

# FUTURE AVIATION TECHNOLOGIES IN THE HIGHLANDS AND ISLANDS

Cleaner, better-connected links  
across our region by air



# Who helped to shape this work

This strategy has been created by HITRANS in collaboration with partners including:



Aquila Aviation



European Marine Energy Centre (EMEC)\*

\*Focusing on Orkney's current facilities and networks



Hybrid Air Vehicles



NHS Grampian (North Innovation Hub)



Skyports



Streamline Logistics



University of Highlands and Islands



Urban Foresight



Windracers

# Acronyms / Terms

## AAM

Advanced Air Mobility – emerging aviation technologies such as drones, electric aircraft, and eVTOL systems used for passenger or cargo transport.

## AMS

Airspace Modernisation Strategy – UK programme to modernise airspace and enable integration of new aircraft such as drones and eVTOL.

## ANSP

Air Navigation Service Provider – organisations responsible for managing and controlling air traffic safely.

## BVLOS

Beyond Visual Line of Sight – operating a drone or UAV beyond the pilot's direct visual range.

## CAP 2540

CAA regulatory sandbox framework allowing temporary airspace areas for testing new aviation technologies.

## CAP 3182

CAA roadmap outlining how BVLOS drone operations will be integrated into UK airspace.

## CAP 722

CAA guidance covering safe UAV operations in UK airspace.

## CAA

Civil Aviation Authority – the UK regulator responsible for aviation safety and airspace regulation.

## COMAH

Control of Major Accident Hazards – UK regulations governing the safe storage and handling of hazardous substances such as hydrogen.

## CONOPS

Concept of Operations – document describing how a system or technology will operate in practice.

## DfT

Department for Transport – UK government department responsible for national transport policy.

## DNO

Distribution Network Operator – companies responsible for operating and maintaining the electricity distribution network.

## EC

Electronic Conspicuity – systems that allow aircraft to electronically broadcast their position so other aircraft can detect them.

## eVTOL

Electric Vertical Take-Off and Landing aircraft – small electric aircraft capable of vertical take-off and landing.

## FPAG

Flight Path Advisory Group – proposed expert group coordinating sustainable aviation deployment in the Highlands and Islands.

## FFIG

Future of Flight Industry Group – national UK forum bringing together government and industry to guide the Future of Flight programme.

## GRT

Gross Register Tonnage – measurement of a ship's internal volume used in shipping statistics.

## HIAL

Highlands and Islands Airports Limited – company responsible for operating regional airports across northern Scotland.

## HITRANS

Highlands and Islands Transport Partnership – regional body responsible for strategic transport planning.

## HSE

Health and Safety Executive – UK regulator responsible for workplace safety and hazardous installations.

## ICAO

International Civil Aviation Organization – United Nations body responsible for global aviation standards.

## MDO

Multi-Disciplinary Optimisation – modelling approach used to identify optimal combinations of aircraft, infrastructure and operations.

## MRO

Maintenance, Repair and Overhaul – aviation industry term for aircraft servicing and maintenance activities.

## NATS

National Air Traffic Services – the UK's main air navigation service provider managing controlled airspace.

**NHS Scotland**

Scotland's publicly funded healthcare system responsible for delivering health services across the country.

**OIC**

Orkney Islands Council – local authority responsible for operating several airfields serving the Orkney islands.

**PSO**

Public Service Obligation – government-supported air routes that maintain essential connectivity for rural regions.

**RAUWG**

Regional Airspace Users Working Group – forum representing aviation stakeholders operating within regional airspace.

**Ro-Ro**

Roll-on/Roll-off – shipping method where vehicles drive on and off ferries carrying freight or passengers.

**SAF**

Sustainable Aviation Fuel – lower-carbon fuel designed to replace conventional jet fuel.

**SAS**

Scottish Ambulance Service – organisation responsible for ambulance and emergency medical transport across Scotland.

**ScotSTAR**

Scottish Specialist Transport and Retrieval – national service coordinating specialist patient transfers across Scotland.

**SEPA**

Scottish Environment Protection Agency – environmental regulator responsible for pollution control and environmental protection.

**SORA**

Specific Operations Risk Assessment – risk assessment framework used to approve complex drone operations.

**SSEN**

Scottish and Southern Electricity Networks – electricity distribution and transmission operator in northern Scotland.

**TRA**

Temporary Reserved Area – designated airspace area reserved for specific operations such as aircraft trials.

**UAV**

Uncrewed Aerial Vehicle – aircraft that operates without a pilot onboard, commonly referred to as a drone.

**UHI**

University of the Highlands and Islands – regional university providing education and training, including aviation-related courses.

**UKRI**

UK Research and Innovation – UK organisation funding research and innovation programmes.

**UTM**

Unmanned Traffic Management – systems designed to manage drone traffic safely alongside traditional aircraft.

# Strategy overview

## This strategy explains how new, cleaner aviation technologies could improve travel and deliveries across the region over the next ten years.

The strategy has been developed by HITRANS with partners from industry, universities and public organisations. Its aim is to explore how new aircraft and air services could continue to make it easier for people and goods to move between communities.

The Highlands and Islands cover a large and rural part of Scotland, with around 470,000–500,000 people living across many towns and islands. Travelling between these places can take a long time and is often affected by weather, particularly when journeys rely on ferries or long road trips. Air travel already plays an important role in helping people reach hospitals, jobs, education and family, and it also supports tourism and local businesses. However, current air services face challenges, including ageing infrastructure, staff shortages and the need to reduce carbon emissions.

This strategy looks at how new types of aircraft could help improve regional transport. These include drones, electric and hybrid aircraft, hydrogen-powered aircraft, airships, eVTOL aircraft and seaglidors. Each technology is at a different stage of development. Drones are already being used in some places and could soon help deliver medicines, mail and small packages. Electric and hybrid aircraft are being tested for short passenger and cargo flights. Other technologies, such as hydrogen aircraft, airships and seaglidors, may become useful in the future as the technology develops.

Projects such as the Sustainable Aviation Test Environment (SATE) in Orkney have already shown that low-carbon aviation can be tested and operated at real airports. These trials show that rural regions like the Highlands and Islands are good places to test new aviation technology and help develop the rules needed for safe operations.

The region already has an extensive aviation network with regional airports and smaller airfields linking island communities to each other and to mainland Scotland. However, improvements will be needed to support new technologies. These include installing electric charging infrastructure, hydrogen refuelling facilities, better cargo handling and training for new aviation skills.

If introduced successfully, sustainable aviation could bring many benefits. It could help deliver medical supplies and test samples more quickly, improve access to services for rural communities and support businesses such as tourism, fisheries and aquaculture. Investment in new aviation technologies could also create skilled jobs and help the region move towards net zero emissions.

# Contents

## 6 Background

- 7 Why this strategy exists and what it covers
- 8 Why this matters for the region
- 10 What we have learned from past trials and projects

## 12 Aircraft types and their readiness

- 13 Readiness of all aircraft
- 14 Drones and uncrewed aircraft
- 15 Electric and hybrid-electric aircraft (Conventional Take-Off and Landing)
- 16 Hydrogen-powered aircraft
- 17 Electric vertical take-off and landing (eVTOL)
- 18 Airships
- 19 Seaglifters

## 20 Current facilities and networks

- 21 Airports and airfields in the region
- 27 Cargo and logistics networks
- 32 Energy supply and renewable energy
- 34 Where current infrastructure falls short

## 39 Social and economic impacts

- 40 Jobs, skills and a fair transition
- 43 Benefits for NHS logistics and healthcare
- 45 Impacts on aquaculture, seafood and freight
- 46 Tourism and local economic growth
- 47 Building the network for communities

## 48 Regional strategy and policy alignment

- 49 How this aligns with regional and national plans
- 50 Rules, regulation and governance
- 53 What helps or blocks delivery
- 54 Working with partners and stakeholders

## 56 Future roadmap

- 57 Use cases
- 59 Potential networks
- 63 How this will be funded
- 65 Priority actions and delivery plan

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# BACKGROUND

# Why this strategy exists and what it covers

This strategy sets out a plan for how new and more sustainable air travel options could be introduced and expanded across the Highlands and Islands over the next 10 years.

It is designed to help government, regulators, councils, transport providers, businesses, local communities and the wider public work together towards a shared goal: enabling new, safe and low-emission future aviation technologies that improve regional connectivity, support essential services, create economic opportunities and help deliver net zero ambitions across the Highlands and Islands.



This strategy aims to support new types of aircraft that:

- Make it easier to travel between rural towns and islands
- Bring investment and create skilled jobs in aviation
- Reduce carbon emissions and support cleaner aviation

The main ways these new aircraft will be used are:

- Delivering medical supplies and helping in emergencies
- Carrying goods and cargo to and from rural communities and islands in greater volumes
- Transporting passengers between small towns and islands
- Checking and maintaining infrastructure like power lines and bridges
- Supporting tourism and leisure travel to help the local economy

In 2035, this strategy will have been successful if it has provided clear benefits to communities and public services, including:

- Increased connectivity and reliability of regional air services
- Established new test routes and commercial flights
- Gained strong community and stakeholder support for aviation innovation
- Reduction in emissions through adoption of low-emission aircraft
- Growth in skilled jobs and regional supply chains
- Increased access to goods, cargo and supplies, including medical

# Why this matters for the region

The Highlands and Islands are a large, rural part of Scotland, home to about 470,000–500,000 people spread across a region larger than Wales and comparable in size to Belgium.. Many towns and islands are very small, with most communities under 5,000 people.

Air travel is really important here. It helps people get to hospitals, schools, and jobs, and it supports businesses and tourism. Airports like Sumburgh, Kirkwall, and Stornoway serve tens of thousands of passengers every year. Regular flights between islands, often several times a week are particularly important where ferry distances are long.

New types of aircraft could make travel and deliveries faster and cleaner. For example, drones could carry medical supplies or food to rural communities quickly.

Using these technologies could make life easier for people (e.g. by reducing travel times), help the economy grow, and protect the environment, so the Highlands and Islands can thrive in the future.

## The region has three key opportunities for improvement and growth:



### Getting Around

Travel options are limited in many areas, and trips by road or ferry can take a long time. Better air services would make travel quicker, more reliable, and easier for people who live in and visit the area.



### Keeping People in the Area

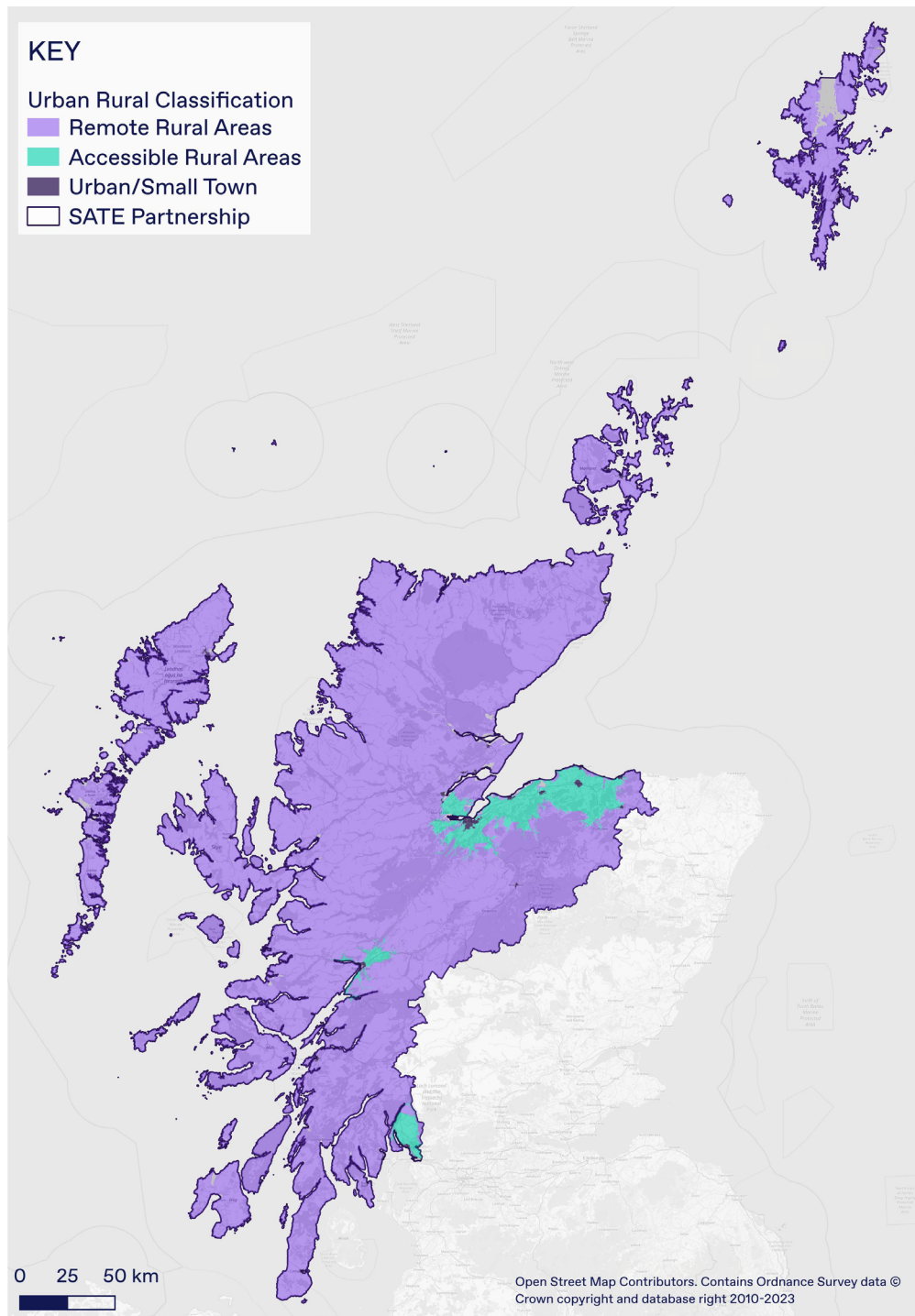
Improved transport would make it easier for young people to live, work, and study locally. It could also help attract new residents.



### Supporting the Local Economy

Tourism, energy, and local businesses are important to the region. Cleaner and more reliable transport, especially air travel, would help businesses grow, move goods more easily, and respond better in emergencies.

Figure 1 - Map of the region showing urban / rural areas



BACKGROUND

# What we have learned from past trials and projects

BACKGROUND

This strategy builds on work that has already taken place in the Highlands and Islands and across the UK. Earlier projects, such as SATE and Future Flight, tested new types of aircraft, airspace management, and ways to operate services safely and efficiently.

These trials have shown what is possible, including faster deliveries, better connections between rural communities, and the potential for cleaner, low-emission aviation. They also highlight what needs to change, such as infrastructure, regulations, and training, before new services can become part of everyday life.

## Sustainable Aviation Test Environment (SATE)

The SATE project, launched in 2020, demonstrates how regional airports can become living laboratories for low-carbon flight.

As the UK's first operationally based low carbon aviation test centre, located at Kirkwall Airport in Orkney, the project shows how real world airport environments can meaningfully accelerate the transition to sustainable aviation technologies. In the years that followed, the project hit major milestones: it set up a working test area for hybrid-electric and autonomous aircraft, carried out Scotland's first hybrid-electric flights, and trialled autonomous deliveries for Royal Mail.

Figure 2: In-flight view recorded during SATE project flight trials, featuring the Windracers ULTRA platform.

Image credit: Windracers.



### **Low-carbon aviation integrated into live airports**

A major learning from SATE is that testing next-generation aviation solutions, such as electric or hybrid, can successfully take place within an operational commercial airport. This reduces the gap between experimentation and deployment by ensuring technologies are evaluated under realistic constraints such as weather, passenger services, existing airline operations, maintenance, and safety procedures.

### **Rural areas provide ideal innovation testbeds**

The project illustrates that regions like Orkney, with geographically dispersed communities and essential air links, offer valuable proving grounds. Short flight routes, community reliance on aviation, and challenging operational environments make these locations uniquely suited for piloting clean-air technologies that can later scale across the UK and globally.

### **Cross-sector collaboration drives sustainable aviation progress**

SATE forms part of the Innovate UK Future Flight Challenge, bringing together national regulators, commercial aviation partners, researchers, and regional stakeholders. This multi partner ecosystem demonstrates that sustainable aviation requires coordinated effort across technology development, regulation, operations, and community engagement.

### **Regional aviation has high potential for early decarbonisation**

A key insight is that smaller aircraft, short-haul services, and rural-region logistics (e.g., medical deliveries, lifeline services) present strong early opportunities for low-carbon adoption. The SATE project underscores that these use cases can transition faster than large commercial aviation because they require less energy, shorter ranges, and more flexible infrastructure changes.

### **Testing shapes future aviation regulations**

By embedding testing in a live airport, SATE provides valuable data on operations, safety, infrastructure requirements, and public acceptance - information that regulators need to develop policies for electric and hydrogen flight. The project shows that test environments are not just technical spaces; they are essential tools for shaping the regulatory pathways that will allow sustainable aviation to scale.

### **Sustainable aviation strengthens communities and economy**

SATE highlights the potential economic and social benefits of clean aviation including improved connectivity for rural regions, reduced reliance on fossil fuels, opportunities for high-tech job creation, and alignment with regional net-zero strategies. This illustrates that sustainability in aviation is both an environmental and economic development opportunity.

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# AIRCRAFT TYPES AND THEIR READINESS

New types of aircraft are developing quickly, but they are not all at the same stage of readiness. Some are already flying today, others are still being tested, and many more are still just ideas that will be tried in the coming years.

This section explains which technologies are available now, which are expected to be ready soon, and which are longer-term opportunities.

# Readiness of all aircraft

Type	Readiness
Drones	Operational now, scaling subject to regulation
Electric/Hybrid CTOL	Early deployment on short routes
Hydrogen aircraft	Medium-to-long-term opportunity
eVTOL	Near to trial operations
Airships	Medium-term for freight and passenger roles
Seaglider	Near to early commercial use

AIRCRAFT TYPES AND THEIR READINESS

# Drones and uncrewed aircraft

Figure 3: Example of a 150kg payload drone produced by Windracers.

Image credit: Windracers.



Drones are the most advanced of the new aviation technologies. They are already being used in parts of the UK for tasks such as medical deliveries, inspections, and environmental monitoring.

In rural and island regions, drones are particularly well suited to:

- Carrying small, time-critical items such as medicines and test samples
- Flying short distances between fixed locations
- Operating in areas with low levels of other air traffic

## What still needs to happen?

- National aviation rules are still evolving, especially for flights beyond the pilot's line of sight
- Systems for managing drones safely alongside other aircraft need further development
- Community engagement is essential to address concerns about noise and safety

## What this means for the Highlands and Islands

Drones are likely to be the first technology deployed at scale, especially for NHS Scotland logistics, inspections, and island-to-island freight. Work is already underway with the CAA Drone Sandbox and SATE projects to make it safe for drones to fly beyond the pilot's sight, which will help make these services routine across the Highlands and Islands.

# Electric and hybrid-electric aircraft (Conventional Take-Off and Landing)

Figure 4: Example of an electric aircraft produced by Ampaire.  
Image credit: Ampaire.



Small electric and hybrid-electric aircraft are being tested and certified now. These aircraft look similar to today's small planes but use batteries or a mix of electric and conventional power.

They are best suited to:

- Short passenger routes
- Small cargo services
- Lifeline and inter-island connections

### What still needs to happen?

- Aircraft certification must be completed by regulators
- Airports need charging infrastructure and upgraded power supplies
- Operators and engineers need training on new systems

### What this means for the Highlands and Islands

Because routes are short and airports already exist, the region is well placed to adopt these aircraft early, particularly on routes currently served by small planes.

# Hydrogen-powered aircraft

Figure 5: Example of a hydrogen aircraft produced by Zeroavia.  
Image credit: Zeroavia.



Hydrogen aircraft offer longer range than fully electric aircraft and produce no carbon emissions at the point of use. Several designs are currently being tested, but they are not yet commercially available.

### What still needs to happen?

- Aircraft designs must complete testing and certification
- Safe hydrogen storage, and refuelling systems must be installed at airports
- Costs need to reduce before regular services are viable

### What this means for the Highlands and Islands

Hydrogen aviation is a medium-to-long-term opportunity, especially where the region's renewable energy resources can support local hydrogen production.

# Electric vertical take-off and landing (eVTOL)

Figure 6: Example of an eVTOL produced by Vertical Aerospace. Image credit: Vertical Aerospace.



Electric vertical take-off and landing (eVTOL) aircraft are still in the trial stage. These aircraft could eventually operate from very small sites, but passenger services are not yet routine anywhere in the UK.

### What still needs to happen?

- Safety certification for passenger use
- Clear rules for airspace integration
- Infrastructure such as landing sites and charging facilities
- Pilot training / regulatory approval

### What this means for the Highlands and Islands

eVTOL aircraft are not an immediate priority but may play a role later if the technology proves safe, affordable, and useful for rural communities. Most current eVTOL business models focus on dense urban areas, where short distances and high passenger volumes can justify costs.

# Airships

Figure 7: Example of an airship produced by Hybrid Air Vehicles.  
Image credit: Hybrid Air Vehicles.



## Modern airships are further along than many people realise.

Designs have been tested at full scale, and manufacturers are now working towards certification and early commercial operations. While airships are not yet in routine service in the UK, they are closer to real-world use than eVTOL aircraft for some cargo and specialist roles.

Airships are already covered by existing aviation rules set by the International Civil Aviation Organization (ICAO), so they do not face the same regulatory challenges as newer uncrewed aircraft. Airlander is not technically a traditional airship, but it will be certified as one. It mainly uses lighter-than-air technology to stay aloft, which keeps the benefits of airships while making it easier to handle on the ground.

Airships are best suited to:

- Carrying heavy or oversized cargo
- Serving rural or infrastructure-poor locations with greater capacity
- Niche passenger and tourism services

### What still needs to happen?

- Completion of safety certification for commercial operations
- Final investment and manufacturing scale-up
- Clear operating models for weather, ground handling, and landing sites

### What this means for the Highlands and Islands

Airships are not a short-term solution for everyday passenger travel in the region as their capacity is in excess of demand, but they could play a valuable medium-term role in freight, logistics, tourism and specialist operations. Their ability to operate with minimal ground infrastructure and lower emissions makes them potentially useful for rural locations, island supply chains, and oversized cargo, if commercial services become viable and reliable.

# Seaglidors

Figure 8: Example of a seaglider produced by Regent.  
Image credit: Regent.



AIRCRAFT TYPES AND THEIR READINESS

## Seaglidors are developing quickly.

They are classified as boats, not aircraft, and travel just above the water using a mix of hydrofoils and ground-effect gliding. Full-scale designs have already been tested, and companies are working on safety certification and early commercial operations.

While they are not yet in regular service in the UK, Seaglidors are closer to being used in the real world than many electric vertical take-off and landing (eVTOL) aircraft or high-speed ferries for certain coastal and island transport routes. Because they are boats, they face fewer regulatory hurdles than new uncrewed aircraft, though safety approval for passengers and cargo is still in progress.

### What still needs to happen?

- Completion of safety certification for commercial operations
- Final investment and manufacturing scale-up
- Clear operating models for docking, charging, and weather-dependent operations

### What this means for the Highlands and Islands

Seaglidors are not a short-term solution for everyday local commuting, as their capacity and operational costs may exceed current demand. However, they could play a valuable medium-term role in coastal and island transport, logistics, and tourism.

Their ability to operate with minimal port infrastructure, high speed, and zero emissions makes them potentially useful for connecting rural communities, supporting supply chains, and offering premium or specialised passenger services if commercial operations become viable and reliable.

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# CURRENT FACILITIES AND NETWORKS

This strategy looks at the whole Highlands and Islands aviation network. This includes regional airports and smaller local airfields that help people travel between islands and the Scottish mainland.

Orkney is used as an example to show how the network works in real life and why these air links are so important for island communities.

# Airports and airfields in the region

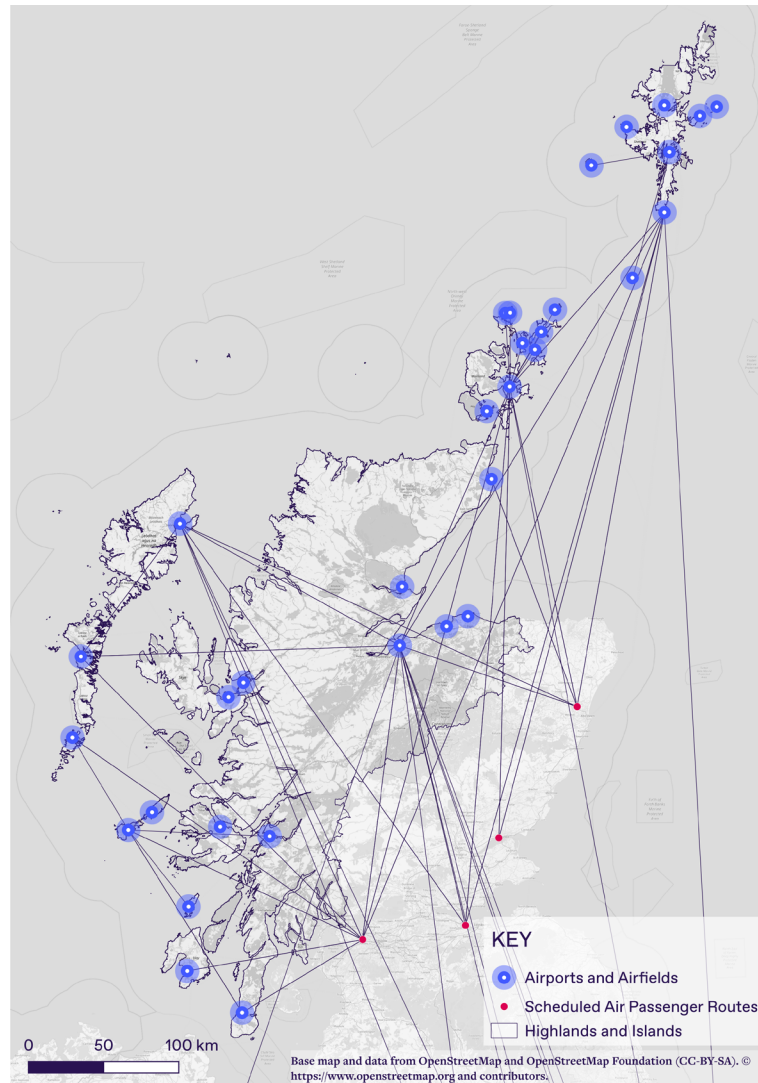
## Scale and importance

The Highlands and Islands have 11 airports and 15 local airfields.

HIAL manages the following airports:

- Barra Airport
- Benbecula Airport
- Campbeltown Airport
- Dundee Airport
- Inverness Airport
- Islay Airport
- Kirkwall Airport
- Stornoway Airport
- Sumburgh Airport
- Tiree Airport
- Wick Airport

Figure 9: Airports and airfields in the region



Additional local airfields/airstrips include Coll Airport, Colonsay Airport, Oban Airport, Skye Airport, Fair Isle Airport, North Ronaldsay Airport, Papa Westray Aiport, Tingwall Airport, Eday Airport, Foula Airport, Sanday Airport, Stronsay Airport, Papa Stour Airport, Lamb Holm International Airfield, Out Skerries Airfield and Whalsay Airstrip.

Together they help people travel for work, healthcare, education and family reasons. They also support tourism, local businesses, emergency services and the delivery of essential goods.

Each year, more than 1.4 million passengers use the region’s main airports including over 800,000 passengers per year at Inverness Airport.

## How the network is organised

### Highlands (mainland)

Mainland airports connect the region to the rest of Scotland and beyond.

- **Inverness Airport**  
The main regional hub with the largest range of flights and facilities.
- **Wick John O’Groats Airport**  
Provides important links for communities in the far north, including routes supported under the Public Service Obligation (PSO) to maintain essential connectivity.
- **Campbeltown Airport**  
Helps maintain essential connections for Kintyre and surrounding areas.

These airports provide access to the wider aviation network and onward travel to the islands.

### Islands

Some island airports act as key centres for travel within the region:

- **Stornoway Airport (Lewis)**  
A main gateway for the Western Isles.
- **Kirkwall Airport (Orkney)**  
A central hub linking the Orkney islands to each other and to mainland Scotland, with around 137,000 passengers annually.
- **Sumburgh Airport (Shetland)**  
A major northern transport hub supporting regional connectivity, healthcare access and key local industries, handling approximately 308,000 passengers per year. The airport also has a significant oil and gas presence, serving as a key helicopter base for transporting offshore workers to and from platforms in the North Sea.

These airports help people move between islands and connect to mainland services.

Smaller airports and airfields serve as vital lifelines for communities with limited transport options, providing scheduled flights and supporting emergency and medical travel across:

- Barra, Benbecula and Tiree airports
- Local airfields across Orkney, Shetland and Argyll & Bute, connecting smaller islands to their main hubs.

Many of these sites have short runways and basic facilities, but they are essential for daily life in rural communities.

The following provides more detail of how Kirkwall Airport in Orkney, as one of these island hubs, provides connection to both the Scottish mainland and lifeline services to its more rural North Isles.

## Orkney Airports and airfields

Kirkwall Airport is the main airport for Orkney, both connecting Orkney to regional hubs in mainland Scotland and acting as a local hub for island hops to Orkney’s Outer North Isles, as well as Shetland and Fair Isle. Kirkwall Airport is operated by Highlands and Islands Airports Limited (HIAL) with the main aircraft operator being Loganair. There are six Outer North Isles airfields and these are operated by Orkney Islands Council (OIC) to ensure lifeline connectivity for healthcare, education and transport.

As the regional airport, Kirkwall Airport has greater facilities for both passengers and operators than the Outer North Isles airfields. A full comparison of the facilities at these airports is shown in Table 1.

Table 1 Summary of facility differences between Orkney hub and Northern Isles airports<sup>1</sup>

	Kirkwall Airport	Outer North Isles Airfields
<b>Operator</b>	Highlands and Islands Airports Ltd.	Orkney Islands Council
<b>Opening hours</b>	Weekdays 07:15-20:00 with reduced weekend hours	Daylight only
<b>Passenger facilities</b>	Café, gift shop, waiting area, information desk, security checks	Waiting area
<b>Refuelling</b>	Jet A-1 and AV Gas delivered by bowser	None
<b>Type of traffic</b>	Instrument flight rules (low visibility) and visual flight rules (clear weather)	Visual flight rules only
<b>Rescue and fire fighting</b>	Category 5: 24-28m aircraft, maximum fuselage 4m Category 6 by prior arrangement: 28-39m aircraft, maximum fuselage 5m	Category A1: up to 9m aircraft Category 2 by prior arrangement: 9-12m aircraft
<b>Hangar space</b>	Yes	No
<b>Repair facility</b>	Yes	No
<b>Seasonal availability</b>	Mechanical and chemical de-icing equipment	No facilities
<b>Main runway surface</b>	Asphalt with grooved stopway	Graded hardcore
<b>Main runway dimensions</b>	1430 x 45m Second asphalt runway 677 x 19m	527 x 17m (Stronsay 515 x 18m)

<sup>1</sup> NATS, 2026 Aeronautical Information Publication. Available online at <https://nats-uk.ead-it.com/cms-nats/opencms/en/Publications/AIP/>

Orkney was a key strategic location during World War II due to the home naval fleet being based at Scapa Flow. Several airfields were built to support the defence of the fleet.

On mainland Orkney these were:

- RAF Kirkwall, also known as RAF Grimsetter, which became Kirkwall Airport.
- RNAS Hatston, which has now been redeveloped into Hatston Industrial Estate.
- RAF Skeabrae, has been sold off and converted back to farmland.
- RAF Twatt, has been sold off and converted back to farmland.

In addition, during World War I Houton Bay seaplane base was established, which is now Houton Ferry Terminal and services Hoy and Flotta.

There is also a privately owned airfield on the Isle of Flotta. This was built and used by the adjacent oil terminal, which is now being decommissioned, and the airstrip is only used by emergency services.

### Current services

The following is a list of operational insights for inter-island flights<sup>2,3,4</sup> :

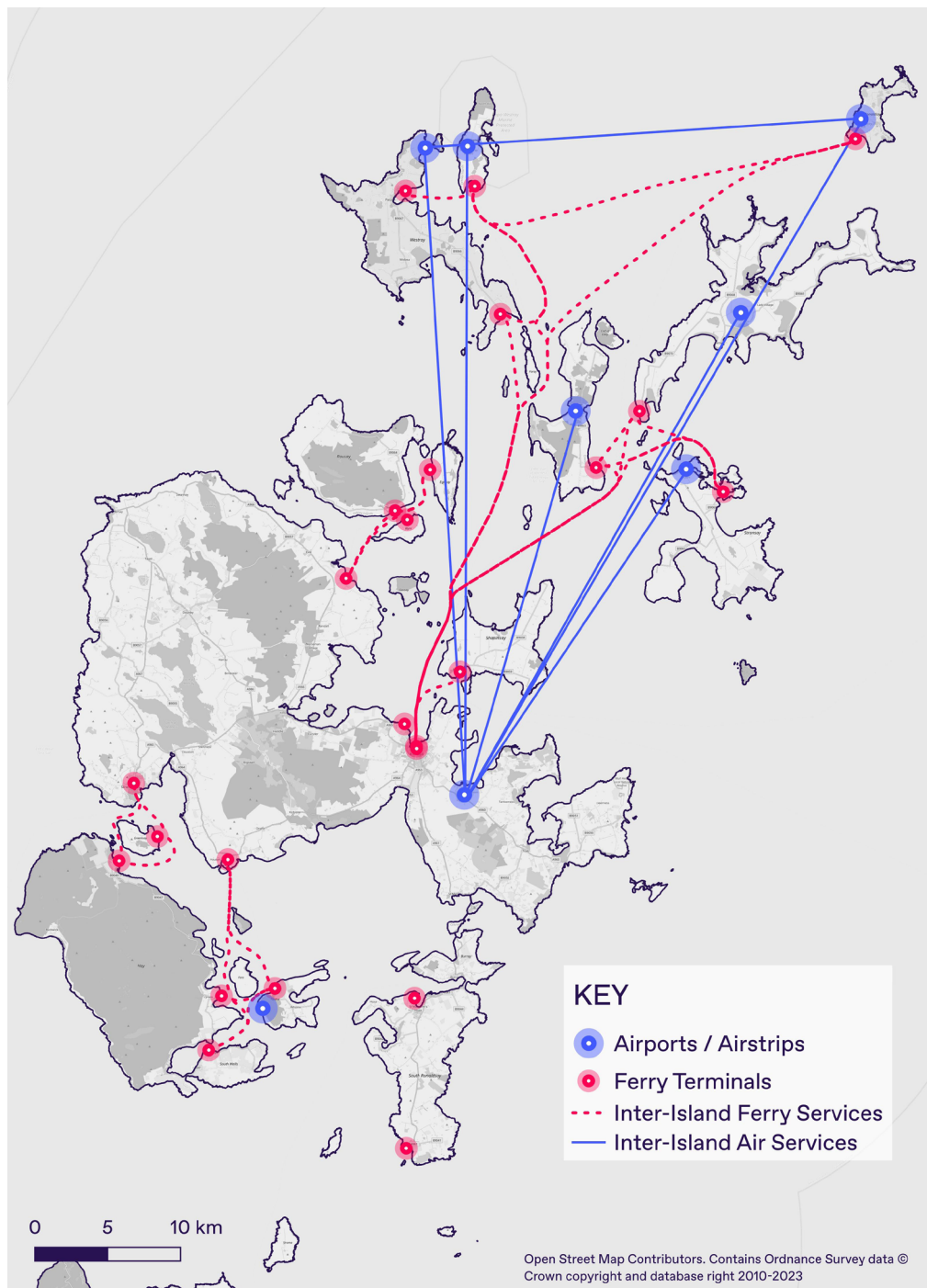
- There are two flights per day to each of the North Isles airfields on weekdays and Saturday, with a reduced service on Sundays. North Ronaldsay is the only exception with three flights per day.
- In total 21,995 passenger flights were made in the financial year 2023/24, with the most used route being North Ronaldsay with 6,544 passengers and the least used Eday with 370 passengers. Figures are available for the first ten months of 2025/26 and figures are broadly in line with this trend.
- Some services are shared between islands or are available by request.
- There are currently two Britten-Norman Islander aircraft servicing these routes, with a third currently being added to the service to provide resilience and reduce the number of shared flights.
- The number of bookable seats per flight reduced from eight to seven on 29 March 2024 due to weight restrictions applied by the CAA.
- The Stronsay Sunday service is currently unable to operate due to a lack of availability of ground crew at this airport.
- North Ronaldsay has an additional freight flight as there is only one ferry per week in the winter season, increasing to three during the summer.
- Buses operate a return service between Kirkwall Travel Centre and Kirkwall Airport every 30 minutes between 06:15 and 18:45, with a final bus at 19:30 on weekdays, with a reduced service on Saturdays and Sundays.
- Westray and Sanday operate a public bus service and North Ronaldsay and Stronsay operate a door-to-door community transport service for transport on the Isles.
- A map of inter-island air and ferry services for Orkney is shown in Figure 10.

<sup>2</sup>OIC, ND. [Inter-Island Air Guide Summer 2026.](#)

<sup>3</sup>OIC, ND. [Passenger Carryings by Financial Year.](#)

<sup>4</sup>OIC, ND. [Loganair – monthly and annual passenger totals.](#)

Figure 10: A map of current inter-island air and ferry services for Orkney



# Cargo and logistics networks

## Ports and harbours

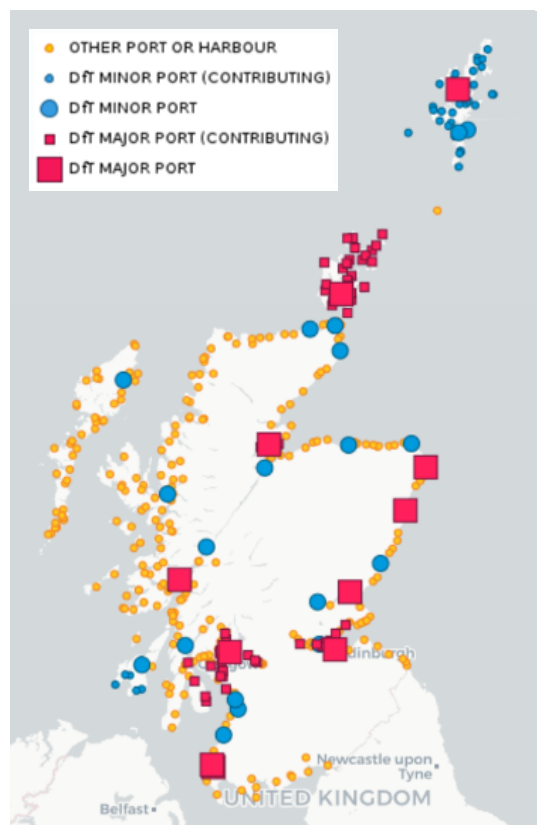
Ports like Scrabster, Aberdeen, and the smaller island ports are key points for moving goods both around Scotland and overseas.

- Scrabster Harbour’s overall annual freight throughput is around 9.7 million gross register tonnes (GRT) including Ro-Ro ferry traffic, with capacity for general cargo, project freight, and bulk products.
- The Port of Aberdeen saw over 7,000 vessel calls and handled over 3 million tonnes of goods in 2023.

Island harbours are especially important for getting supplies to and from the islands, often connecting to bigger ports on the mainland. Some smaller ports have limited space and equipment, which can make it harder to handle large shipments or adopt new shipping methods.

- Stornoway Harbour – key ferry and commercial port on the Isle of Lewis; supports freight and vehicle ferry services to Ullapool (CalMac) and other island links.
- Lochboisdale Pier (South Uist) – ferry terminal connecting to Mallaig and Oban; a commercial lifeline for island freight and passenger ferry links.

Figure 11: Map of ports and harbours across Scotland.  
Image credit: Scottish Government.



## Roads

Main roads like the A82, A9 and A96 connect ports, towns, and cities, and are vital for moving goods across the region.

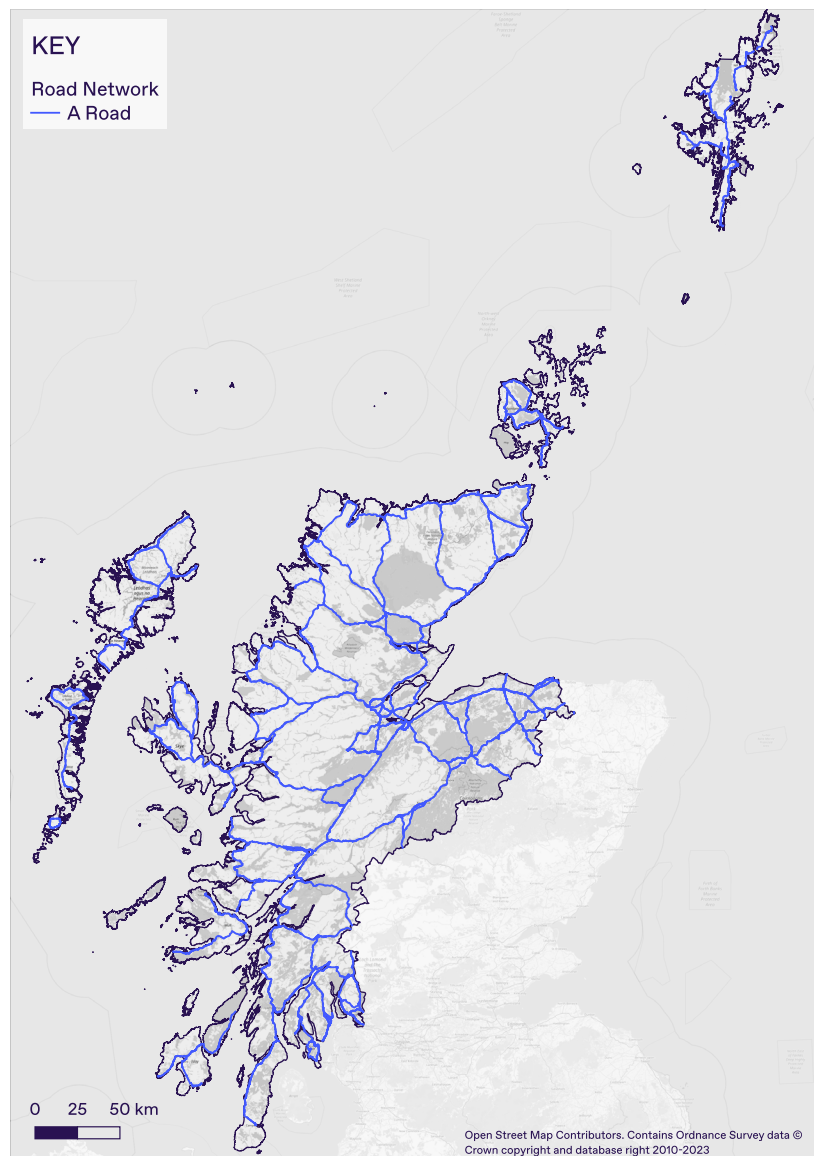
Road transport is critical for “last-mile” logistics enabling the movement of goods from ports, freight terminals and warehouses to retail outlets, businesses and end users. As a result, network performance directly affects supply chain reliability, operating costs and delivery times.

However, parts of these roads can slow things down. Much of the A82, A9 and A96 are still single carriageways, meaning there is only one lane in each direction. This makes overtaking difficult, especially for lorries, and can lead to queues building up behind slower vehicles.

Both roads also pass through towns, where lower speed limits, traffic lights and busy junctions can cause congestion. In rural areas, narrow sections and bad weather can also lead to delays, particularly in winter.

All of this can make journey times longer and less reliable, which affects the cost and timing of deliveries across the region.

Figure 12: Map of the major road network in the region



## How it works

- Goods usually move using a mix of roads, ferries, and ships, depending on speed, cost, and destination.
- Air freight often complements, rather than replaces, road and ferry transport, particularly for time-sensitive goods. Ferry routes support 3 million vehicles and 8 million passengers domestically within Scotland.
- Limited infrastructure at smaller ports and roads can create bottlenecks, making it harder to expand freight services or introduce new technologies.

## Orkney logistics networks

Freight is currently moved around Orkney by road as there is no train network. Northlink ferries operate two passenger and two freight ferries between Aberdeen, Orkney and Shetland and these are all a roll-on roll-off design allowing easy connection to the road network. There are an additional two smaller passenger ferry services operating several times per day each between the North of Scotland and Orkney which can also carry freight.

Kirkwall is the main town and is central in Mainland Orkney allowing short transit times between the airport, hospital, main logistic hubs and the various ports, as shown in Table 2. All routes are single carriageway A roads, with the majority not having pavements for pedestrians.

Table 2: Journey distances by road from Kirkwall Airport to key logistics locations in miles

Service	Location	Distance by road from Kirkwall Airport (miles)
<b>Balfour Hospital</b>	Kirkwall	3
<b>Royal Mail Delivery Office</b>	Kirkwall	4
<b>Streamline Shipping Group</b>	Hatston, Kirkwall	5
<b>Northwards Ltd.</b>	Hatston, Kirkwall	5
<b>NorthLink Ferry Terminal</b> (Aberdeen and Shetland)	Hatston, Kirkwall	5
<b>NorthLink Ferry Terminal</b> (Scrabster)	Stromness	18
<b>Orkney Ferries Ltd.</b> (Shapinsay, Stronsay, Sanday, Eday, Westray, Papa Westray, North Ronaldsay)	Kirkwall	4
<b>Orkney Ferries Ltd.</b> (Rousay, Egilsay, Wyre)	Tingwall	16
<b>Orkney Ferries Ltd.</b> (Hoy, Flotta)	Houton	13
<b>Pentland Ferries</b> (Caithness)	St Margaret’s Hope	14

**Key hubs:**

- Aberdeen, Edinburgh and Glasgow airports: have dedicated handling agents, connecting to national and international freight networks.
- Kirkwall and other island airfields: have limited cargo handling facilities, with these being handled by Loganair. Freight is offered both on internal North Isles flights and to the Scottish hubs of Aberdeen, Edinburgh, Glasgow, Inverness and Sumburgh.

**Operational Insights:****General logistics**

- The majority of current freight handling is designed around the ferry services with daily trailer services to the Scottish Mainland.
- The largest logistics company in Orkney is Streamline Shipping Group, who handle parcels and home delivery as well as the transportation of temperature-controlled goods and supporting large logistics projects such as the construction of the new Balfour Hospital and Kirkwall Grammar School.
- Northwards Ltd are the second largest logistics company and offer services including the transportation of temperature-controlled goods and dangerous goods.
- There are also smaller local companies, such as Robert Rendall & Co based in Westray, that handle the logistics to the Outer Isles under subcontract from Streamline's Kirkwall office.
- Both Streamline and Northwards Orkney depots are located within the Hatston Industrial Estate in Kirkwall for fast access to the nearby ports of Hatston and Kirkwall.
- Even time sensitive goods, such as fresh seafood, are currently reliant on road and ferry transport.

**Current aviation logistics**

- The Orkney inter-island service enables the delivery of education by transporting itinerant teachers to the junior-high schools based on the isles and also bringing senior students to Orkney Mainland to attend school during the week.
- Loganair supports the delivery of mail both to Orkney and then onward to the North Isles.
- The inter-island service also supports the delivery of healthcare, with time-sensitive tests such as bloods being transported using this service. Prescriptions and non-time sensitive logistics are transferred by ferry.
- Emergency transfer of patients from the Isles to Mainland Orkney or from Mainland Orkney onto the major trauma centres in Scotland is coordinated at a national level via Scottish Specialist Transport and Retrieval (ScotSTAR), a division of the Scottish Ambulance Service. Orkney is covered by the Northern branch, which operates from Aberdeen.

- A triage team at ScotSTAR will decide whether patient retrieval is required. This will be organized using the most suitable combination of road ambulance, air ambulance, search and rescue or military aircraft and commercial ferries<sup>5</sup>, with transfer to either Kirkwall or Aberdeen based on the level of care required. For care on Mainland Orkney, aircraft land at Kirkwall Airport and patients are transferred to the Balfour hospital via ambulance.
- Airport staff are on call 24/7 to open the airport if required for air ambulance operations and HM Coastguard's Search and Rescue activities.
- Kirkwall Airport is a primary logistics hub for the oil and gas industry, providing a refuelling point and enabling crew transfers to offshore rigs.

<sup>5</sup> Scottish Ambulance Service, 2024. [OG028 ScotSTAR referral and activation.](#)

# Energy supply and renewable energy

## Orkney energy network

Due to its strong winds, Orkney has been an experimental site for wind turbines since the 1950s. It now has the highest concentration of small and micro wind turbines in the UK, with over 700 domestic turbines<sup>6</sup>. Orkney first became a net exporter of electricity in 2013, generating 103% of its consumption. By 2020 this had risen to 128%. Orkney is also a world leader in tidal and wave energy generation. As these technologies progress towards maturity, Orkney is preparing for the deployment of wave and tidal farms in its waters. Despite this, there are times of low local generation when electricity must be imported from Scotland, and this electricity may be less green.

Due to this excess generation and a limited connection to mainland Scotland, an Active Network Management system has been implemented in Orkney that initiates curtailment of generation when there is an excess of electricity being generated. This is based on a zoning system, however the airport is located in a zone that is subject to minimal curtailment and so cannot benefit from this. In the mid-term, a new 220 MW HVAC transmission system is being constructed between Finstown in Orkney and Dounreay in Caithness and this is due for completion in 2028. This will enable the export of the current excess of green electricity to the Scottish mainland and the construction of several new green electricity generation projects are based on the completion of this infrastructure.

## Renewable integration to aviation hubs in Orkney

### Electrical integration in Orkney

The network near Kirkwall and the airport was recently upgraded as part of a £2.7 million investment in Orkney's electrical infrastructure. One of the aims of this was to support the development of the SATE aviation test centre at Kirkwall Airport and enable it to conduct electric flight trials<sup>7</sup>. This will enable smaller electric aircraft to use Kirkwall. However, if fast charging systems are required for larger aircraft, then further upgrades may be required.

It should also be noted that there is currently only one 7.2 kW electric car charging point in the car park of the airport. These facilities would also need expanding to support a wider green logistics infrastructure.

<sup>6</sup> [Orkney Renewable Energy Forum](#)

<sup>7</sup> [SSEN, 2022](#)

## Hydrogen integration in Orkney

There are currently no hydrogen suppliers located in Orkney. Importing liquid hydrogen to Orkney would require transportation by both road and ferry and it is covered by various dangerous goods legislation. The need to vent during the transportation of liquid hydrogen requires different safety approaches between road and ferry transportation and this does not currently occur in the UK. Due to these additional safety precautions and the frequency of delivery required due to hydrogen's low volumetric energy density, transporting hydrogen from the Scottish mainland is likely to be uneconomical. Local production will therefore be required to make hydrogen as a fuel viable.

Hammar Hill Energy, in partnership with Green Cat and Eneus Energy, has had planning approved for a hydrogen and ammonia production facility in the West Mainland<sup>8</sup> and is now looking to secure funding for this project.

<sup>8</sup> Green Cat Renewables, 2021. [Green Cat Renewables delighted to be part of the delivery of UK's first commercial green ammonia plant.](#)

# Where current infrastructure falls short

Several constraints must be addressed to enable the deployment of sustainable aviation in the region:

- Limited or no charging/refuelling facilities for electric and hydrogen aircraft, particularly at smaller airfields.
- Runway and navigation limitations at rural airstrips restrict larger aircraft or new technology types.
- Surface transport and multimodal integration are inconsistent, affecting both passengers and cargo.
- Workforce and maintenance capacity for advanced aviation technologies is currently limited.

## Orkney Infrastructure

Both Windracers and Hybrid Air Vehicles have provided a summary of the supporting infrastructure that would be required to enable them to deliver an operational service to support Orkney. These are summarised in Table 3 and the information from this has been used to identify gaps and limitations in the current infrastructure available.

The information provided by Windracers is based on a Monday to Friday service with two commercial flights per day from Kirkwall to each of the North Isle airfields. This results in a total of twelve return flights daily which would require two Windracers Ultra Aircraft based at Kirkwall. In addition, a twice daily Scottish mainland to Orkney and Shetland return service based in Wick would also require unloading and loading by the Kirkwall team.

Information provided for the Airlander are based on a single unit operating from Kirkwall Airport with 15 hours of flight time per day and carrying around 15 tonnes of payload.

Table 3: Infrastructure requirements for specific technologies at hub airports and outer airfields

	Windracers	Hybrid Air Vehicles
Length and width of runway/landing pad (m)	350 x minimum 17 (preferred width 20 m)	600 x 600
(300 x 300 for 10-12 tonne payload)	Weekdays 07:15-20:00 with reduced weekend hours	Daylight only
Runway surface	Asphalt, graded hardcore, grass, hard-packed sand or dirt	Any surface including water up to sea state 3
Current fuel	AV Gas	Jet A1
Plans for future fuel	Trialing SAF	Liquid hydrogen at 5-10 bar
Hangar facilities	Shared use at Kirkwall/hub airport	None. Requires 200 m diameter to 'weathervane' with nose pointing into wind with 8 'anchors' at centre. All routine maintenance conducted in this state.
Refuelling facilities	AV Gas at Kirkwall/hub airport	This will be required at Kirkwall/hub airport
Staff at Kirkwall/hub airport	3 engineers/UAV safety pilots	Crew chief and 2 ground crew. These could be part of a wider role at the airfield.
Staff at outer airfields	3 dispatchers that could be part of wider role at airfield	Crew chief. This could be part of a wider role at the airfield.
Main runway surface	Asphalt with grooved stopway	Graded hardcore
Main runway dimensions	1430 x 45m Second asphalt runway 677 x 19m	527 x 17m (Stronsay 515 x 18m)

## Orkney refuelling infrastructure

Both technologies currently only require refuelling at the hub airport and use fuel that is currently available at these locations. In their current form these aircraft could integrate into the current refuelling infrastructure with relative ease, ensuring that all procedural and safety changes are fully considered and documented in line with CAA regulations.

### Liquid hydrogen

The Hybrid Air Vehicles Airlander aircraft intends to transition to a hydrogen-electric fuel cell system by 2032 that will require 3,000 kg of liquid hydrogen per aircraft per day. This will require significant infrastructure changes and may cause barriers to deployment at Kirkwall. Points to be considered include:

- There is currently no confirmed hydrogen production for Orkney and this amount of hydrogen cannot be imported by ferry.
- This is a significant amount of hydrogen to move by road and even for one aircraft would require at least two deliveries of fuel per day as Orkney roads are not suitable for large liquid hydrogen trailers.
- The only current site being considered for hydrogen production in Orkney is on the West Mainland. Hydrogen would need to be transported around the main conurbation of Kirkwall as there is no alternative route to the airport due to the road layout of the main island.
- Under the Control of Major Accident Hazards (COMAH) Regulations 2015, Kirkwall Airport would need to be registered as a lower-tier COMAH site as it would have greater than five tonnes of hydrogen or equivalent fuels on site at any one time. This requires assessment by both the Health and Safety Executive and the Scottish Environment Protection Agency (SEPA) with input from local emergency services.
- Kirkwall airport's status as providing lifeline services to the North Isles may prevent it from being approved as a COMAH site. This may mean a completely new site would need developing for the Airlander to use for hydrogen refuelling.
- Hydrogen refuelling at airports is currently being evaluated as part of the CAA's hydrogen challenge sandbox. It is still unclear how liquid hydrogen refuelling would be safely implemented at airports, but it is expected to require expensive infrastructure to ensure that current safety levels are maintained.
- Due to the serious risks that hydrogen presents if it is ignited, strict safety distances are imposed on the storage and operation areas for hydrogen and these must not impinge on other operations of the airport. These may be difficult to implement without expanding the size of Kirkwall Airport.
- In addition, the Town and Country Planning (Hazardous Substances) (Scotland) Regulations 2015 require consent for locations where there is above two tonnes of hydrogen on site. This may mean that any landing site for the Airlander will need to have this planning approval.

## Runways and landing pads

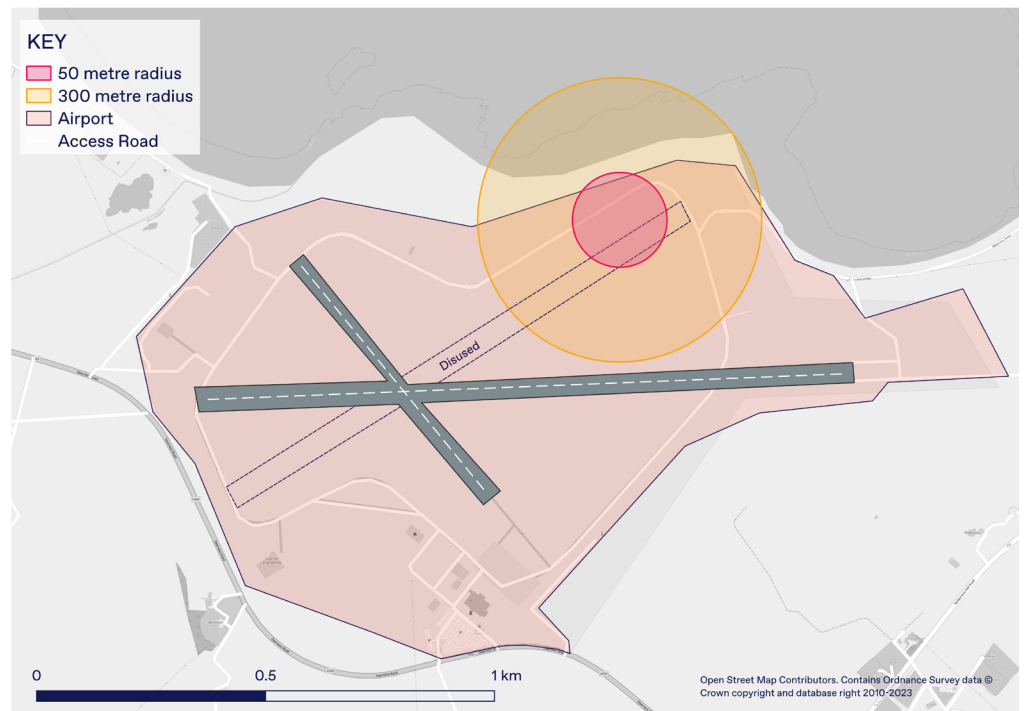
Although the Windracers aircraft has a desired runway width of 20m, it has an authorized minimum width of 17m, which has been specifically designed to allow operation from the OIC North Isle airfields without alteration to the runways. This means that there is no alteration required to any of the current infrastructure for Windracers technology.

The Hybrid Air Vehicles Airlander aircraft is considerably larger than any of the aircraft currently using Kirkwall Airport. Although it does not require a runway, to operate at maximum weights, it does require an area large enough to allow a 600m take off / landing distance. Smaller distances degrade payload range but this effect is likely to be insignificant in the region as the maximum range of the aircraft is 2000 nautical miles. When parked, it is attached to a mast. The position of this landing mast must allow the Airship to move around it within a 100 m radius so that the aircraft can remain with its nose pointing into the wind. The mast is usually attached to a tracked vehicle and resembles a large aircraft tug.

For a small airport such as Kirkwall Airport, this is a considerable amount of space and will need careful consideration to ensure that it does not impact on other operations at the airport. Figure 13 shows the landing area on the outer orange circle and the mooring area on the inner red circle, with these being drawn to scale of the airport. As can be seen, these areas take up a significant portion of the airfield and the decision of where this should be located will require careful consideration by HIAL to ensure that it does not impact on any of the other operations that take place at the airport. Again, this may require expansion of the airport to enable the Airlander to use this airport.

If Airlander uses the North Isle airfields it is unlikely to shut down and moor – so those considerations do not apply. However, the need remains to ensure that sufficient space for omnidirectional take-off and landing is available such that operations are not restricted. Prior studies have investigated this performance in more detail.

Figure 13 Kirkwall Airport with red and orange circles showing the landing and mooring areas required in concentric circles<sup>9</sup>



<sup>9</sup> NATS, 2026 Aeronautical Information Publication. Available online at <https://nats-uk.ead-it.com/cms-nats/opencms/en/Publications/AIP/>

## Operational and maintenance staff

Recruiting a skilled workforce can be a challenge, particularly for the North Isle airfields. Increasing the amount of responsibility and training required to operate these different technologies carries the risk of exacerbating this further and leading to the cancellation of services due to a lack of available staff.

Airfields must operate with a certain level of staff to remain in compliance with the CAA. Staff recruitment, retention and training must carefully be considered if additional technologies and responsibilities are added to these airfields.

## Other considerations

- Current runways are built and rated on aircraft burning fuel during flight to reduce their weight. Electric aircraft with batteries may have a heavier landing weight than current equivalent runways are designed for and may need upgrading.
- Although public transport to Kirkwall is implemented well, services to destinations beyond this will need to be improved if passengers are going to be encouraged to use aircraft instead of taking their cars on the ferries.

Cargo handling infrastructure will need to be considered at both Kirkwall and the North Isles airports if the use of these for logistics is going to be increased.

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# SOCIAL AND ECONOMIC IMPACTS

Sustainable aviation in the Highlands and Islands has the potential to deliver significant socio-economic benefits by creating jobs, supporting skills development, enhancing community resilience, and promoting inclusive growth.

By aligning technological adoption with local priorities, the sector can contribute to a just transition to net zero while strengthening regional industries and public services.



## Bringing new skills to the region

Previous work identified the range of skills required to support a future low-carbon, enhanced-connectivity aviation network, and the gaps in those skills not provided by current business and/or training and education institutions.

The training requiring development, and the means to implement that training can be summarised as follows.

### Licensed-Engineer Type Training

Type training is an extra course that lets a licensed aircraft engineer work on a specific aircraft. For example, a technician with a standard EASA Part 66 Category B licence would need extra training to work on a Boeing 787, and would need more training if they later worked on an Airbus A350. Many of the aircraft in this project are experimental or still developing, so formal, approved Type Training doesn't exist yet and must be created.

### Basic Engineering Training

New fuels and high-voltage powertrains will be added to the basic engineering training, such as the EASA Part 66 courses. As these aircraft become more common, every technician will need this training to work safely and effectively with these technologies.

### General Awareness Training

Some staff who do not work directly with aircraft may still need basic training. For example, airport reception or helpdesk staff might get questions from passengers if they see hydrogen fuel being used. UHI Orkney has looked at this kind of training based on maritime experience, but it should also cover high-voltage batteries, sustainable aviation fuel (SAF), and other new technologies.

### Fire and Rescue Training

Training already exists for dealing with fires involving high-voltage lithium-ion batteries and hydrogen, both on and off airfields. The challenge comes with hybrid aircraft, where fires behave differently depending on the fuel or battery type. Firefighters need guidance on how to handle these aviation-specific situations, whether they work at airports or with general fire services.

### Pressure Vessel Training

While pressure vessel training already exists, it would be useful to create a special course focused on hydrogen pressure vessels. This could be added to training for both maintenance workers and emergency responders.

### Human Factors Training

Training on human factors is common in the aviation industry, but new types of aircraft and engines bring some unique challenges. Most of the new skills needed are just updates or additions to existing training.

Our region already has many technically skilled people from the armed forces, nuclear, oil, and gas industries. This means there are good opportunities to re-train or further train these people. As the sustainable aviation industry grows, the demand for training new staff from scratch will increase, and the region needs to be ready to meet that demand.

### Additional

This does not cover the special skills needed for autonomous flight. Skills like flying Beyond Visual Line of Sight (BVLOS) are currently handled by service providers such as Windracers and Skyports. These skills are still evolving, especially as safety assessments like SORA develop, and they will continue to change as airspace rules adapt to allow both crewed and uncrewed aircraft to operate together.

# Benefits for NHS logistics and healthcare

Figure 15 - Skyports drone used in Argyll and Bute demonstrations. Image credit: Skyports.



## Rural communities in the Highlands and Islands can face challenges getting quick access to medical care.

New types of aircraft, especially sustainable ones, could give NHS staff faster ways to respond to emergencies, urgent and routine care needs and move medicines, equipment, and samples between locations

Using this technology could help in several important ways:

### Delivering medicines and equipment quickly

New aviation options could support delivery of medicines, vaccines, blood supplies, and medical equipment to services and patients in rural areas much faster. This means that people could receive the treatment they need without unnecessary delays.

### Speeding up lab results

Medical tests often require samples to be sent to laboratories. By moving these samples more quickly, lab results can be returned sooner, helping doctors diagnose conditions faster and start treatment earlier.

## Getting emergency information faster

In emergencies, every minute counts. Faster transport can help medical teams collect and share vital information quickly, allowing them to make decisions sooner and respond more effectively to patients in need.

## Why this could make a big difference

Faster access to medical care such as AED delivery, supplies, and specialist support could improve patient outcomes. It can also reduce long-standing inequities in healthcare delivery, for people in rural communities. Over time, this could make healthcare across the Highlands and Islands more reliable, equitable, and effective.

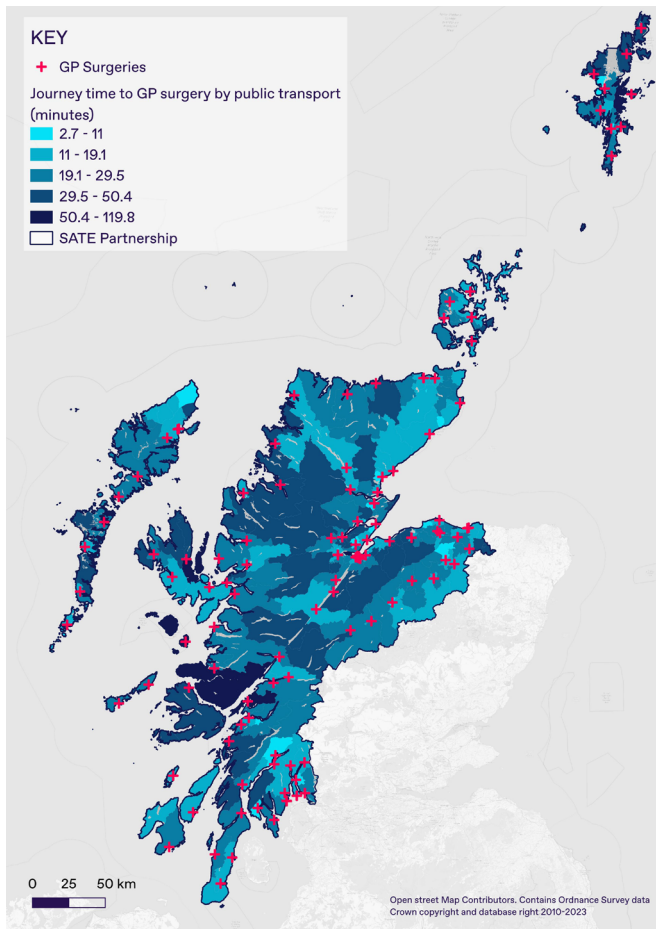


Figure 16 - Current journey time to GP surgeries by public transport in the region

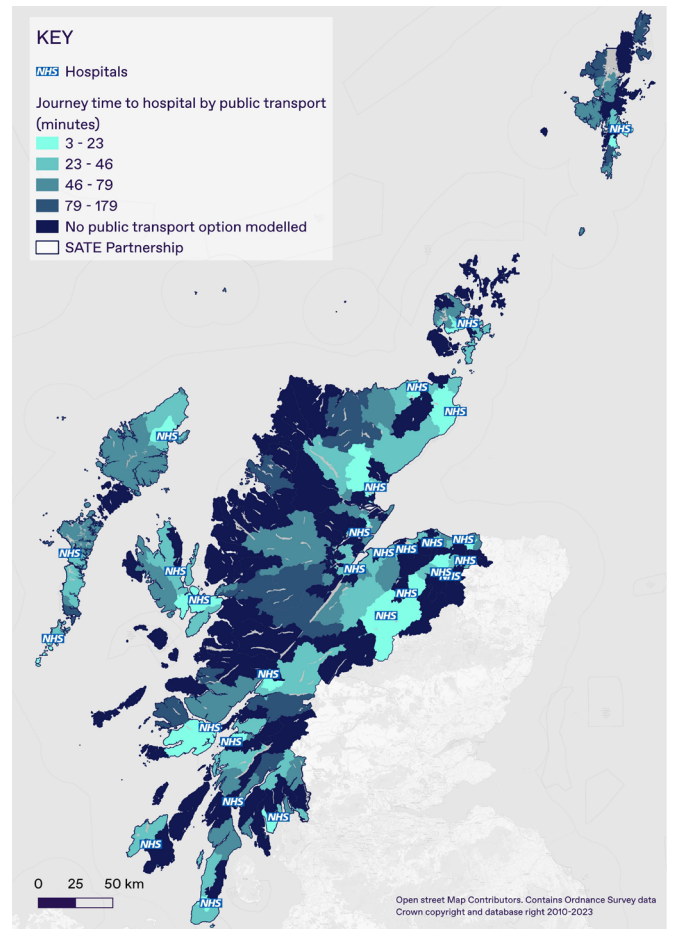


Figure 17 - Current journey time to hospitals by public transport in the region

# Impacts on aquaculture, seafood and freight

**New aviation technologies can transform the transport of goods—including seafood, aquaculture products, and general freight—across the Highlands and Islands, where rural locations and dispersed ports often limit timely access to markets and critical supplies.**

Logistics and supply chain management in these industries can be challenging, particularly for high-value, perishable, or time-sensitive products. Developments in sustainable aviation will expand the suite of transport options available to move goods quickly and reliably between production sites, processing facilities, and national or international markets. With exports making up 70% of Scotland’s seafood industry, timely access to international markets remains vital, while other regional businesses also benefit from faster, more flexible transport for general freight.

This technology has the potential to:

- Speed up delivery of seafood, perishable products, and general freight, maintaining freshness, quality, and reliability.
- Increase economic competitiveness by enabling regional fisheries, aquaculture, and other businesses to reach broader markets and respond more flexibly to demand.
- Support critical operations by ensuring timely delivery of equipment, maintenance teams, and supplies to offshore and island-based facilities, improving operational resilience.

By improving supply chain efficiency, sustainable aviation could strengthen the economic position of the Highlands and Islands, helping fisheries, aquaculture, and other regional industries grow while maintaining high standards of quality, reliability, and service.

Map showing shellfish farming sites in the region and a generated image of a cargo drone for parcels.



# Local economic growth

Improved air connectivity can play a transformative role in addressing demographic and economic challenges in the Highlands and Islands, a region facing a declining working-age population and a growing proportion of older residents.

Accessible transport influences young people's ability to take up education and employment opportunities, and poor transport links can drive out-migration<sup>10</sup> and reduce the local labour pool, impacting businesses' ability to attract staff. Developments in sustainable aviation could:

- Enhance labour market resilience by making it easier for staff to travel to work, even in rural areas where commuting is limited.
- Stimulate economic growth through improved links for tourism, trade, and business opportunities.
- Strengthen community resilience by reducing isolation, supporting access to services, and improving the movement of goods and people across the region.

By making the region more accessible, aviation technologies can help retain population, attract new residents, and generate sustainable economic development.

## Renewable energy opportunity

The Highlands and Islands are expected to see substantial investment in offshore wind, marine energy, onshore renewables and green hydrogen production over the coming decades. These developments could support the deployment of electric and hydrogen-powered aircraft while also creating new use cases for drones and other advanced aviation technologies in inspection, logistics and workforce transport.

10 <https://post.parliament.uk/the-role-of-transport-in-improving-access-to-opportunities/>

# Building the network for communities

One concern is that if aviation networks are left entirely to commercial companies, they will naturally focus on services that can launch fastest or survive the market, rather than what is best for communities and businesses. Most of the technology developers in the SATE project aim to make a profit from their innovations, which is understandable. However, the services that evolve commercially may not deliver the best overall outcome for the region.

This is where a regional strategy is most valuable. By carefully choosing the best technologies and approaches, we can create a network that is greater than the sum of its parts. This may not align with purely commercial goals, but it is essential if we want to maximise socio-economic benefits. The region has generally been supportive of testing new technology, but people need to see real benefits designed for their needs, not feel like “lab rats.” Policy, regulation, or legislation might be needed to encourage the right behaviour, but these tools must be carefully designed to avoid unintended consequences, which have happened in the past.

Many use cases have been identified and studied, but hard data is limited because much of it is commercially sensitive. Economic impact assessments have been carried out both within and outside SATE, including by the University of the Highlands and Islands and the Connected Places Catapult. Using the example network suggested below could help quantify potential benefits, such as economic value and well-being, from a strategically designed aviation or multi-modal network.

## Digital twin

A useful next step would be to create a “digital twin” of the system. This is a virtual model that can be used to test and find the best combination of aircraft and infrastructure while taking into account physical, market, and regulatory limits.

A Multi-Disciplinary Optimisation, or MDO, process looks at how all the parts of a system interact and how changes to each part affect the overall performance. Using computer simulations, it can explore many different options efficiently to find the combination that works best while staying within the rules and constraints.

MDO is already widely used in aerospace and motorsport, but it can be applied to any complex system. Some parts of this digital twin have already been started, such as a simple model of the energy generation and distribution system, but a full, complete model of the entire network has not yet been created.

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# REGIONAL STRATEGY AND POLICY ALIGNMENT

# How this aligns with regional and national plans

Sustainable aviation complements regional mobility and connectivity priorities by:

The [Just Transition Framework](#) ensures island and rural economies benefit from emerging green technologies

Supporting the [Highlands and Islands Regional Transport Strategy \(HITRANS\)](#) vision for improved, reliable, and inclusive transport services.

Contributing to [Scotland’s National Transport Strategy](#), which prioritises low-emission transport modes, enhanced connectivity, and regional economic development.

Supporting [NHS Scotland to become a net-zero health service by 2040 at the latest](#).<sup>11</sup>

Advancing Scotland’s 2045 Net Zero aviation targets, by promoting electric, hybrid, and hydrogen aircraft and low-emission logistics.

Integrating with the wider multimodal transport mix, including road, ferry, and rail, to improve overall regional accessibility and resilience.

Advancing progress towards the [National Islands Plan and Islands \(Scotland\) Act 2018](#) which aims to tackle population fragility and improve transport links.

<sup>11</sup> [NHS Scotland climate emergency and sustainability strategy: 2022-2026 - gov.scot](#)

# Rules, regulation and governance

## BVLOS

Beyond Visual Line of Sight – operating a drone or UAV beyond the pilot’s direct visual range.

## The rules shaping new aircraft

### Main rulebook for drones

The Civil Aviation Authority CAP 722 guidance explains the safety rules for drones, including BVLOS flights.

Operators must show that they can:

- Avoid other aircraft using detect-and-avoid technology
- Maintain reliable command-and-control links
- Reduce risks in line with UK law

This guidance is based on EU safety rules adapted for the UK.

### UK Future of Flight plan

The Government’s Future of Flight Action Plan (2024) sets ambitious national targets:

- Regular drone deliveries by 2027
- Early passenger/cargo eVTOL flights by 2028

It is the main framework for national planning, coordination with industry and Government support.

### CAA roadmap to routine BVLOS

The Civil Aviation Authority CAP 3182 roadmap explains how BVLOS operations will evolve:

1. Segregated trials in low-traffic areas
2. Partially integrated operations with restricted sharing of airspace
3. Fully routine BVLOS operations in normal airspace

The plan is phased, based on evidence from live trials, to ensure safety.

### Airspace Modernisation Strategy (AMS)

- The AMS is the UK-wide programme to prepare airspace for new users:
- Introduces digital tools so all aircraft “see” each other electronically
- Provides a deployment plan for short-term milestones
- Supports gradual integration of drones and eVTOL with manned aircraft

### Sandbox trials

The CAA’s regulatory sandbox (CAP 2540) allows drones to operate in temporary reserved areas (TRA).

- These are short-term, specially controlled areas for testing
- Operators can collect safety data on systems like detect-and-avoid and traffic management
- But: sandbox operations do not represent full routine flying, outside these areas, BVLOS is still heavily restricted

## Vertiports

Guidance from the Civil Aviation Authority explains:

- How existing airports can support eVTOLs
- Interim design considerations for safety, obstacles, and emergency services
- Future standards are still being developed, this is early guidance, not full regulation

## Local planning

UKRI and Future Flight guidance highlights:

- Drone hubs and vertiports need planning permission
- Local authorities must coordinate with airport safety rules
- Current planning rules have gaps, councils may need bespoke decisions

## Airspace in the Highlands

### From segregation to integration

Highlands airspace (Class G) and near small aerodromes is less busy, making it ideal for temporary trial areas (TRAs):

- These allow safe BVLOS flights without interfering with other users
- TRAs are not a permanent solution; routine flights will require broader airspace integration

### Lessons from UK trials

Trials like the Solent BVLOS medical delivery project in the south of England show:

- Multi-agency coordination is essential
- BVLOS operations can scale

### Electronic conspicuity (EC)

The Government is developing systems so aircraft are digitally visible to each other.

- This is vital in mixed-use lower airspace
- Ensures drones, manned aircraft, and helicopters can coexist safely

## Organisational responsibilities (who does what)

- Department for Transport (DfT). Sets the UK's national aviation rules and targets (like the Future of Flight), co-funds drone and advanced air mobility projects with the Civil Aviation Authority, and guides how new drone operations and beyond-visual-line-of-sight (BVLOS) flights fit into UK airspace.
- UK Civil Aviation Authority (CAA). The aviation regulator. Works with the DfT on funding and guidance, issues rules for drone operations (like CAP 722 and CAP 2540), develops licensing rules for vertiports, approves airspace changes, and grants authorisations for new flight operations.
- NATS & ANSPs. Plan and manage UK airspace, support experimental drone flights (sandboxes), and keep corridors open for BVLOS flights, including offshore routes.

- Scottish Government / Transport Scotland. Aviation rules are mostly UK-wide, but Scotland sets its own regional priorities, such as improving connectivity, reducing emissions, and aiming for net-zero domestic flights by 2040. They also focus on low- or zero-emission aircraft, sustainable fuels, and efficient airport operations.
- HITRANS leads the SATE project. Manages day-to-day readiness, plans infrastructure (like electric charging and hydrogen facilities), and ensures new services work well with local communities.
- HIAL operate Barra, Benbecula, Campbeltown, Dundee, Inverness, Islay, Kirkwall, Stornoway, Sumburgh, Tiree and Wick airports.
- NHS Scotland and Medicines and Healthcare products Regulatory Agency (MHRA) define clinical demand and service integration (NHS), while regulating medicines, distribution standards and ensuring that drone transport maintains product safety, quality, and traceability (MHRA).
- Local authorities / planning. Determine permissions for drone hubs/vertiports within town-and-country planning while coordinating aerodrome safeguarding and community engagement; UKRI guidance outlines gaps and recommended practices.

## Highlands driving clean innovation

SATE has established the UK’s first operational low-carbon aviation test centre at Kirkwall, with use cases spanning scheduled routes, NHS Scotland logistics, offshore energy services, and environmental inspection, targeting UAS hub-and-spoke networks.

Previous work by SATE developed fuel assurance and infrastructure studies give a credible pathway for sustainable aviation operations at small aerodromes, with this transition underpinned by HIAL’s sustainability strategy which explicitly supports the Highlands & Islands Net Zero Aviation Zone by 2040.

# What helps or blocks delivery

## Enablers

Government funding schemes for low-carbon transport infrastructure.

Scottish and UK net-zero aviation targets providing strategic support.

Partnerships with universities, research centres, and technology providers driving innovation.

## Barriers

Regulatory delays for certification of novel aircraft and BVLOS drone operations.

Limited or no local infrastructure for charging and no hydrogen refuelling infrastructure at any airports.

Workforce and skills gaps in low-carbon aviation technologies.

Community concerns over noise, safety, budget and environmental impacts, requiring proactive engagement.

# Working with partners and stakeholders

Making sustainable aviation a reality in the Highlands and Islands means working closely with a wide range of people and organisations.

## What we want to achieve

- Make sure sustainable aviation fits with government policies and regulations.
- Share knowledge between transport authorities, aviation companies and researchers.
- Listen to communities to understand their needs and concerns.
- Identify challenges early so they can be solved.

## Who we will work with

### Local Communities

- Residents to understand local priorities, address concerns on noise and safety and build long-term community support.
- Local businesses to identify logistics, connectivity and economic opportunities and ensure services meet real demand.

### Operators and Industry

- Aircraft, drone and eVTOL operators to trial commercial, medical and logistics services.
- UTM and digital airspace providers to validate airspace management and flight authorisation systems.
- Maintenance and MRO providers to develop local servicing capability and skilled jobs.

### Government and Regulators

- Civil Aviation Authority (CAA) to obtain flight approvals, ensure airworthiness, and support regulatory sandbox testing.
- Department for Transport (DfT) to align trials with national Future of Flight policy and funding objectives.
- Aerodrome operators to agree local operating procedures and safety management arrangements.

### Emergency and Public Services

- NHS Scotland, SAS and air ambulance services to trial medical logistics and patient transport use cases.
- HM Coastguard to explore maritime surveillance and emergency support applications.
- Police Scotland to assess public safety, surveillance and resilience benefits.

### Skills, Research and Funding

- Universities and research organisations to support testing, data analysis and technology validation.
- Colleges and skills providers to develop the future workforce for zero-emission aviation.
- Innovate UK and UKRI to secure research, development and demonstration funding.
- Private investors to support commercialisation and long-term deployment.

### Infrastructure and Utilities

- HIAL airports to enable access to runways, apron space, charging infrastructure and operational trials.
- Ports and harbour authorities to explore multimodal connectivity and island logistics use cases.
- DNOs (e.g. SSEN) to assess electrical capacity, resilience and future upgrade requirements.
- Telecommunications providers to ensure reliable command-and-control and data connectivity, including BVLOS operations.

## How we will engage

- Workshops and meetings to discuss ideas and solutions together.
- Advisory groups with experts to provide guidance on key challenges.
- Public consultations including surveys and events to hear community views.
- Regular updates to keep everyone informed about progress and plans. This includes transparent communication on budget allocation, cost justification and long-term value of the project.

### Flight Path Advisory Group

A proposed group of experts called the Flight Path Advisory Group (FPAG) will bring together key organisations like HIAL, the CAA, HITRANS, NHS Scotland, UHI, Regional Airspace Users Work Group (RAUWG), Department for Transport’s Community Integration Working Group and Transport Scotland to make low-emission aviation happen faster in the Highlands and Islands.

FPAG will be technology-neutral, meaning it will support all types of new aircraft, drones, electric and hybrid aircraft, hydrogen or eVTOL, without favouring one over another. Its job is to create the right environment for these technologies to grow safely, quickly and effectively.

The group will help coordinate plans, guide infrastructure upgrades, support training, and advise on safety, regulation, and community concerns.

The group will feed upwards into the national Future of Flight Industry Group (FFIG) which brings together government, industry and other key stakeholders to collaborate on the development and delivery of a Future of Flight Plan that will accelerate the growth of Future of Flight safely and securely in the UK.

# FUTURE ROADMAP

The Highlands and Islands are in a unique position to test sustainable aviation. What was once a challenge, rural communities separated by water and rugged land, is now an advantage. By becoming a “living laboratory,” the region is not just testing new technology it is showing the world how rural areas can stay connected in a net-zero future.

This plan builds on the early successes of the SATE project and moves toward a fully commercial, low-carbon aviation network.

# Use cases

The SATE projects have focused on real-world demonstrations of new aviation technologies, covering both existing inter-island routes and potential new services.

These projects have explored several key areas:

- **Aircraft Operations & Certification**  
Testing electric, hydrogen, autonomous aircraft, and sustainable aviation fuels.
- **Energy & Infrastructure**  
Developing airfields and safety measures.
- **Digital Infrastructure**  
Ensuring reliable data and communication networks for remotely piloted or autonomous flights.
- **Operational Infrastructure**  
Integrating new aircraft into air traffic management, ground operations, maintenance, logistics, and supply chains.
- **Impact & Policy**  
Studying socio-economic effects, system planning, and workforce skills.

Work on physical infrastructure has included using green electricity to refuel low-carbon aircraft. Digital infrastructure work has explored robust communications networks and trial airspace for autonomous operations. Operational infrastructure has focused on hardware, supply chain opportunities, and integrating new technologies with current airspace users. All of this has been guided by current and emerging aviation regulations to ensure safe operation alongside existing aircraft.

The Highlands and Islands have proven an ideal “living laboratory” for these trials because the region offers:

- Low-traffic airspace suitable for experimental flying.
- An integrated air traffic control system.
- Strong links with the UK Civil Aviation Authority.
- Opportunities to test scheduled services, medical supply flights, and offshore operations.
- Aerial monitoring capabilities for fisheries, forestry, pollution, coastal erosion, and maritime search and rescue.
- Challenging geography and weather conditions that help test aircraft performance in real-world conditions.

## The following are identified use cases for new aircraft:

### Delivering medical supplies and emergency support

- Same-day delivery of medicines, blood, and diagnostic samples between mainland hospitals (e.g. Raigmore) and island health centres
- Rapid response during ferry cancellations or road closures caused by storms and winter weather
- Supporting GP outreach, community nursing, and minor injury units on smaller islands

### Carrying goods and cargo to rural communities and islands

- Regular transport of food, mail, and time-critical supplies to islands with limited ferry frequency (e.g. Small Isles, North Isles)
- Supplying construction materials and spare parts for utilities and renewable energy sites
- Improving resilience of island supply chains during peak tourist seasons or adverse weather

### Transporting passengers between small towns and islands

- Faster connections between island communities and regional hubs (e.g. Stornoway, Kirkwall, Lerwick) for work, education, and healthcare
- Enabling same-day return trips that are not possible with current ferry timetables
- Providing alternatives on routes where ferry crossings are long, infrequent, or weather-dependent

### Inspecting and maintaining infrastructure

- Routine inspection of overhead power lines across rural glens and island networks
- Monitoring bridges, causeways, ports, and coastal defences exposed to harsh marine conditions
- Supporting maintenance of wind farms, substations, and grid connections in hard-to-access locations
- Supporting offshore wind, tidal and wave energy developments through inspection, logistics, maintenance and specialist transport operations

### Supporting tourism and the local economy

- Creating low-carbon visitor routes to islands and rural destinations without increasing pressure on ferries
- Enabling short scenic trips that extend visitor stays and spending in local communities
- Supporting year-round tourism by improving access outside the peak summer ferry season

### Western Isles Sustainable Logistics Trial (Proposed)

HITRANS and Windracers have submitted a funding application through the Island Centre for Net Zero (ICNZ) programme to support a proposed sustainable aviation logistics trial across the Western Isles.

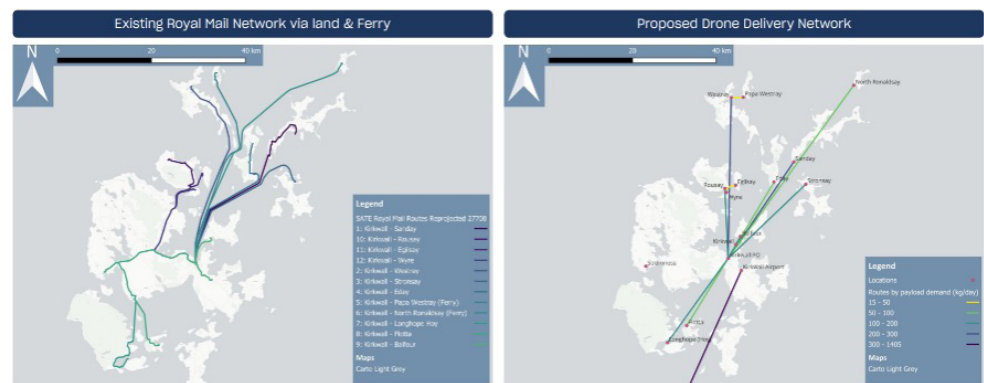
The project would establish an operational base at Benbecula Airport to support trial deployments of the Windracers ULTRA autonomous cargo aircraft. The proposed programme would explore how low-emission autonomous aircraft could improve logistics, resilience and connectivity for island communities.

If funded, the programme would represent one of the most significant real-world demonstrations of sustainable autonomous cargo operations in the Highlands and Islands to date.

# Potential networks

## Drone case study 1: Parcel deliveries with Royal Mail

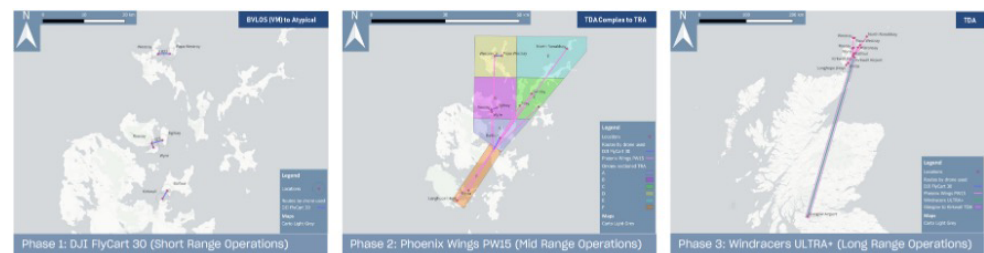
The study proposes a drone delivery network for Orkney based on the existing Royal Mail system, with Kirkwall as the main hub to keep sorting simple and efficient, and small sub-hubs added where island groups are close together.



Different types of drones would be used depending on distance and demand: small vertical-take-off drones for short hops between nearby islands, medium drones for regular links from Kirkwall to outer islands, and larger fixed-wing aircraft for the long mainland route.

The design reflects local conditions, including strong winds, limited infrastructure on small islands, and the need to carry anything from small daily deliveries to large mainland shipments. Most island routes involve modest daily volumes over short to medium distances, while the mainland link carries much higher loads and needs fewer but larger flights.

The network would be rolled out in phases, starting with simple, short island routes that can operate quickly with minimal infrastructure, before expanding to wider island coverage and, in the longer term, direct mainland-to-Orkney drone services.



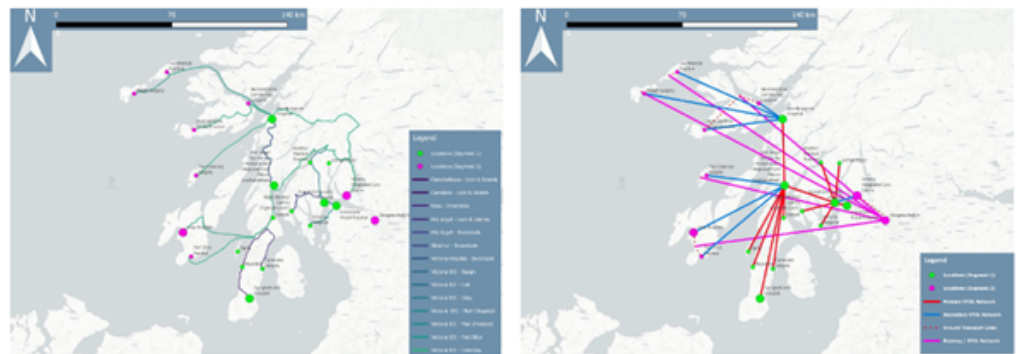
## Drone case study 2: NHS logistics Argyll and Bute

A linked study proposes a drone delivery network across the Highlands and Islands to support NHS Highland, enabling faster transport of medical supplies such as blood samples, medicines, and urgent equipment between rural communities and hospitals. The network is designed around key healthcare hubs, with main hospitals acting as central nodes and smaller landing sites located at GP surgeries, clinics, and island facilities.



FUTURE ROADMAP

Different types of drones would be used depending on distance, urgency, and payload. Small vertical-take-off drones would support short, frequent trips between nearby sites, while larger drones would be used for longer routes between mainland hospitals and island communities. This allows time-critical items to be prioritised, while still supporting routine logistics needs.



The image on the left shows how the NHS currently delivers items using roads and ferries, while the image on the right shows how drones could be used to carry out those deliveries instead.

The design reflects the challenges of delivering healthcare in the region, including long travel times, reliance on ferries, variable weather conditions, and limited infrastructure in rural and island locations. Many routes involve relatively low but high-value payloads where speed and reliability are more important than volume, particularly for urgent clinical needs. The system also needs to operate safely alongside existing airspace users, including air ambulances and other emergency services.

The network would be introduced in phases, starting with trial routes between selected healthcare sites to demonstrate safety, reliability, and community acceptance. Over time, the service would expand to connect more rural locations and integrate into routine NHS logistics, supporting a more resilient and responsive healthcare system across the region.

## Additional cargo routes

The networks shown below aim to match each use case with the technology that works best, without favouring any particular option. There are many factors to consider, such as payload, range, speed, energy use, and turnaround time, so some uses could be met by more than one type of aircraft. The examples here are simple, but realistic.

For logistics, we have shown a hub and spoke delivery model. This combines individual route demonstrations and ideas from project partners into one connected network.

Passenger transport is more complex. Previous work by CPC and UHI looked at existing travel using current modes. To explore new possibilities, public opinion needs to be combined with this data and included in the digital model mentioned earlier. However, it is very difficult to predict human behaviour using just mathematical models.

Other researchers could come up with different but equally valid solutions if they use a broad, hands-on approach. The discussions they create will help improve this vision and build a shared approach that brings the most benefit to communities and businesses.

### Heavy-Lift Cargo

**Example aircraft:** HAV Airlander 10, Windracers Ultra

**Indicative Origins:** Eurocentral (Holytown), Glasgow Airport, Edinburgh Airport, Prestwick Airport

**Indicative Destinations:** Campbelltown, Stornoway, Inverness, Kirkwall, Sumburgh/Tingwall

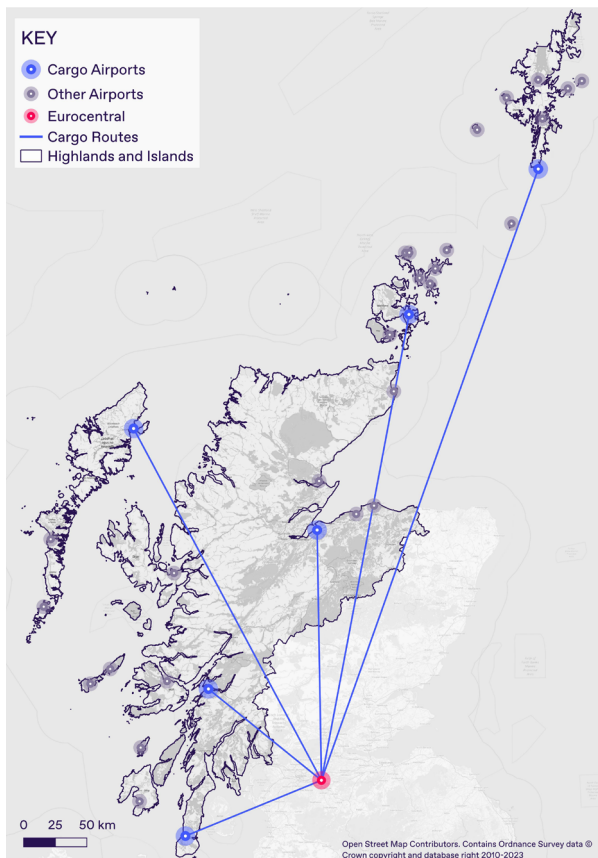


Figure 18 - Example of potential heavy cargo routes

### Medium and Light Lift Cargo

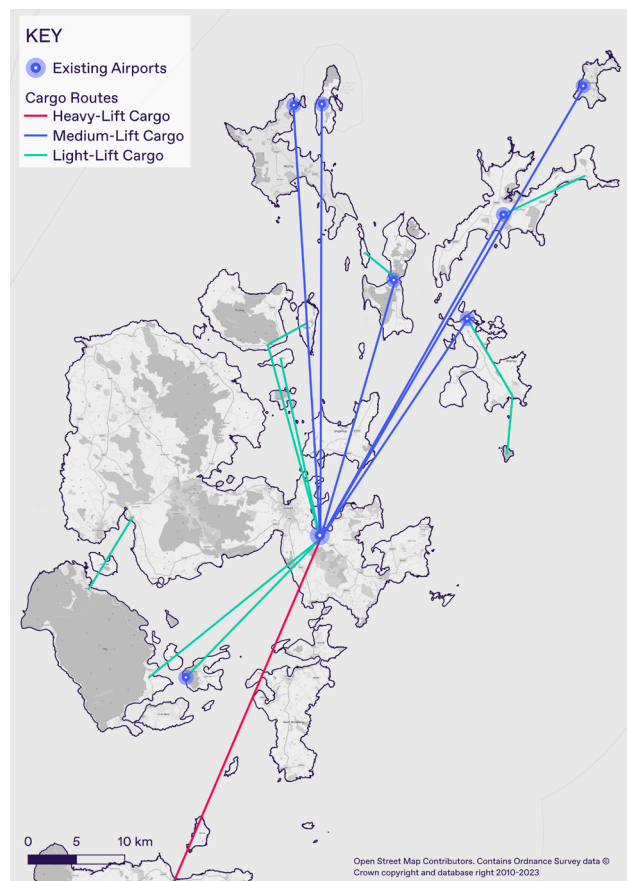


Figure 19 - Example of potential medium and light lift cargo routes

### Medium-Lift Cargo

**Example aircraft:** Windracers Ultra, Dronamics Black Swan

**Indicative Origins:** Campbelltown, Oban, Stornoway, Inverness, Kirkwall, Tingwall

**Indicative Destinations:**

- Campbelltown – Arran, Islay, Jura, etc.
- Oban – Mull, Coll, Tiree
- Stornoway – Benbecula, Barra
- Inverness – Ullapool, Wick, Thurso
- Kirkwall – Eday, North Ronaldsay, Papa Westray, Sanday, Stronsay, and Westray, Fair Isle
- Tingwall – Foula, Unst, Fair Isle

### Heavy-Lift Passenger

**Example aircraft:** HAV Airlander 10

**Indicative Origins:** Glasgow Airport, Edinburgh Airport, Prestwick Airport

**Indicative Destinations:** Stornoway (via Ullapool), Inverness, Aberdeen, Kirkwall (via Wick/Thurso), Sumburgh/Tingwall

**Round-trip tourist flights:** Inverness, Kirkwall (seasonal), Stornoway (seasonal)

### Medium-Lift Passenger

**Example aircraft:** Heart ES-30

**Indicative Origins:** Glasgow Airport, Edinburgh Airport, Prestwick Airport, Inverness, Kirkwall, Sumburgh

**Indicative Destinations:** Campbelltown, Oban, Stornoway, Inverness, Kirkwall, Sumburgh

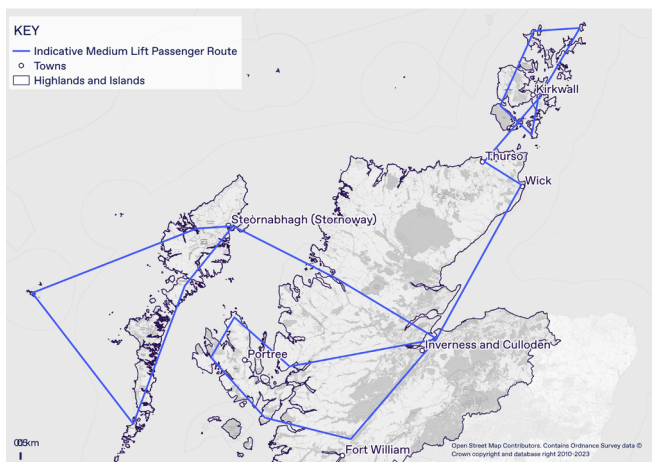


Figure 20 - Indicative medium lift passenger route

### Light-Lift Cargo

**Example aircraft:** Speedbird Aero DLV-2

**Indicative Origins:** Various airfield locations served by the Medium-Lift Cargo aircraft

**Indicative Destinations:** Various non-airfield locations, e.g. the inhabited islands in Orkney with no airfield (Egilsay, Flotta, Graemsay, Hoy, Rousay, South Ronaldsay, and Wyre)

### Light-Lift Passenger

**Example aircraft:** Cormorant Seaplane, ARC P9

**Indicative Origins:** Various airfield and non-airfield locations, including existing harbour locations

**Indicative Destinations:** Various airfield and non-airfield locations, including existing harbour location

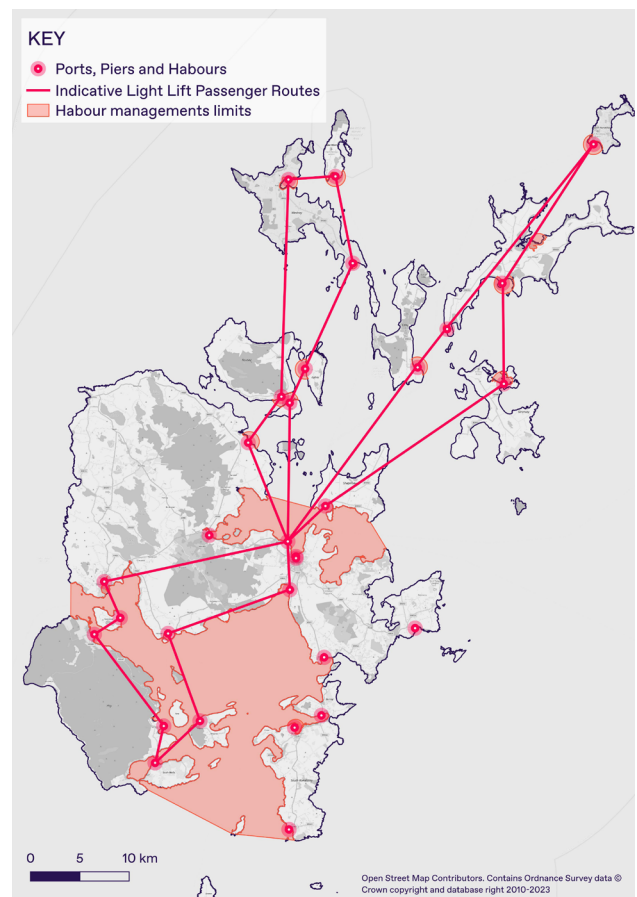


Figure 21 - Indicative light lift passenger route

# How this will be funded

## Making sustainable aviation work in the Highlands and Islands will require a mix of public funding, private investment, and income from services over time.

Not everything will be paid for by government, and not everything can be left to the private sector. Different stages of the plan will need different types of funding.

### In the early years

New aircraft types, charging systems and hydrogen refuelling are still developing. Early trials carry risk and need support.

In the first phase, funding is likely to come from:

- Scottish and UK Government programmes that support low-carbon transport.
- Innovation funding from organisations such as Innovate UK and UK Research and Innovation.
- Aviation and Future of Flight programmes led by the Department for Transport.
- Regional transport investment through Transport Scotland.

### As services begin to grow

Once trials prove successful, private companies will start investing more directly.

This may include:

- Aircraft operators buying or leasing new aircraft.
- Logistics companies funding regular cargo routes.
- Airport operators investing in charging or refuelling facilities.
- Energy companies investing in hydrogen production or grid upgrades.

Some infrastructure, such as charging hubs, may be funded jointly by airports, energy providers and public bodies.

## In the longer term

As services become reliable and widely used, they are expected to operate on a commercial basis, funded by:

- Passenger fares.
- Freight and parcel delivery contracts.
- Service agreements with organisations such as NHS Scotland.
- Landing fees or infrastructure use charges.

Public funding may still support routes that are socially important but not commercially profitable, similar to how some island air services operate today.

## Keeping costs transparent

Any public money invested will be subject to:

- Clear business cases.
- Careful assessment of costs and benefits.
- Open reporting on how funds are spent.

Communities will be kept informed about why funding is being used, what it delivers, and what long-term value it creates.

# Priority actions and delivery plan

This section sets out the key actions by time for each of the technology types, across the following sections:

- Regulation
- Infrastructure
- Skills and Workforce
- Operations and Use Cases
- Stakeholder Engagement

This sets out the strategic direction at this stage and will be supported by detailed action plans and costings for each aircraft type, reflecting the level of public funding and private investment available.

## Drones and UAVs

Theme	Immediate (0–3 yrs)	Medium (3–7 yrs)	Long-Term (7–10 yrs)
Regulation	Engage with CAA and Scottish authorities to enable trial BVLOS flights in rural areas.	Support development of clear operational standards for commercial freight, aquaculture, and medical deliveries.	Integrate drones into routine logistics and emergency response networks.
Infrastructure	Identify key take-off/landing sites near hospitals, ports, and airfields.	Expand drone landing/charging hubs and connect with regional logistics infrastructure.	
Skills and Workforce	Upskill operators in drone piloting, maintenance, and safety.	Support development of accredited training programs for commercial UAV operations and emergency services.	Maintain a skilled workforce capable of operating advanced autonomous UAV networks.
Operations and Use Cases	Trial Case Study 1 and 2 with NHS Scotland and Royal Mail networks.	Expand freight, environmental monitoring, and healthcare services.	Fully operational, commercial UAV networks integrated with multimodal logistics.
Stakeholder Engagement	Consult local communities and healthcare providers on trial routes and safety.	Develop engagement plans for commercial operators, local councils, and island communities.	Maintain ongoing community liaison and feedback loops for operational optimisation.

# Electric or Hybrid CTOL

Theme	Immediate (0–3 yrs)	Medium (3–7 yrs)	Long-Term (7–10 yrs)
<b>Regulation</b>	Work with CAA for certification of electric/hybrid aircraft; align with Future of Flight milestones for short-haul trials.	Support type-specific certification pathways; incorporate AMS and TRA considerations; update local planning frameworks for charging/maintenance infrastructure.	Full regulatory integration for commercial electric/hybrid CTOL flights; compliance with AMS, DfT, and Scottish decarbonisation policies.
<b>Infrastructure</b>	Identify airports suitable for trials; install temporary charging infrastructure.	Build mid-term electric charging hubs and hybrid refueling facilities at regional airports; integrate with HIAL operations.	Airports fully equipped for routine commercial electric/hybrid operations across the Highlands & Islands.
<b>Skills and Workforce</b>	Train pilots, engineers, and maintenance crews on electric/hybrid systems. Modify basic engineering training (EASA Part 66) to include high-voltage powertrains; general awareness training for airport staff.	Develop Type Training for specific electric/hybrid aircraft; fire & rescue training for hybrid/electric aircraft incidents; human factors courses.	Fully skilled workforce capable of operating, maintaining, and responding to all electric/hybrid aircraft types; continuous re-skilling.
<b>Operations and Use Cases</b>	Short-haul regional passenger/cargo flights; initial NHS Scotland logistics trials.	Expand regional networks, low-emission feeder routes, hybrid freight operations.	Routine integration into domestic/regional networks; scalable low-carbon operations supporting island connectivity
<b>Stakeholder Engagement</b>	Engage airlines, airport staff, residents, DNOs on safety, charging capacity, and noise/environmental impacts.	Collaborate with energy providers, aircraft operators, HIAL, emergency services, and local authorities.	Continuous engagement to optimise infrastructure deployment, operations, and community acceptance.

# Hydrogen aircraft

Theme	Immediate (0–3 yrs)	Medium (3–7 yrs)	Long-Term (7–10 yrs)
<b>Regulation</b>	<p>Continue engagement with the UK Civil Aviation Authority and other partners (including the Flight Path Advisory Group) on hydrogen aircraft safety, fuel handling and operational regulatory environment.</p> <p>Continue safety and compliance workshops with regulators and operators.</p> <p>Support development of operational standards, Type Training approvals, pressure vessel safety standards, hydrogen contamination monitoring standards, and emergency protocols.</p>	<p>Integrate hydrogen operations into airspace and airport safety management systems to allow for an initial aircraft trial.</p>	<p>Support a wider network of hydrogen aircraft operations operating in line with national aviation safety regulations.</p>
<b>Infrastructure</b>	<p>Build on previous feasibility work by continuing to assess suitable airports, refining hydrogen demand forecasts, infrastructure requirements, storage options and undertaking safety studies.</p>	<p>Deploy mobile hydrogen refuelling systems and initial gaseous hydrogen storage infrastructure.</p> <p>Develop hydrogen production and storage capacity at regional airports.</p>	<p>Develop fixed hydrogen infrastructure including scalable supply systems supporting routine operations.</p>
<b>Skills and Workforce</b>	<p>Continue assessing workforce needs and expand hydrogen safety awareness training for airport operational and engineering staff.</p>	<p>Develop and deliver type-specific hydrogen aircraft training, fire and rescue training for hydrogen incidents, pressure vessel and handling courses to allow for initial aircraft trial.</p>	<p>Fully competent workforce maintaining hydrogen aircraft, refuelling systems, and safety operations, with continuous reskilling for emerging hydrogen technologies.</p>

Theme	Immediate (0–3 yrs)	Medium (3–7 yrs)	Long-Term (7–10 yrs)
<b>Operations and Use Cases</b>	Build on existing operational planning work to further develop procedures for hydrogen aircraft operations, including refuelling processes, emergency response plans and operational modelling.	Undertake initial trial of regional hydrogen aircraft supported by mobile refuelling.	Commercial operation of a hydrogen aircraft supporting connectivity and logistics use cases.
<b>Stakeholder Engagement</b>	Engage with local communities, airports, government, regulators, health services and local authorities to build awareness of potential hydrogen trials and safety measures.	Develop structured partnerships with fuel suppliers, operators, airports, regulators, and emergency services to support infrastructure deployment and trial operations.	Maintain ongoing community engagement and governance as hydrogen aircraft operations scale up.

# eVTOL

Theme	Immediate (0–3 yrs)	Medium (3–7 yrs)	Long-Term (7–10 yrs)
<b>Regulation</b>	CAA engagement for eVTOL airspace corridors; initial vertiport siting and operating guidance; TRA sandbox trials.	Type Training approvals; safety case development; integrate with AMS EC concept; local planning for vertiports.	Full operational integration into urban & rural airspace; compliance with DfT Future of Flight and Scottish net-zero aviation strategy.
<b>Infrastructure</b>	Identify vertiport locations near hospitals, transport hubs, island communities; temporary charging & maintenance facilities.	Expand vertiport network; integrate charging & recharging systems; coordinate with HIAL and ports.	Fully operational vertiport infrastructure network supporting passenger, cargo, and emergency services.
<b>Skills and Workforce</b>	Upskill pilots, maintenance crews, and airport staff on eVTOL systems, high-voltage powertrains, and human factors.	Develop Type Training; emergency services training; general awareness for front-of-house staff; BVLOS familiarisation.	Fully trained workforce capable of autonomous /piloted networks, advanced maintenance, and integrated urban/ regional operations.
<b>Operations and Use Cases</b>	Pilot air taxi services, emergency response, short-haul logistics.	Expand passenger/ cargo networks; medical logistics; environmental monitoring.	Fully operational eVTOL networks integrated into multimodal logistics and emergency response.
<b>Stakeholder Engagement</b>	Engage residents, NHS, Coastguard, police, councils, and HIAL on trials.	Collaborate with operators, DNOs, UTM/ ATM providers, research organisations, airports, and ports.	Maintain continuous consultation, operational feedback loops, and community acceptance programmes.

FUTURE ROADMAP

# Airships

Theme	Immediate (0–3 yrs)	Medium (3–7 yrs)	Long-Term (7–10 yrs)
<b>Regulation</b>	Work with aviation authorities to plan trials and define safety standards, particularly in relation to airfield operations.	Test airships safely in local airspace; develop approval processes and emergency procedures.	Fully approved and regulated airship services operating across the region.
<b>Infrastructure</b>	Identify potential landing and mooring sites near ports, airports, and rural communities.	Build demonstration hubs with maintenance, storage, and refueling facilities.	A full network of operational airship hubs supporting passenger, cargo, and emergency services.
<b>Skills and Workforce</b>	Start training pilots and maintenance crews; explore skills gaps.	Expand training programs to cover new fuels, safety, and emergency response for airships.	A fully skilled workforce capable of operating and maintaining airships across the Highlands & Islands.
<b>Operations and Use Cases</b>	Conduct small-scale trials for cargo delivery, community supplies, and tourism demonstrations.	Expand trial routes for cargo, passenger, and offshore logistics; gather operational data.	Regular airship services supporting local communities, freight, passenger travel, and emergency operations.
<b>Stakeholder Engagement</b>	Talk with residents, councils, ports, and airports about trials and safety.	Work closely with operators, researchers, and local businesses to plan and improve services.	Keep communities and stakeholders involved to ensure services meet local needs and operate smoothly.

# Seaglidors

Theme	Immediate (0–3 yrs)	Medium (3–7 yrs)	Long-Term (7–10 yrs)
<b>Regulation</b>	Work with UK safety regulators like the Civil Aviation Authority and the Maritime and Coastguard Agency to agree how seaglidors should be classified and regulated.	Support clear national rules covering passenger safety, pilot training, maintenance, and port operations.	-
<b>Infrastructure</b>	Identify suitable take-off and landing points near islands, ferry terminals, and coastal towns. Check local electricity networks can support charging.	Build simple but dedicated seaglider terminals at selected ports. Install charging equipment and basic passenger facilities.	Fully integrate seaglider terminals with ferries, rail stations, and bus services.
<b>Skills and Workforce</b>	Train existing maritime and aviation workers to operate and maintain electric seaglidors.	Support formal training programmes through colleges and universities.	Maintain a skilled workforce able to operate larger fleets and more advanced systems.
<b>Operations and Use Cases</b>	Run pilot services linking island and coastal communities.	Expand to regular passenger routes and tourism services.	Establish reliable, scheduled services forming part of the wider public transport network.
<b>Stakeholder Engagement</b>	Speak with local communities, ferry operators, and environmental groups about safety, noise, and environmental impact.	Work with councils and regional transport bodies to plan routes and services.	Keep open communication channels to ensure services meet local needs and operate responsibly.



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