CAELUS2

ACP-2022-102
ACP-2022-103
ACP-2022-104
ASSESSMENT MEETING

CAELUS

PROJECTCAELUS.CO.UK

May 3rd, 2023

CAELUS2 TRIALS

N1-N3 FlightS Agenda
(ACP-2022-102
ACP-2022-103
ACP-2022-104)

1. Introductions
2. Statement of Need
3. Issues & Opportunities
4. Route & RPAS Info
5. Process Requirements
6. Provisional Timelines and Identified Stakeholders
7. Further Steps & AOB
8. Contacts

ATTENDEES & INTRODUCTIONS

UK CAA

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CAELUS2

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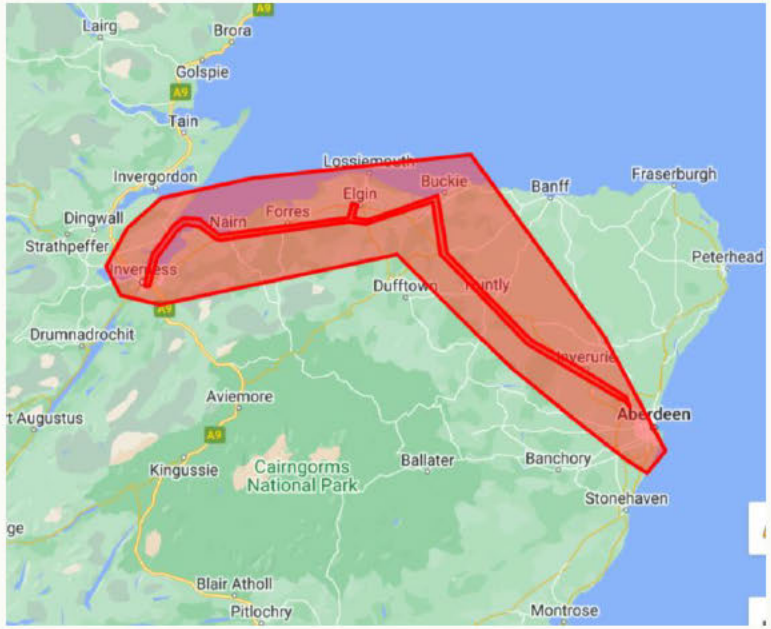
Statements of Need



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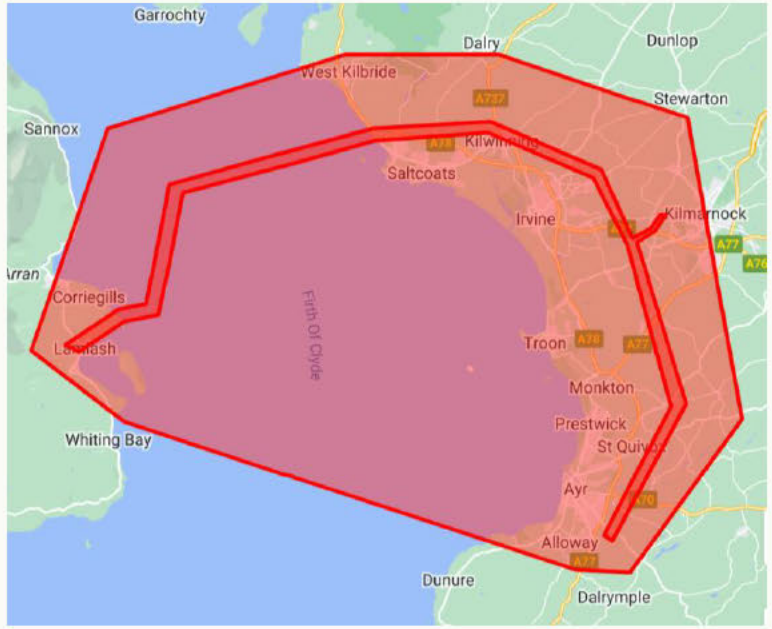
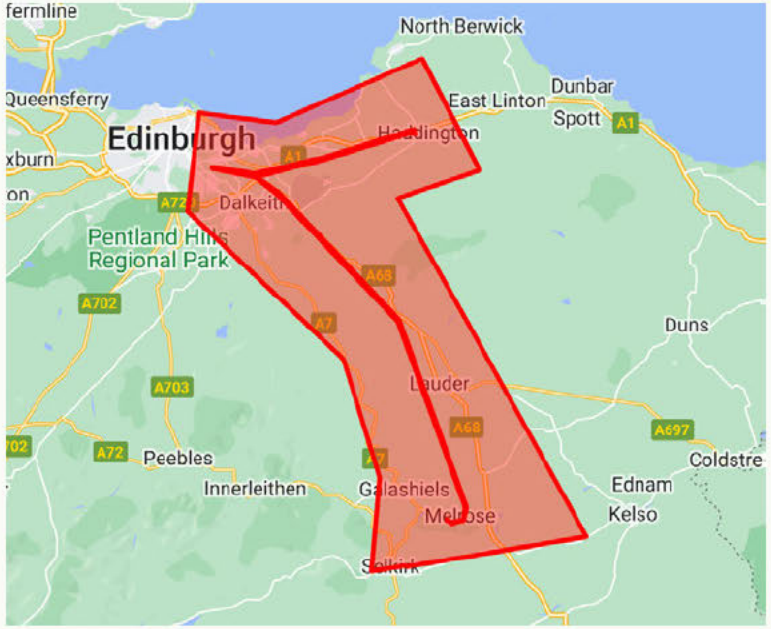


N2



N3

Note: Route order will depend on outcome of OSC, CAP 1616 process and CAELUS programme management

Statement of Need

ACP-2022-102-ACP-2022-104: Project Overview

The CAELUS (Care & Equity – Healthcare Logistics UAS Scotland) **consortium is led by AGS Airports Ltd on behalf of NHS Scotland** and the consortium partners and part **funded by Innovate UK through the Industrial Strategy Challenge fund, Future Flight** competition. The project which brings together AGS Airports, NHS Scotland, NATS, ATKINS, Cellnex, Connected Places Catapult and 10 other companies are working together to demonstrate the viability of a national drone network that can transport essential medicines, bloods and other medical supplies throughout Scotland.The project will deliver a Concept of Operations **(CONOPS) for the transition to fully integrated UAS operations** at a national level. This specific workstream, led by NATS will develop and publish a phased approach outlining proposed airspace constructs and detailing regulatory and technology gaps required to enable the transition. **Elements of this CONOPS will be validated** through live flight operations, differentiating CAELUS from other projects by seeking to move the industry forward by proposing and validating a method of operations that are fully integrated and sustainable.

Statement of Need

ACP-2022-102-ACP-2022-104: Healthcare opportunity

With approximately **26% of Scotland's population living in remote or rural areas** spread across 69% of the land mass, service delivery can encounter constraints which contributes to treatment inequity. NHS Scotland encompassing the Territorial Boards and Scottish Ambulance Service (SAS) views the adoption of Unmanned Aircraft Systems (UAS) or drones as an opportunity to **transform the patient experience** and reduce the impact of traffic congestion and CO2 emissions. Key to this is the driver of the NHS Scotland Recovery Plan (2021) which highlights the essential need for research, innovation and redesign as integral to the recovery of NHS Services. **For both SAS and NHS Scotland equity** in the delivery of healthcare **is a key driver** for involvement in this project as NHS Scotland considers how to remobilise and redesign services to address the needs of Scotland's health and social care challenges. A current strategic directive for SHIP (Scottish Health Industry Partnership) is to grow the economy (community wealth building) and **support remobilisation, accelerating the adoption of Innovation into NHS and Social Care** (Life Sciences in Scotland, 2022). A drone-based network has the potential to **reduce mileage and produce significant time saving opportunities** improving patient experience, outcomes and equity in care delivery. As a formal partner of the consortium, NHS Scotland via lead board NHS Grampian, are providing a joined-up approach bringing input and expertise from **health boards and SAS under the "Once-for Scotland"** banner. The NHS will define and support at ground level the clinical use cases that will be flown or simulated in the live and digital demonstrations.

Statement of Need

ACP-2022-102-ACP-2022-104: Informing Regulation

Today, most beyond visual-line-of-sight (BVLOS) UAS operations can only be conducted within segregated airspace. The most common way most common way to achieve this is to establish temporary danger areas (TDAs) for the UAS to operate within. Current regulation is regulation is designed to consider a per flight basis without means to provide a scalable solution. Recognised detect and avoid capabilities avoid capabilities are basic. CAELUS intend to **validate a developed concept of operations around airspace structure and use that is use that is scalable and sustainable.**

Statement of Need

ACP-2022-102-ACP-2022-104: Proposed Operations

We aim to **utilise volumes of segregated airspace** across Scotland in a total of 5 locations to enable us to prove elements of our proposed of our proposed future concept of integrated airspace. For these proposal, we intend to fly in the Grampian / Ayrshire & Arran / Lothian Arran / Lothian regions representing use cases for North / West / East NHS Innovation boards respectively and the Scottish Ambulance Ambulance Service.

The use cases will require **volumes of segregated airspace** to be in place for a **maximum of 8 weeks** with expected **flying during 4 of those weeks**. Our proposal is that we activate this for limited duration. **The segregated airspace** dimensions and duration of activation **will be informed by stakeholder feedback**. This segment of flying will be undertaken by Skyports.

A system of **ADS-B Receivers** will be deployed to demonstrate an **additional layer of situational awareness** to the UAV pilot along the flying routes and contribute to the Detect and Avoid solutions that will form part of the demonstrations.

CAELUS2 Background

Part-funded by Innovate UK Future Flight Challenge

16 Partners

Led by AGS and supported by NHS-Scotland.

Airspace Integration

ConOps created by NATS and will be validated through trials.

NHS Need

Serve real-life use cases across urban and rural environments.

"Once for Scotland"

Reduce the need for patient travel in 3 NHS innovation regions.

NHS Use Cases

CAELUS would enable samples and supplies to be delivered rapidly, within a time controlled window with medical grade, temperature controlled and monitored packaging

Local Chemotherapy Administration

Reduces patient travel time, stress and cost by removing the need to travel to specialist centres.

Faster blood product cross-matching

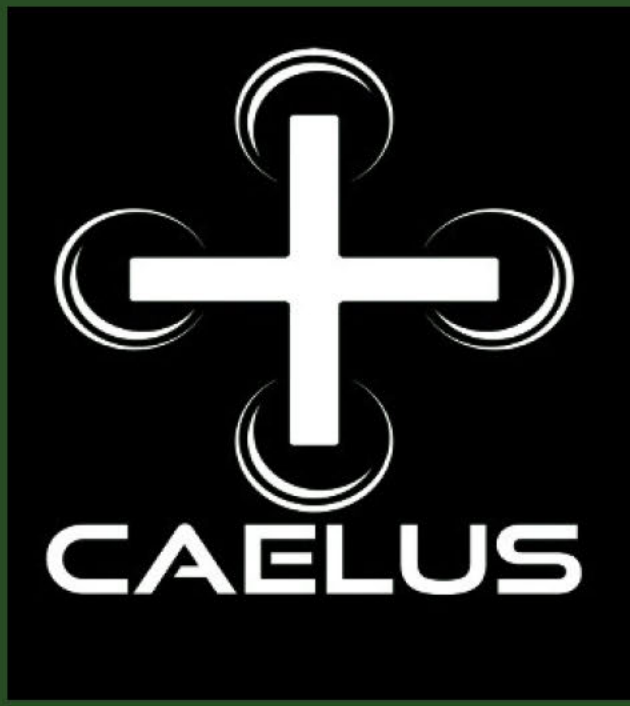
- Faster emergency treatment.
- Better patient outcomes.
- More efficient use of blood products.

Faster Lab Testing

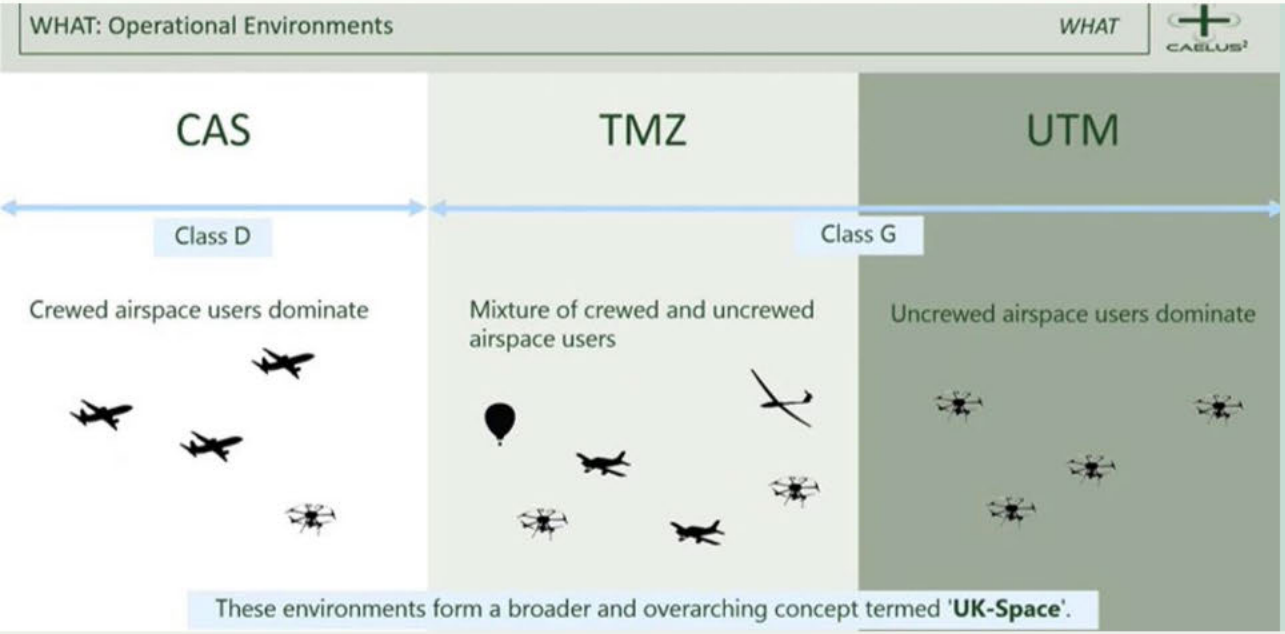
- Reduces antibiotic resistance.
- Better patient outcomes.
- Shorter hospital stay

Faster Emergency Medicine

- Better patient outcomes.
- Shorter hospital stay.



Operational Environment: Airspace Constructs



- CAS – Controlled Airspace
- TMZ – Transponder Mandatory Zone
- UTM – UAS Traffic Management

– The UAS corridors/volumes and UTM geographical zones are forms of a broader and overarching concept termed 'UK-Space'

–'UK-Space' takes the best practices, policies, regulations and thinking from world-leaders in drone service integration, modifies them to a UK context, and creates a near term, scalable solution for airspace integration

Horizons - Phased Evolutions of Airspace Management

		Airspace Integration Horizon-dependent Assumptions	
Horizon	**Time period**	**Airspace**	**Regulations**
H1	"Tomorrow" Day 1 1 (following the project)	– Baseline operational service – Low volumes of UAS operations in low-risk environments environments – Operations where there is low utilisation by other airspace airspace users	– Approval to operate in Class G TMZs – Existing CAA standards and regulations – Safety cases assessed on a case-by-case basis
H2	"Near future" + 3-5 years	– Comprehensive but geographically limited service – Low volumes of traffic in relatively low risk environments – Permanent volumes within Class D (with the ability to activate/deactivate segments) – TMZ corridors in Class G	– Approval to operate in Class G TMZs – Airspace changes required (approval to operate in Class D UAS corridors) – VLOS and EVLOS UAS Operators are not exempt from TMZ requirements.
H3	"Far future" + 10 years	– Comprehensive regional service – Scaled up, medium volume of UAS traffic across both urban and rural environments – Dynamic volumes of airspace	– Approval to operate in Class G TMZs. – Further airspace changes required (Approval to operate in Class D UAS corridors/volumes or within Class G UTM geographical zones)
H4	"Very distant future" + 20 years	– Comprehensive national service – Nationwide delivery network – Dynamic volumes of airspace with ability to utilise Free Route Airspace (FRA)	– Potential widescale change to airspace classifications and constructs – Approval to operate in controlled and uncontrolled airspace – Dangerous goods carriage approved – Multiple aircraft certified for use in service

Validation Objectives – Example

CAELUS 2 ConOps Mapping		FF3 Roadmap Mapping	
"Child" **Validation Requirement**	**Partner(s) involved**	**ID**	"Parent" **Validation Objective(s)**
The Delivery Management System (ANRA) shall (a) receive customer orders (NHS) and (b) drone operator(s) (Skyports) shall be provided with orders from the lists of available jobs.	ANRA, NHS, Skyports	S05	Demonstrate mobile, on-demand AAM booking services
The Airspace Manager (NATS) shall use a digital ATM/UTM interface (NATS, ANRA) for flight plan approval.	NATS, ANRA	S02	Demonstrate interoperability of UTM and ATM e.g., ability to manage a single flight plan across UTM and ATM designated airspace
The USP (ANRA) shall provide a strategic deconfliction service within a TMZ with other planned UAS flights.	ANRA	S04	Demonstrate planning of UTM operations with strategic deconfliction and demand balancing to ensure efficiency
The payload shall be loaded onto the UAS.	NHS	S03	Demonstrate a mixed vehicle class use case where aircraft of different types are integrated to provide an end-to-end solution to a customer problem (e.g., cargo delivery to distribution centre and onwards)
The UAS flight plan in the TMZ shall be activated (using the digital ATM/UTM interface) by the Airspace Manager (NATS) following a request from the UAS Operator (Skyports).	NATS, ANRA, Skyports	S02	Demonstrate interoperability of UTM and ATM e.g., ability to manage a single flight plan across UTM and ATM designated airspace
Specific procedures shall be designed (NATS) such that the UAS (Skyports) flight plan is segmented to allow crossing during climb out/approach.	NATS, Skyports	S06	Identify and demonstrate airspace solutions to support UTM activities
Tracking and conformance monitoring services shall be provided in a TMZ by the USP (ANRA) using a surveillance network (Pinkfroot) and an internet connection between UAS Operator (Skyports) and the USP	ANRA, Pinkfroot, Skyports	S20	Demonstrate exchange of information between flight operations, airport and traffic management services to manage predictability of operations
Video (picture and sound) shall be recorded of the UAS (Slyports) during the flight.	Skyports	S46	Demonstrate use cases that actively engage with the public, provide social benefits and support social acceptability
Tactical deconfliction shall be provided with other traffic.	ANRA, Skyports	S33	Demonstrate tactical deconfliction between aircraft of different types (e.g., drone and regional aircraft) using pilot and automated traffic collision avoidance / alerting

UAV AIRCRAFT

SWOOP KITE

MTOW: 25 KG

PAYLOAD: 4 KG

CRUISE: 68 KTS IAS

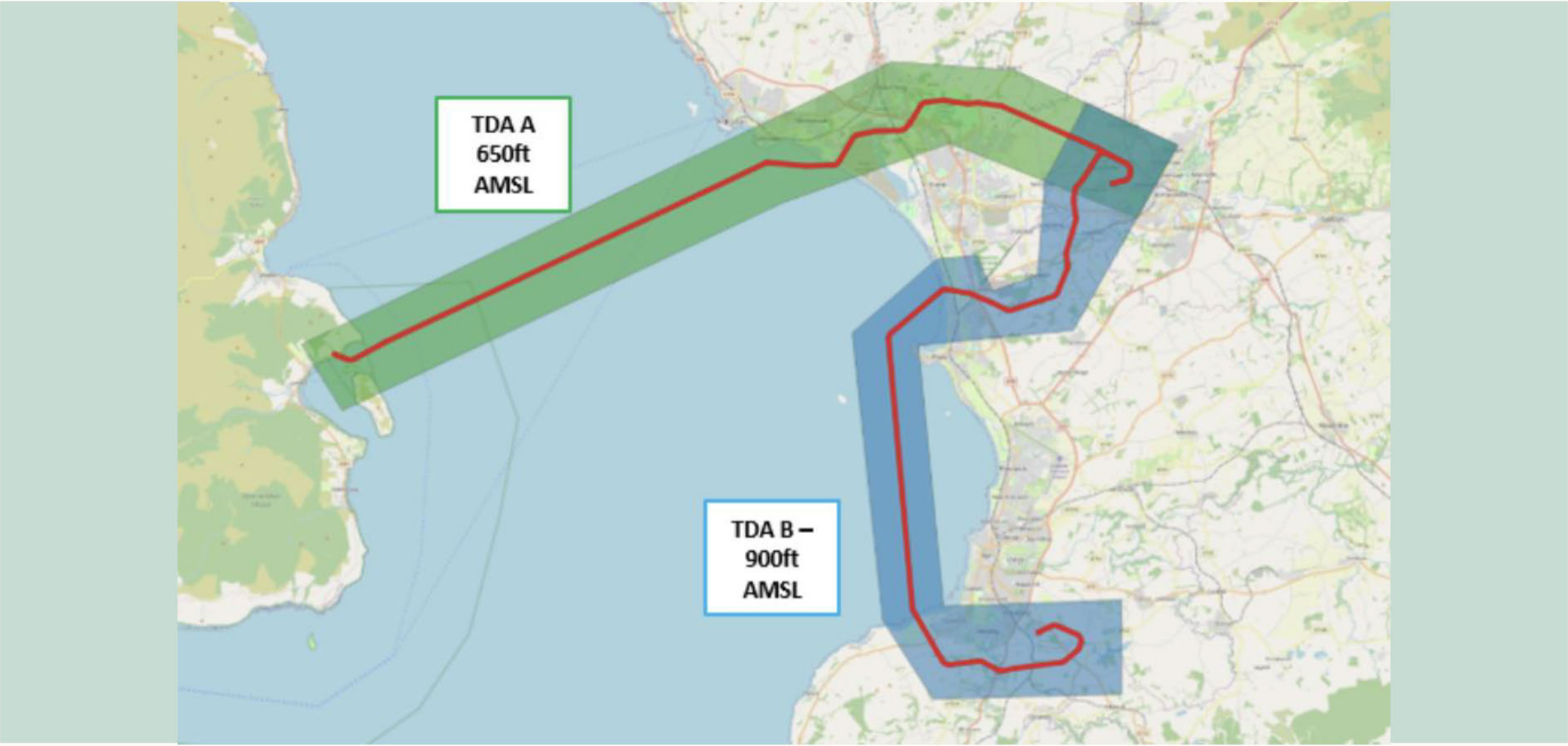
TYPICAL ALT: 400 FT AGL

RANGE: 160 KM

ROUTE: N1-N3

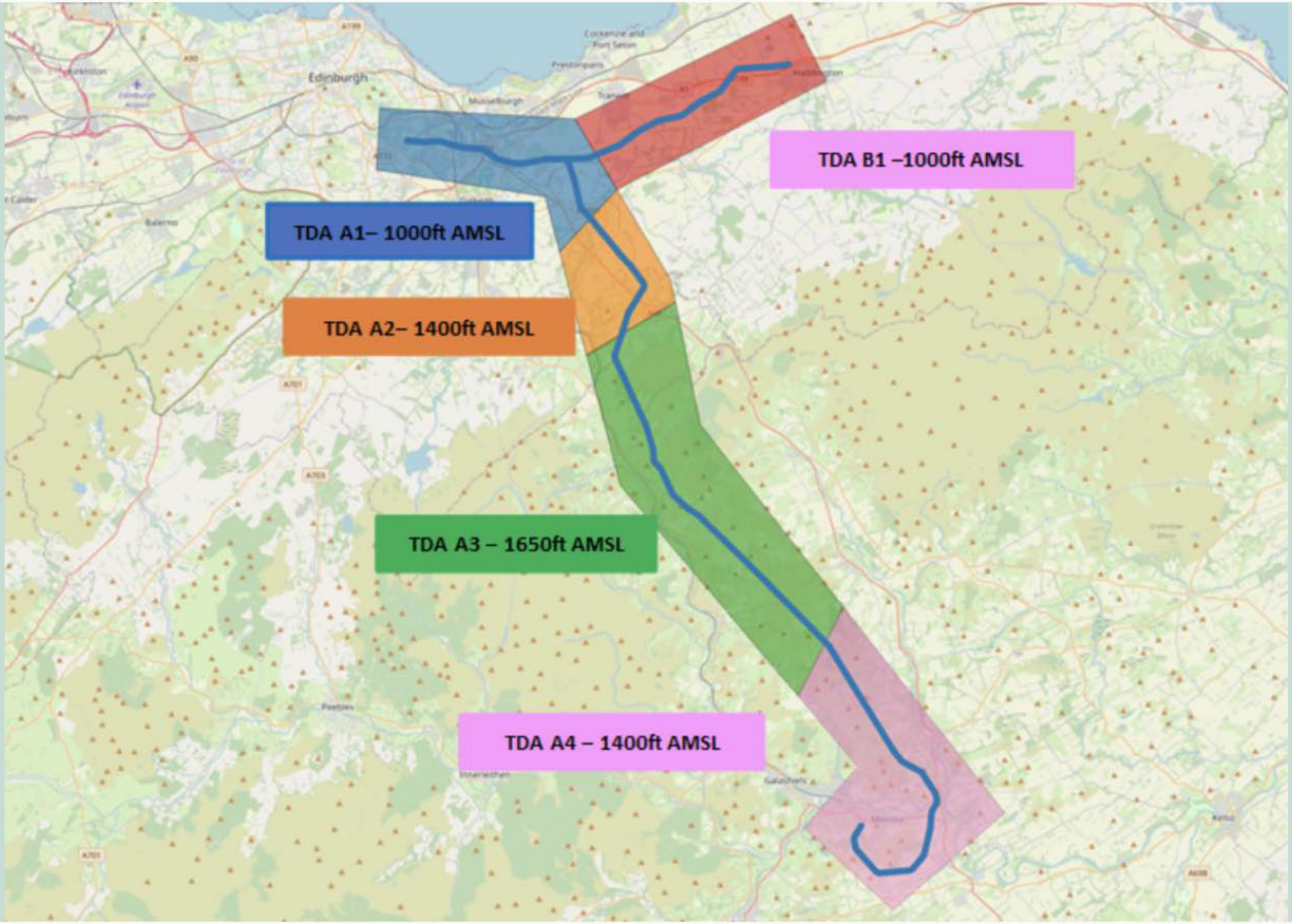
N1-N3 ROUTE FOR SWOOP KITE

– DEP/ARR: ABERDEEN ROYAL INFIRMARY – DEP/ARR: RAIGMORE HOSPITAL – DEP/ARR: UNIVERSITY HOSPITAL CROSSHOUSE – DEP/ARR: Royal Infirmary of Edinburgh at Little France	– ARR/DEP: DR GRAY'S HOSPITAL – ARR/DEP: ARRAN WAR MEMORIAL HOSPITAL – ARR/DEP: UNIVERSITY HOSPITAL AYR – ARR/DEP: Borders General Hospital – ARR/DEP: East Lothian Community Hospital Hospital
REQUIRED AIRSPACE AND DIMENSIONS	SEGMENTED TSA + TDA: ~2-4 km wide along the route and ceiling of ceiling of less than 1500 ft. Designs will be finalised after engagement.
REQUIRED WINDOW OF OPPORTUNITY	Each network operations to be conducted over 4 consecutive weeks consecutive weeks once started. We are planning for each network network ops to be within 1 of 3 potential windows: SEP-OCT, NOV-OCT, NOV-DEC OR JAN-FEB
ACTIVATIONS	Activation by NOTAM for short periods up to twice a day.
COMMENTS	Details will follow during formal engagement as per CAP1616, however we will aim to incorporate any comments known to us in the initial formal proposal

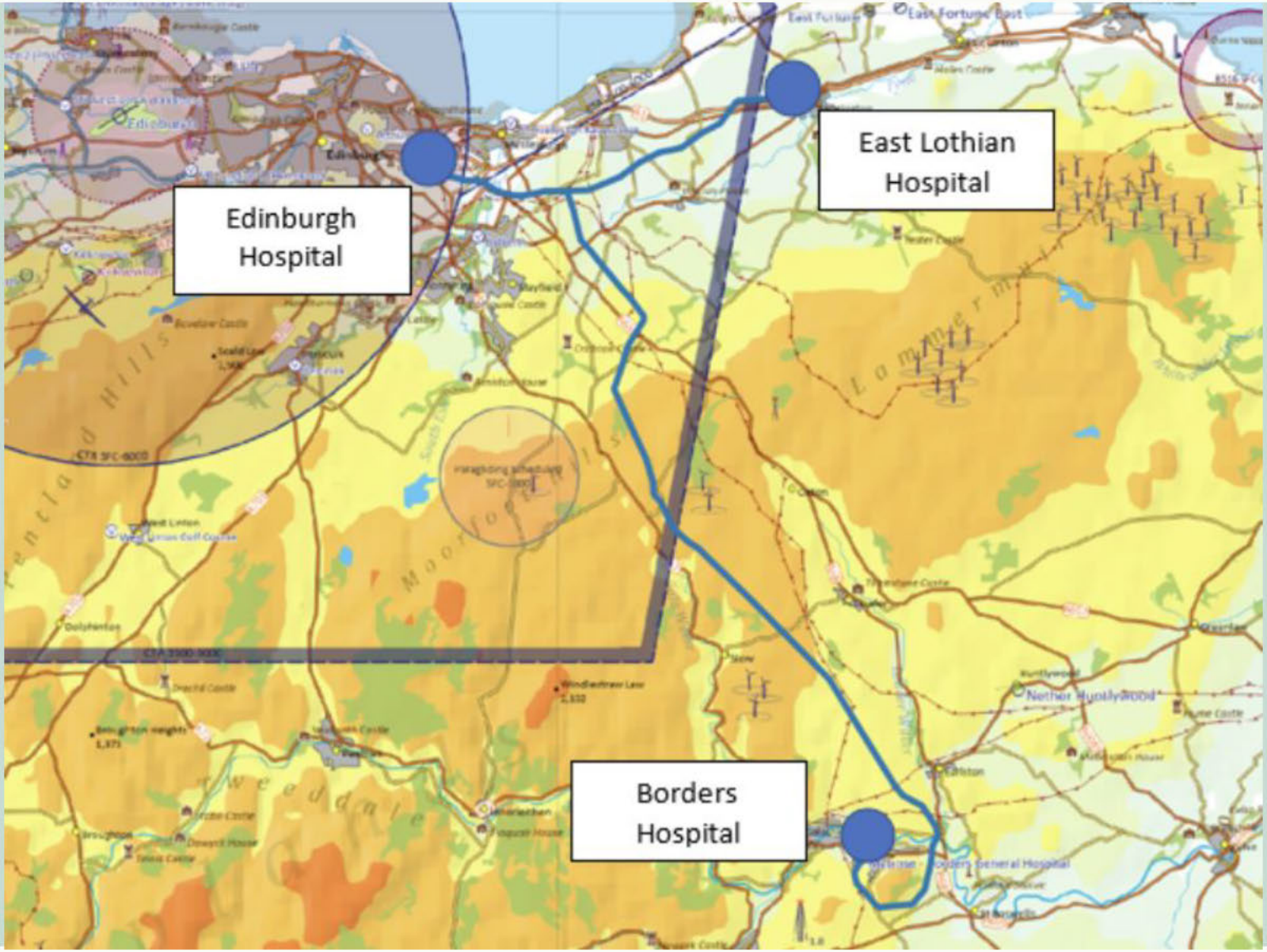


N2: Draft TDA from OSC submission

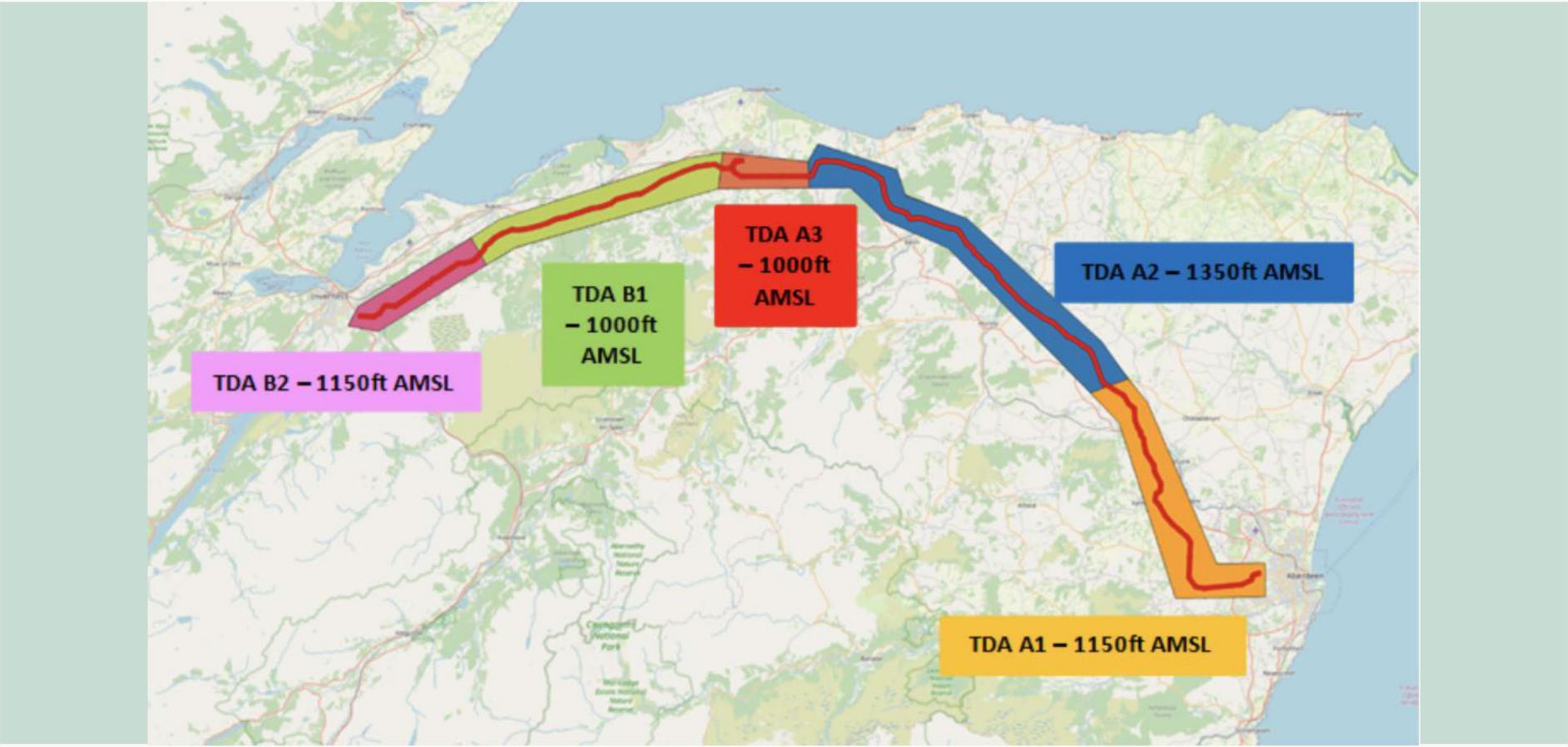
N2: Indicative Route on Airspace Map



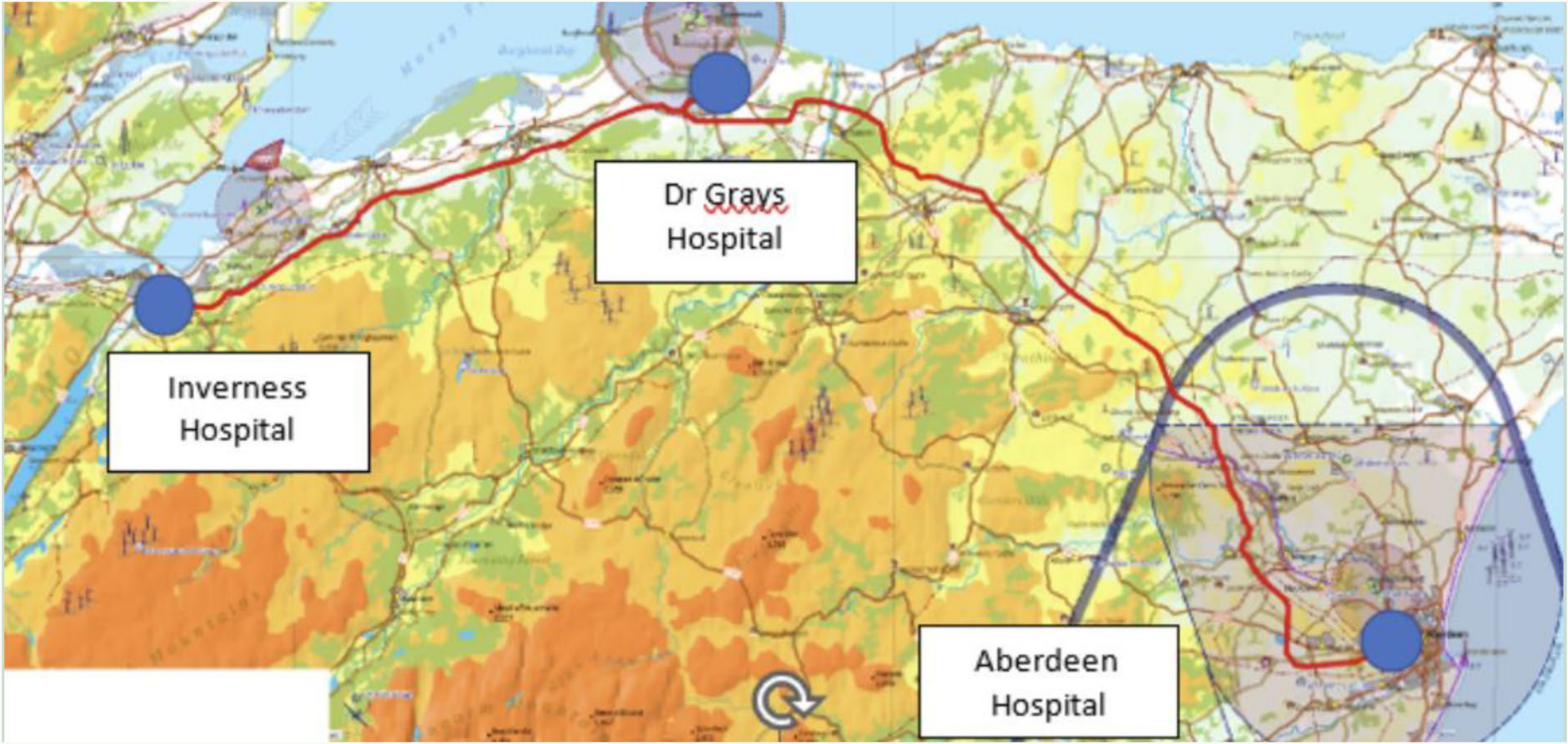
N3: Draft TDA from OSC submission



N2: Indicative Route on Airspace Map



N1: Draft TDA from OSC submission



N1: Indicative Route on Airspace Map

Process Requirements

Note: Temporary Change has Been Previously Proposed for Consideration

Trial Plan

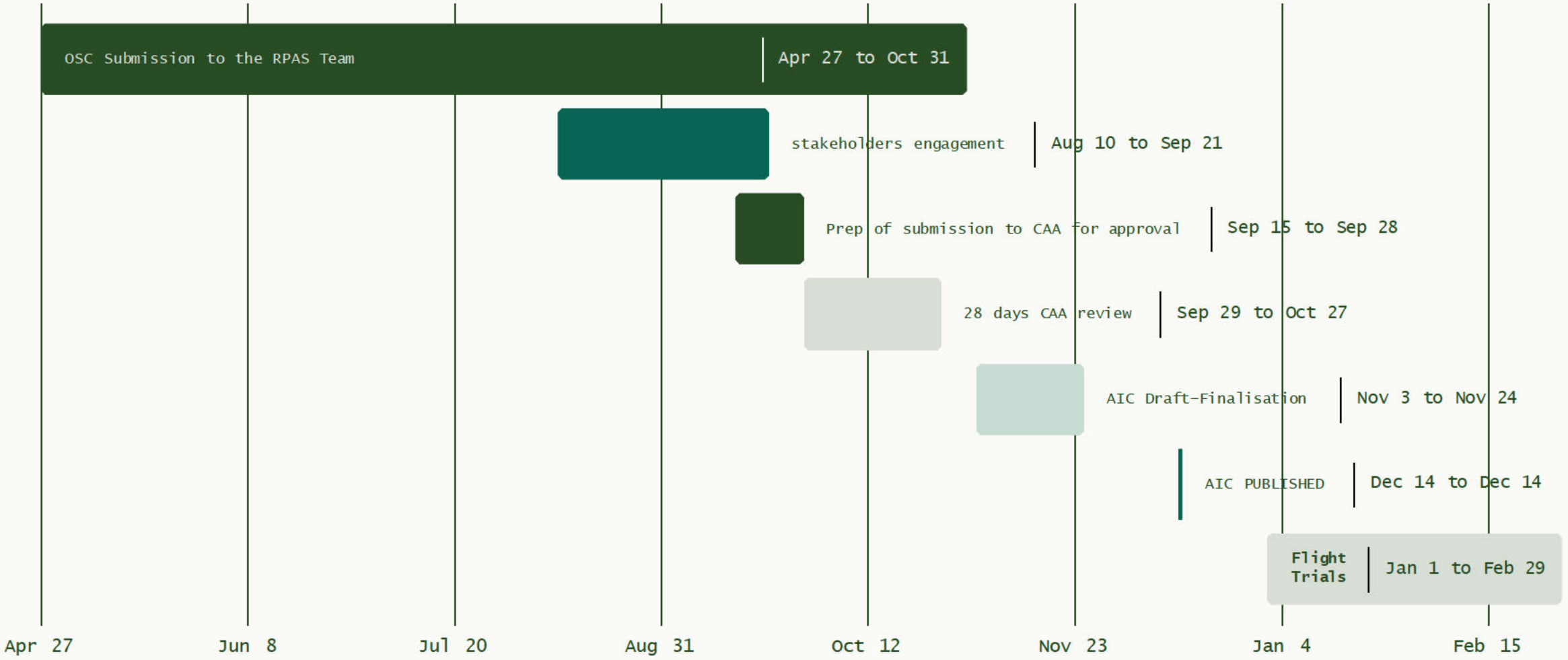
Stakeholder Engagement

Noise Impact Assessment

Safety Assessment

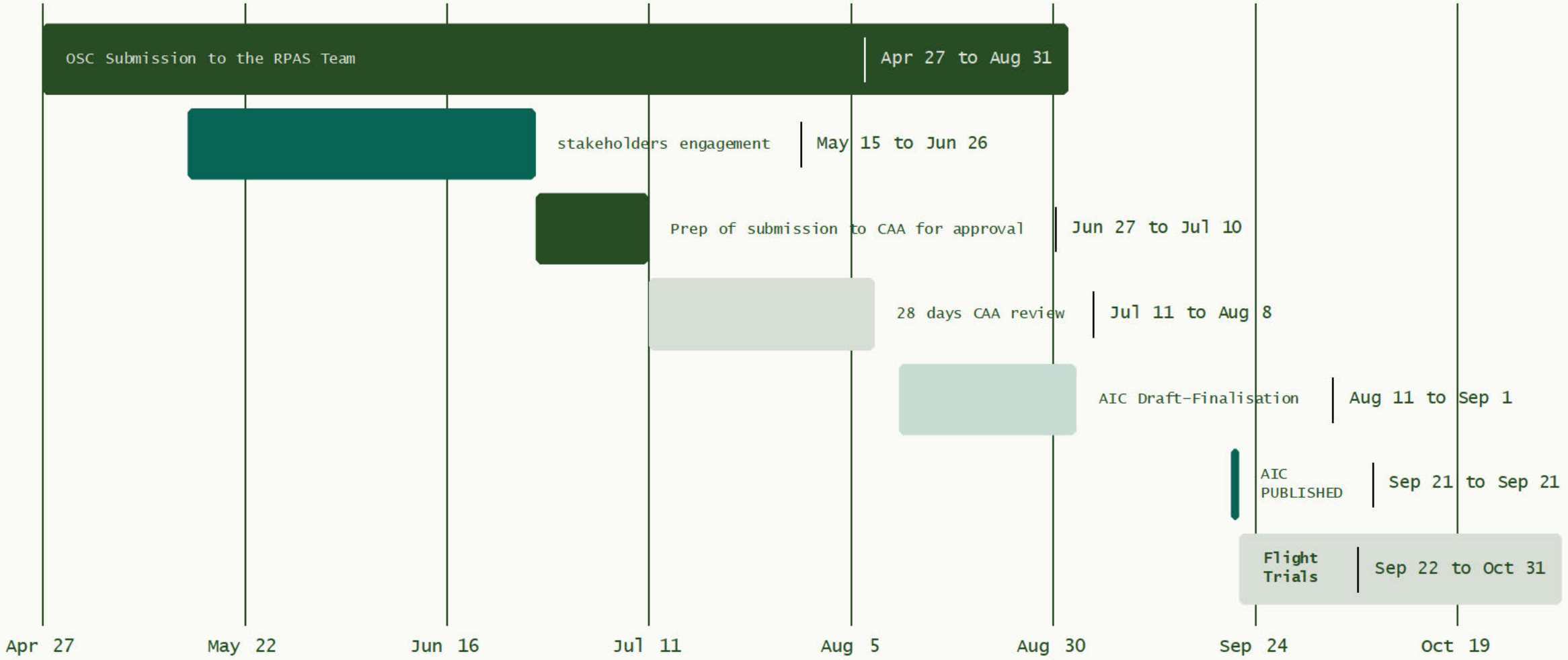
Timeline for N1

ACP-2022-102



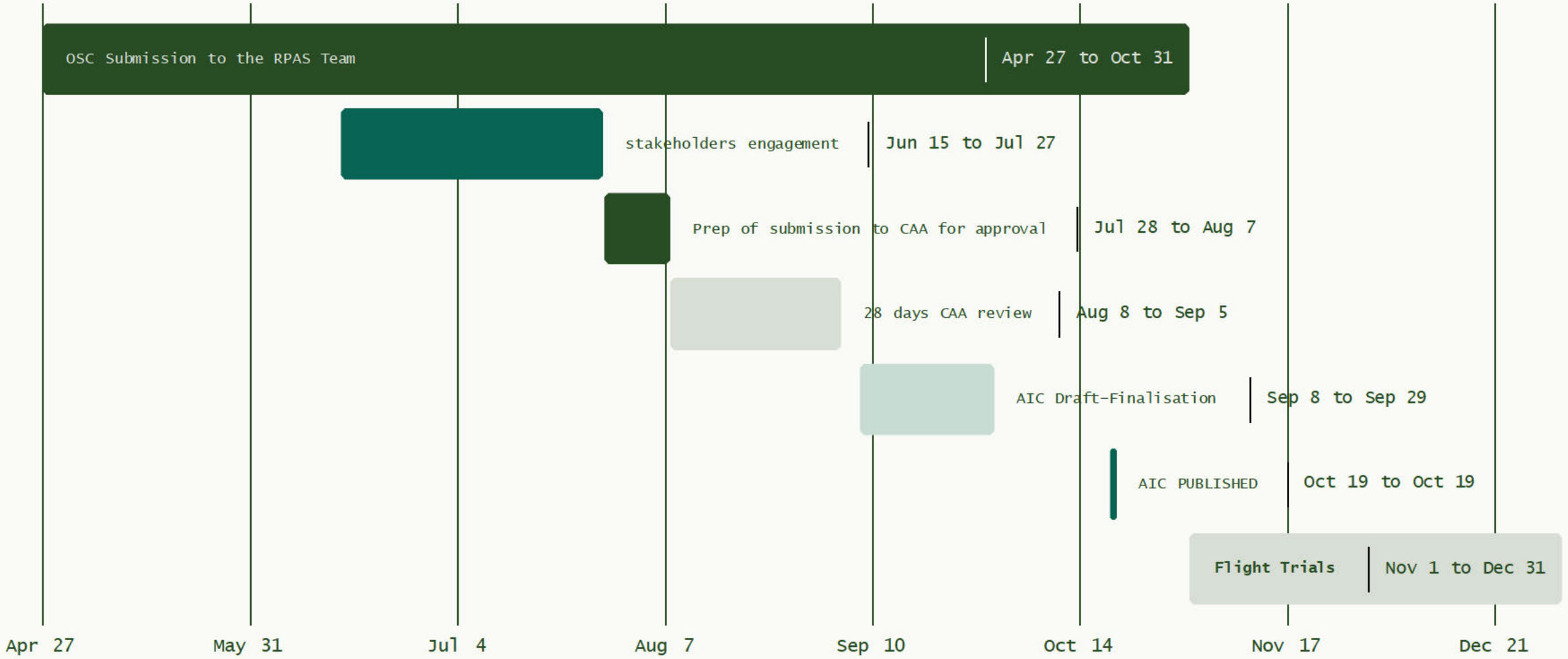
Timeline for N2

ACP-2022-103



Timeline for N3

ACP-2022-104



INVITED TO PRE-ENAGEMENT ON 18042023

National GA Organisations (excluding emergency services)

ARPAS-UK	**Attended**	Light Aircraft Association Association	**Attended**	General Aviation Safety Council	Declined
General Aviation Alliance Alliance	**Attended**	PPL/IR (Europe)	Not responded	General Aviation Awareness Campaign	Not responded
British Balloon and Airship Club	Not responded	Royal Aero Club	Not responded	Scottish Mountain Paragliding Club	**Not originally invited, but attended**
British Gliding Association	**Attended**	British Model Flying Association	**Attended**	Drone Major	**Attended**
British Hang Gliding and Paragliding Association	Intended, but not attended	British Business and General Aviation Association	Responded, but not attended	Easterton Airfield/Highland Gliding Club	Not originally invited, expressed interest, but NOT attended
British Microlight Aircraft Association	Declined/Not responded	British Helicopter Association	**Attended**	Strathaven Airfield	**Not originally invited, but attended**
British Skydiving Association	Not responded	Aircraft Owners and Pilots Association	**Attended**		
Helicopter Club of Great Britain	Not responded	Airspace4All	Not responded		

INVITED TO PRE-ENAGEMENT ON 25042023

Emergency Services Organisations

Babcock	Not responded	NPAS	**Attended**	Helicentre	Not sure if they conduct emergency services tasks?
BRISTOW SAR	**Attended**	Great North Air Ambulance	**Attended**	2Excel	Not sure if they conduct emergency services tasks?
GAMA HELIMED	Not responded	Aeronautical Rescue Coordination Centre	Not responded		
Falk Fire Services UK	**Attended**	Maritime and Coastguard Agency	**Attended**		
SAS	**Attended**	PDG Helicopters	Not able to attend		
UK Police	**Attended**				
OHS Rescue Helicopter	**Attended**				

STAKEHOLDERS IDENTIFIED

National Defence and Safety Critical Organisations

MoD DAATM		Isle of Man CAA	Likely not required		
Military Aviation Authority (MAA)	via DAATM	NATS			
Navy Command HQ	via DAATM	RAF	via DAATM		
United States Visiting Forces (USVF)	via DAATM				
BAE Systems					
UK Airprox Board (UKAB)					
UK Flight Safety Committee (UKFSC)					
UK Civil Aviation Authority					

STAKEHOLDERS IDENTIFIED

Other Organisations from NATMAC list

Airlines UK		Guild of Air Traffic Control Officers (GATCO)			
British Airline Pilots Association (BALPA)		British Airways (BA)			
Aviation Environment Federation (AEF)		Airport Operators Association (AOA)			
Heavy Airlines					
Honourable Company of of Air Pilots (HCAP)					
Iprosurv					
Low Fare Airlines					
Airfield Operators Group (AOG)					

STAKEHOLDERS IDENTIFIED

N2: University Hospital Ayr – Arran War Memorial Hospital – University Hospital Crosshouse

Aeordomes in Immediate Vicinity & ANSPs		GA Airfields, clubs and Unlicensed Sites		Emergency services	Suggest specific callsigns below	Other Aviation Stakeholders		Other Non-Aviation Stakeholders	
Prestwick Airport	Intro meeting held	Prestwick Flight Centre Ltd		Police	Specific callsigns and additional organisations to be confirmed as part of Emergency Services engagement	Ladyburn Heliport		University Hospital Ayr	
Prestwick ANSP?		Prestwick Flying Club Club		GAMA Helimed		Turnberry Heliport		Arran War Memorial Hospital	
University Hospital Crosshouse Heliport		Air Training Corps		SCAA Helimed		Malin Court Heliport		University Hospital Crosshouse	
Arran Heliport		Stair microlight site		Bristow SAR		Ayr Racecourse Heliport			
		Kilkerran Airfield		OHS Rescue					
		Bute Airfield		Babcock Mission Critical Services Onshore					
						Warrix Flying Group			

STAKEHOLDERS IDENTIFIED

N3: Borders General Hospital – Edinburgh Royal Infirmary – East Lothian

Aeordomes in Immediate Vicinity & ANSPs		GA Airfields, clubs and Unlicensed Sites		Emergency services	Suggest specific callsigns below	Other Aviation Stakeholders		Other Non-Aviation Stakeholders	
Edinburgh Airport		Kirknewton Gliding Site		Police	Specific callsigns and additional organisations to be confirmed as part of Emergency Services engagement	Dalhousie Castle Heliport		Borders General Hospital	
ANSL		Latch Farm Airfield		GAMA Helimed		Musselburgh Racecourse Heliport		Royal Infirmary of Edinburgh	
Edinburgh Royal Infirmary Infirmary Heliport		Midlem Airfield		SCAA Helimed		Dryburgh Abbey Heliport		East Lothian Hospital	
Borders General Heliport		Nether Huntlywood Airfield		Bristow SAR		Roxburgh Golf Course Heliport			
East Fortune Microlight Site		Charterhall Airfield		OHS Rescue		Ednam House Heliport			
East Fortune East Airfield		Lempitlaw		Babcock Mission Critical Services Onshore		Kelso Racecourse Heliport			
East of Scotland Microlights		Microlight Site				Carfaemill Heliport			
		Milfield Gliding Site				Livingston Model Aircraft Club			

STAKEHOLDERS IDENTIFIED

N1: Aberdeen – Lossiemouth – Inverness

Aeordomes in Immediate Vicinity & ANSPs		GA Airfields, clubs and Unlicensed Sites		Emergency services	Suggest specific callsigns below	Other Aviation Stakeholders		Other Non-Aviation Stakeholders	
AGS (Aberdeen)		Alexander Air Flight Training		Police	Specific callsigns and additional organisations to be confirmed as part of Emergency Services engagement	Mansion House Heliport		Aberdeen Royal Infirmary	
NATS (Aberdeen)		Longside Airfield		GAMA Helimed		Castle Hotel Heliport		Raigmore Hospital	
Lossiemouth	Introduction and first review meetings held. Supported by DAATM.	Hatton Airfield		SCAA Helimed		Pittodrie House Heliport		Dr Gray's Hospital	
HIAL (Inverness)	Introduction meeting held	Fetterangus Airfield		Bristow SAR		Thainstone House Heliport			
Inverness ANSP?		Meikle Endovie Microlight Site		OHS Rescue		Ardoe House Heliport			
Aberdeen UK CAA Inspector		EGEA Aberdeen (Culter)		Babcock Mission Critical Services Onshore		Raemoir House Heliport			
Inverness UK CAA Inspector		Whiterashes Airfield				Milton Brasserie Heliport			
Aberdeen Royal Infirmary Heliport		Insch Airfield				Knockomie Inn Heliport			
Raigmore Hospital Heliport		Grampian Microlight & Flying Club		Offshore helicopter operators		Boath House Heliport			
EASTERTON GLIDING SITE/Highland Gliding Club		Aboyne Gliding Site		Bristow offshore		Nairn Heliport			
		Moray Flying Club		Offshore Heli UK		Culloden House Heliport			
		Shempston Strip		PDG		Bunchrew House			
		Highland Aviation		Airtask		Dallachy Aviamodellers			
				2Excel		Buchan Aeromodellers			
				NHV		Inverurie & District Model Flying Club			
				CHC		Aberdeen Aeromodellers Flying Club			
				Viking					

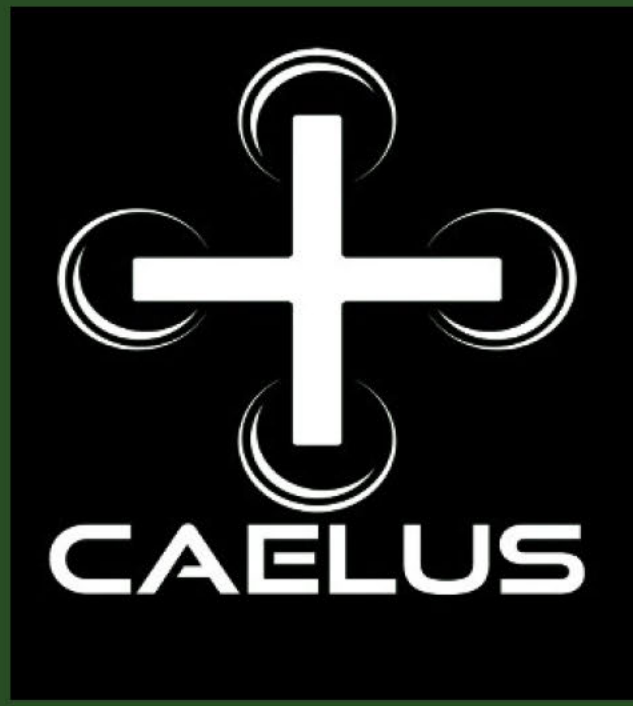
Further Steps & AOB

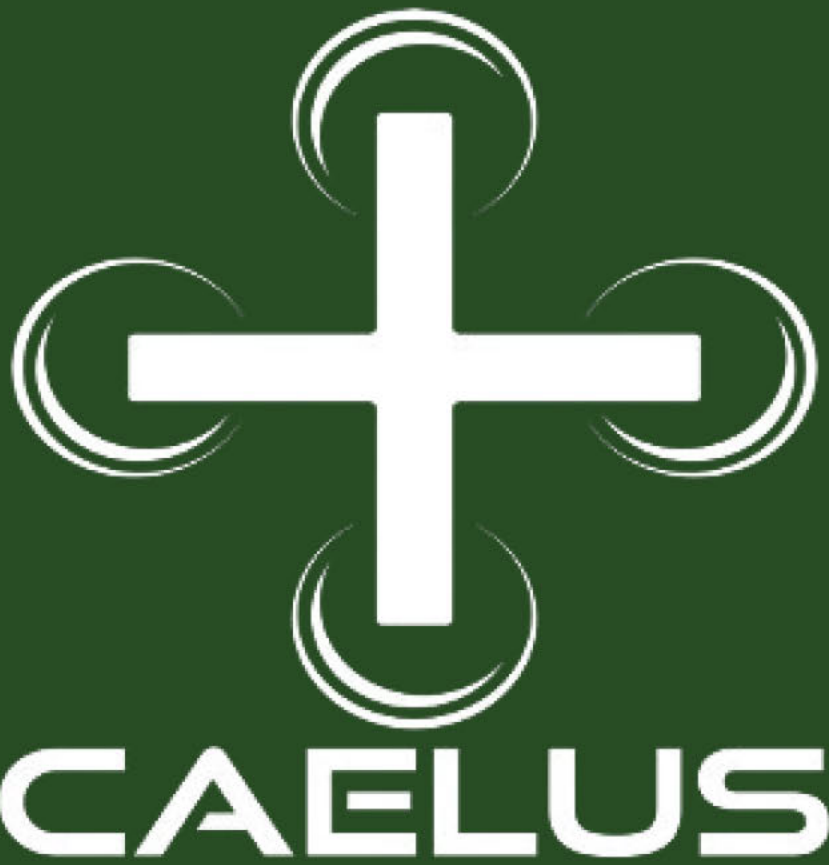
CAELUS2 ACTIONS

UK CAA ACTIONS

CAELUS2 QUESTIONS

UK CAA QUESTIONS





PRIMARY CONTACTS RE ACP MATTERS

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