CAELUS2

ACP-2022-105
ASSESSMENT MEETING

27 Nov 23

CAELUS

PROJECTCAELUS.CO.UK

27 Nov 23

CAELUS2 TRIALS

N4 Flight Trial Agenda

ACP-2022-105

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

Statement of Need

ACP 2022-105 Project Overview

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

Statement of Need

ACP-2022-105: 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 can encounter constraints which contributes to treatment inequity. NHS Scotland encompassing the Territorial Boards and Scottish Ambulance Service (SAS) Ambulance Service (SAS) views the adoption of Unmanned Aircraft Systems (UAS) or drones as an opportunity to **transform the patient experience** and **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 (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 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 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 for SHIP (Scottish Health Industry Partnership) is to grow the economy (community wealth building) and **support remobilisation, accelerating the adoption accelerating the adoption of Innovation into NHS and Social Care** (Life Sciences in Scotland, 2022). A drone-based network has the potential to **reduce** potential to **reduce mileage and produce significant time saving opportunities** improving patient experience, outcomes and equity in care delivery. As a 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 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 ground level the clinical use cases that will be flown or simulated in the live and digital demonstrations.

Statement of Need

ACP-2022-105: 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 and use, that is scalable and sustainable.**

Statement of Need

ACP-2022-105: 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 this proposal, we intend to fly a route connecting Kirkwall and Sumburgh, Sumburgh, representing use cases for NHS Shetland and NHS Orkney, both are territorial health boards within the North of Scotland Regional of Scotland Regional Innovation Hub and Scottish Ambulance Service.

The use cases will require **volumes of segregated airspace** to be in place for a **maximum of 4 weeks** with expected **an expected 1 return flight to take place and a series of localised flights.** 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 Dronamics.

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.

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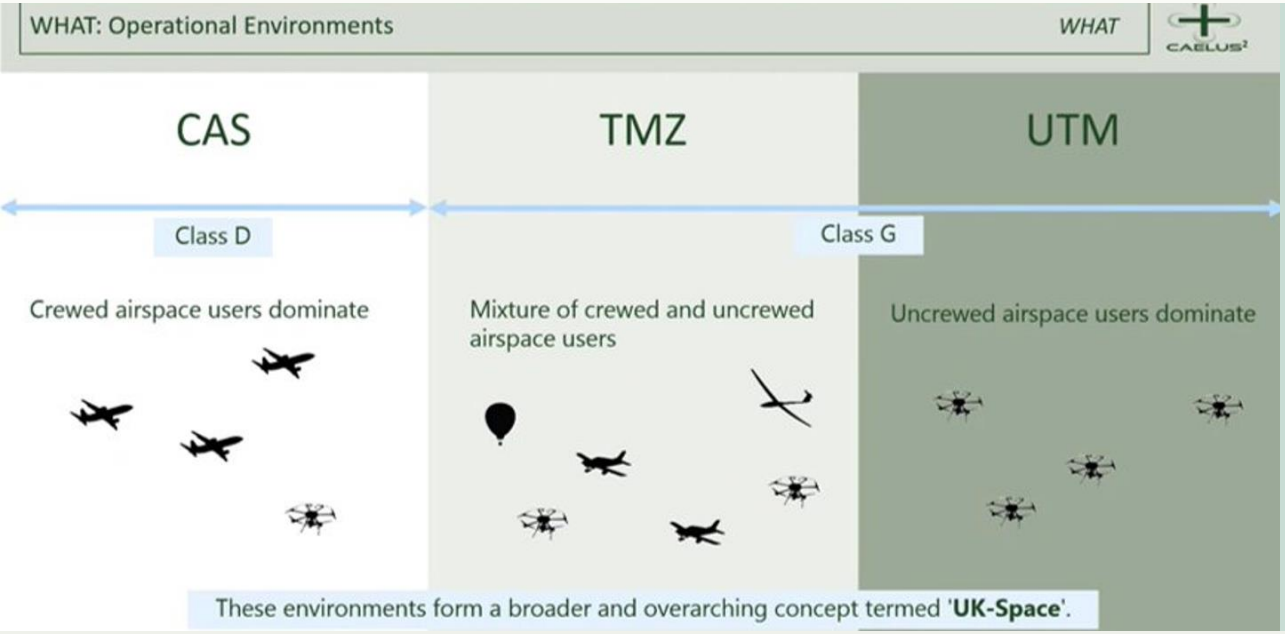
Operational Environment: Airspace Constructs



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

– The 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

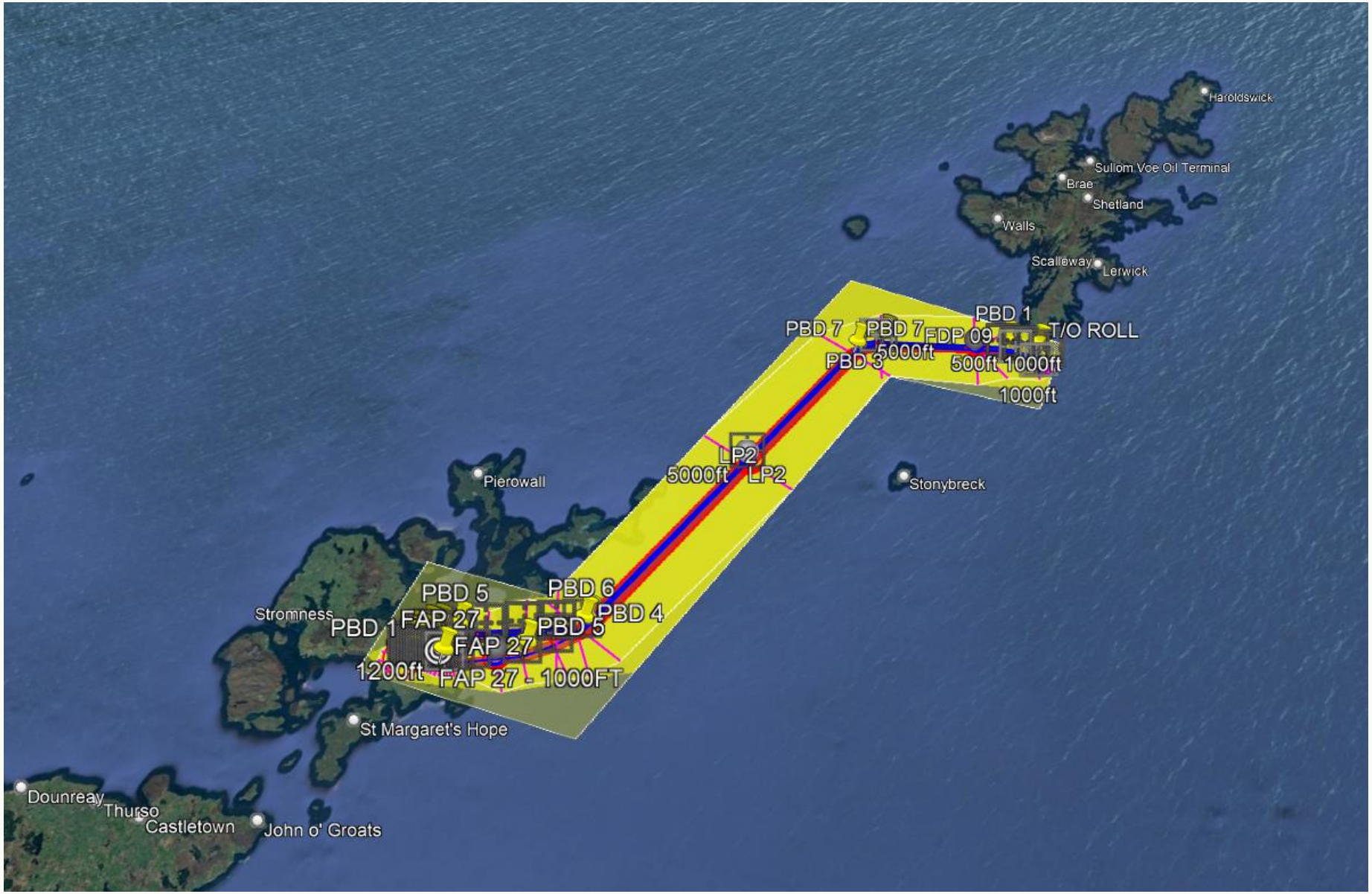
Validation Objectives – Example

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)	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 service

UAV AIRCRAFT
BLACK SWAN UAV

DRONAMICS

N4 ROUTE FOR BLACK SWAN UAV



Process Requirements

Note: Temporary Change has Been Previously Proposed for Consideration

Trial Plan

Stakeholder Engagement

Noise Impact Assessment

Safety Assessment

Timeline for N4

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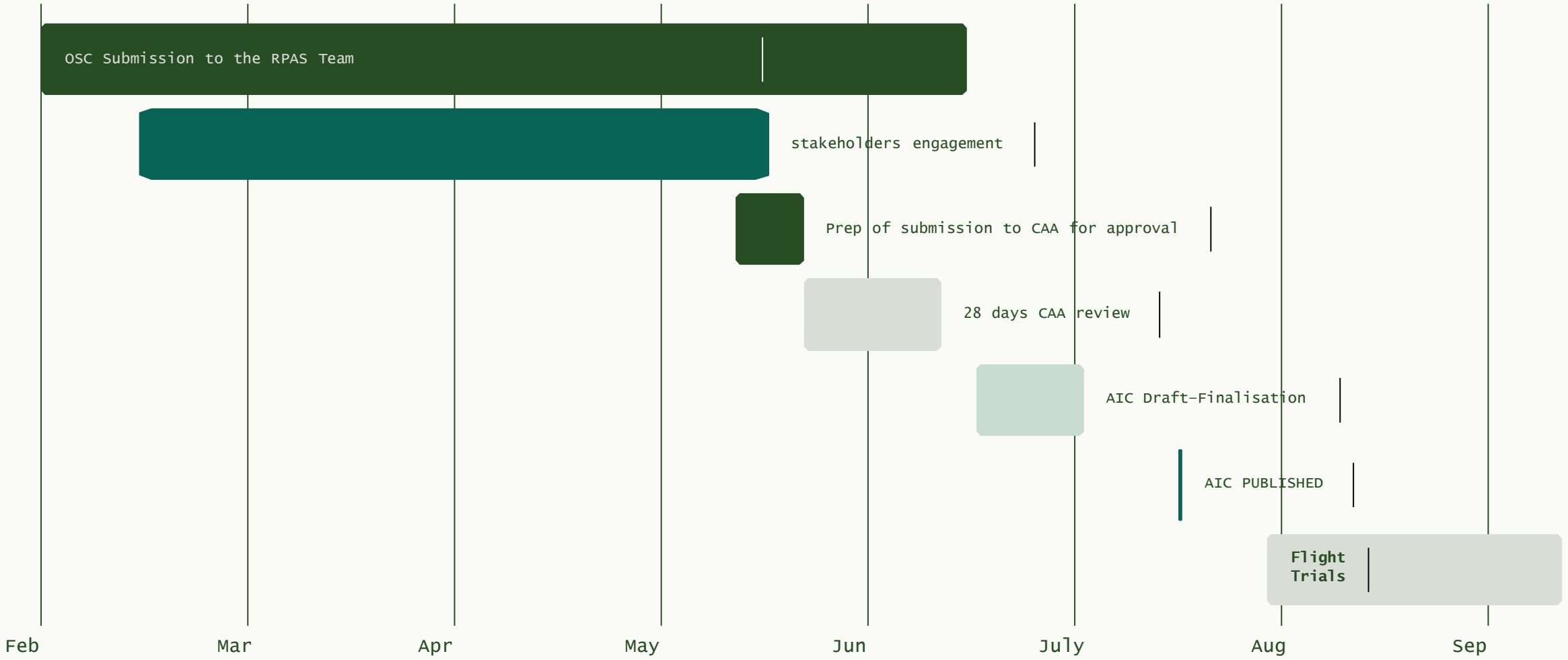

Further Steps & AOB

CAELUS2 ACTIONS

UK CAA ACTIONS

CAELUS2 QUESTIONS

UK CAA QUESTIONS

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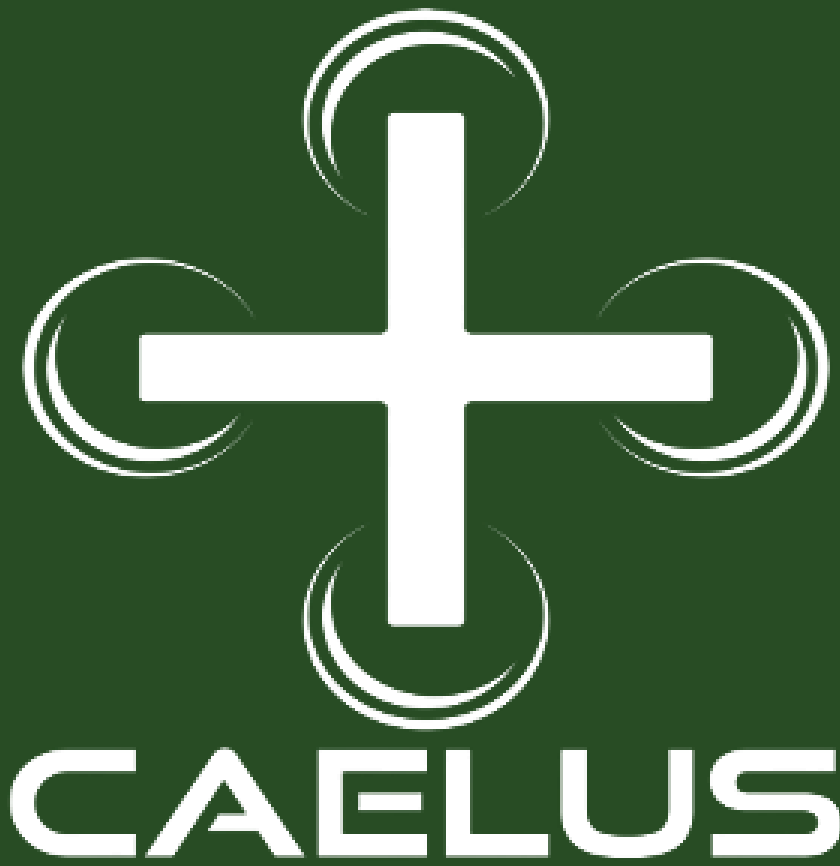

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