., Grote, M., Smith, A., Cherrett, T., Pilko, A., Dickinson, J., and Aitbihiouali, L 'Integrating drones into NHS patient diagnostic logistics systems: Flight or fantasy', December 2022 – available at: Integrating drones into NHS patient diagnostic logistics systems: Flight or fantasy? | PLOS ONE

Table 11: Summary of assumptions used to calculate our baseline business-as-usual delivery costs

Assumption	Baseline estimate
Total hours to deliver pathology samples per GP per year	139
Total miles to deliver pathology samples per GP per year	2,326
Total delivery driver costs to deliver pathology samples per GP per year	£1,744
Total mileage costs to deliver pathology samples per GP per year	£1,070
Total delivery costs to deliver pathology samples per GP per year	£2,814

Similarly, we have used results from the study to form baseline assumptions of the average flight time to estimate costs of using drones to deliver pathology samples per GP in a year.

Table 12: Summary of assumptions used to calculate our baseline drone delivery costs

Assumption	Baseline estimate
Total flight time in hours to deliver pathology samples per GP per year	62.7
Total operating cost of a VLOS delivery drone per hour	£113
Total delivery costs to deliver pathology samples per GP per year	£7,092

As GPs are smaller than hospitals, the study found that only 17.7% of GPs had sufficient space to accommodate the infrastructure required for delivery drone take-off and landing. In our analysis, we have extrapolated this finding across the UK. Table 13 shows our estimates for the number of GPs that could be served by drones for each country in the UK.

Table 13: Number of GPs in the UK that could be served by drone deliveries

Country in the UK	Number of GPs	Number of GPs that could be served by drone deliveries
England ⁹⁷	6,495	1,150
Scotland ⁹⁸	911	161
Wales ⁹⁹	374	66
Northern Ireland ¹⁰⁰	317	56
United Kingdom	8,097	1,433

In the analysis, we have estimated the total operational cost of the current business-as-usual state versus a blended delivery model of drones and vans, used for GPs who cannot be served by drones alone. In the blended delivery model, we have assumed that adverse weather conditions prevent drones from operating 19% of the time. In these situations, we have estimated the cost of using a contingency taxi service to replace drone delivery. In line with our blood transfusion services case study, we assume that the NHS will be able to deploy one-to-many BVLOS drone deliveries from 2027.

⁹⁷ GP Online 'Fifth of GP practices have closed or merged since NHS England was formed', June 2022 – available at: [Fifth of GP practices have closed or merged since NHS England was formed | GPonline](#)

⁹⁸ Public Health Scotland 'General Practice – GP workforce and practice list sizes', December 2022 – available at: [General Practice – GP Workforce and practice list sizes 2012 – 2022 – General Practice – GP workforce and practice list sizes – Publications – Public Health Scotland](#)

⁹⁹ Welsh Government 'General practice workforce: as at 31 December 2023', April 2024 – available at: [General practice workforce: as at 31 December 2023 | GOV.WALES](#)

¹⁰⁰ Department of Health 'Publication of FPS General Medical Services For Northern Ireland, Annual Statistics 2022/23', June 2023 – available at: [Publication of FPS General Medical Services for Northern Ireland, Annual Statistics 2022/23 | Department of Health \(health-ni.gov.uk\)](#)



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