CAELUS 2

Flight Trial Management Document

Project Ref: 10023400

Version 1.0

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Contents

1 Amendments, Distribution, Replacement and Endorsement.

1.1 Amendments

Version No	Issue Date	Comments / Changes
V1.0	28/07/23	First Issue – supporting GLA-GJH ACP submission

1.2 Distribution

Controlled master copy – Work Package 3 Lead

Full Distribution – Project CAELUS partners

1.3 Replacement

NA

1.4 Endorsement

Document Sponsor: CAELUS Project Director

Document Owner: Work Package 3 Lead

Revision Period: To be reviewed for each flight trial

Date: 28 July 2023

Retention Period: 5 years

2 Introduction

This Flight Trial Management document is intended to capture a high-level understanding of the trial programme together with signposting for further detail. This document will primarily be used for CAELUS partners and will be held in an easily accessible document. This document may be used to support further work for assurance and regulatory purposes.

2.1 CAELUS Project Overview

The vision for the CAELUS 2 project is to deliver a

Demonstration of a UAS-enabled medical logistics network for Scotland, serving a variety of validated real-life use cases across urban and rural environments

The primary aims of CAELUS 2 are to:

1. Conduct live physical and digital demonstrations of key technologies, concepts of operations and processes in support of the vision
2. Enable first mover advantage to consortium partners in the emerging market
3. Develop "UK-space" concept for fully integrated UTM / ATM
4. Inform technical regulation enabling access for entrants to the market
5. Determine routes to financial viability for the network model
6. Support NHS case to accelerate drone enabled logistics services enabling improved patient outcomes and service efficiency

3 Governance

3.1 Overarching Project Level Governance

The overall responsibility for ensuring appropriate governance of the CAELUS project is in place to manage safety and risk effectively resides with the Project Lead partner AGS Airports Ltd. A Governance framework is in place to enable this responsibility to be discharged via the Work Package structure.

This is organised as follows:

- WP1 Project Management and Dissemination
- WP2 System engineering and Economic Model
- WP3 Flying Demonstration
- WP4 Digital Demonstration and Operational Support
- WP5 Social Perception and Stakeholders Engagement
- WP6 Physical Infrastructure
- WP7 Future Airspace Integration

The consortium members:

- Identify those risks and opportunities which could prevent or assist in achieving objectives;

- Identify and implement measures to manage our risks to an acceptable level;
- Maintain registers of identified risks at work package levels, with regular reviews of the level of risk and effectiveness of control measures.

Governance meetings occur monthly to provide regular updates, and as required for any issues arising or where activity intensifies. The project structure has been designed, to the largest extent possible, to reduce the dependencies between WPs and particularly between partners. All task level risks are reviewed monthly by the WP groups and project level risks are reviewed quarterly by the Governance Board.

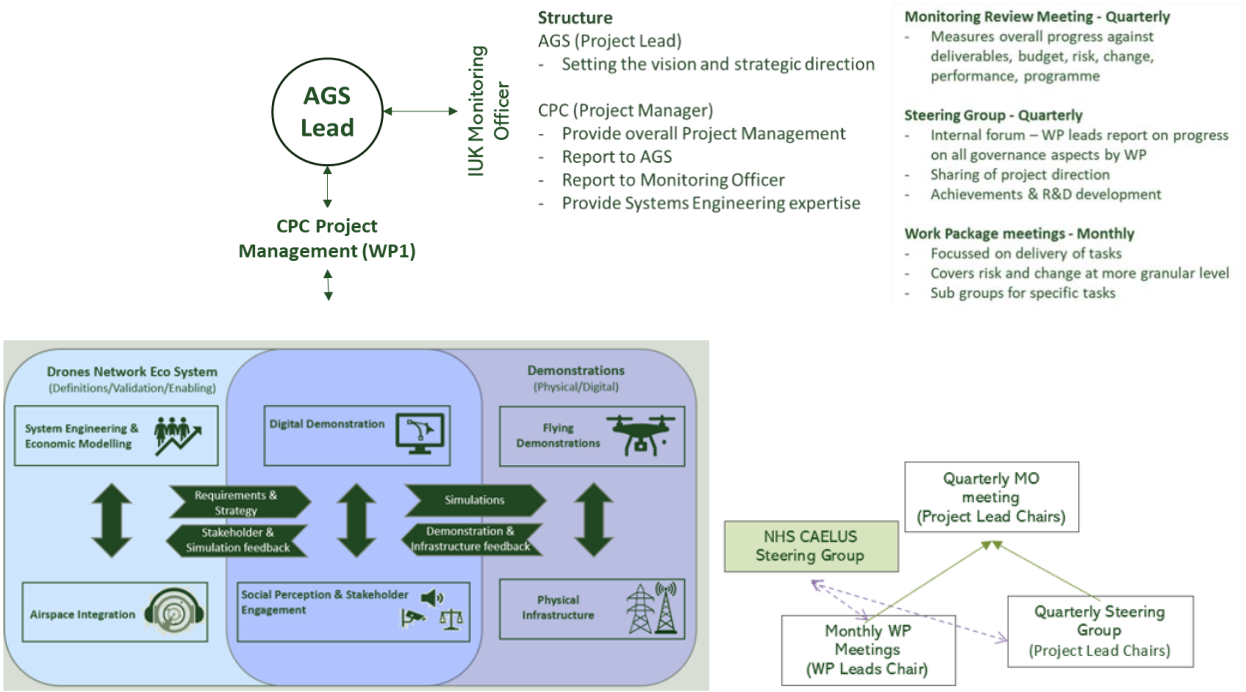


Figure 1 CAELUS Project Governance Structure

Each Partner will provide the CAELUS Project Manager with monthly reports summarising the progress of the project and the results including any updates on risks or actions allocated to them.

A risk register is held at Project level, owned by Project Lead AGS Airports and all Work Packages feed in a report on risks to the Steering Group meeting and quarterly MO meetings.

3.2 Work Package 3 (Flying Demonstration) Governance

Flight demonstration activity is planned and managed through Work Package 3. The WP lead Trax is responsible for coordinating the activity via the meeting framework and ensuring risks are reviewed and escalated where required. Work Package 3 meetings are organised as such:

Attendees

- Partners – AGS, NATS, ANRA, NHS, Skyports, Dronamics, CPC, Intelsius, Cellnex, Planefinder
- Specific technical experts as required
- Innovate UK representative as required or on request

Objectives:

The Work Package monthly meetings are in place to enable the development and delivery of the respective Work Package

The objectives of the monthly WP meeting are:

- To monitor the progress of the WP tasks and programme
- To manage the risk log for the WP and agree mitigation measures
- To agree and monitor the flight trial plans
- To report to the Steering Committee on any decisions required, budget performance and risk management
- To ensure that the WP members have access to all inputs required in order to achieve objectives and facilitate where not in place

The Work Package Leads will provide Progress Reports to the Steering Committee and QMO review meetings.

3.3 Roles and responsibilities

The flight trial programme roles and responsibilities are captured below:

Project Partner	Type of Stakeholder	Involvement / Needs
AGS Airports	Airport Operator	- Overall CAELUS project lead - Responsible for Coordinating assurance activities - Development of overall flight plan and risk register for flights - Role as airport operator for flights operating at an AGS Airport
ANRA Technologies	USP	- Provide open-access interface to a simulated UTM service provider to support pre-flight authorisations and in-flight monitoring and control services.
Atkins	Drone Hub Infrastructure Provider	- Provide prototype infrastructure to serve drone operations in flight and during take-off and landing
Connected Places Catapult	Innovation Accelerator	- Overall coordination of objective validation plan
DGP Intelsius	Medical Packaging Provider	- Provide temperature controlled medical packaging

Dronamics Global	UAS Operator	- Operation of the large, cargo drones in the physical, delivery flight demonstrations (only applicable for final flight trial)
NATS	ANSP	- NATS (local) – ANSP provider for Glasgow Airport airspace, assessing the impact on ATS provision by the UTM flight trial and managing local airspace during operation of UTM flight trial on behalf of airport customer. Managing trial and day to day ATC activity safely and expeditiously in compliance with NATS Safety Processes and creating safety assured Temporary Operating Instruction (TOI) and agreeing Letters of Agreement (LOAs) with relevant airspace users - - NATS (UTM team) – Coordinate validation objectives against future airspace CONOPS and measure trial performance against those objectives
Trax International	ATM Consultancy Service Provider	- Lead ACP approval process including ensuring adequate engagement activity and coordinate activity required for preparation of flying activities including liaison with all non-partner aviation stakeholders
Planefinder	Infrastructure Provider	- Deployment of aircraft surveillance networks covering the drone trial areas.
Skyports Deliveries	UAS Operator	- Operation of the physical flight demonstration drones implementing and operating end-to-end, middle and last mile drone deliveries.
NHS Grampian	Customer	- Role as landing site operator for flights operating at NHS locations - Testing NHS processes for loading and unloading and ordering - Ensuring staff awareness and competence and site risk assessments are undertaken

Note: The above represents a high-level overview of the roles and responsibilities only and not those specific to each partner for the individual flight trials.

3.4 Safety Assurance

Safety is the foremost priority for the CAELUS partners and each trial will be subject to safety assurance. The CAP 1616 process requires a safety assessment to be submitted for each ACP. Skyports and Dronamics hold their own safety management processes which are described though their OSCs. The CAELUS partners have agreed to undertake independent oversight activity of drone operators to provide additional assurance. This work is undertaken by Atkins under direction from AGS Airports and is documented in the CAELUS Drone Operator Safety Assurance Report. Assurance

around Air Traffic operations will be undertaken by NATS for flights around AGS airports and by the incumbent ANSP for other airports. AGS will play the role of oversight on all activity.

The operational responsibility for each element will be allocated to the most appropriate resources and recorded in each project documentation.

Changes to the programme will be managed on a tactical level within each work package, where there are impacts identified that effects other work packages then these should be highlighted at the earliest opportunity. Should the change result in an impact on a programme level then this is to be highlighted to AGS as the lead and the sponsor of the ACPs.

3.5 Risk Management

Project CAELUS adopts an integrated risk management process based on ISO 31000. AGS Ltd as Project Lead partner take ownership of the risk governance. The Risk Matrix, severity and likelihood classification tables shown below outline the method by which hazards, and their associated risks are identified and measured.
Risks are recorded and reviewed through the Work Package 3 governance framework and held in a special Flight Plan Risk Register which is continually reviewed up until each fight. This process does not preclude the need for each individual organisation to review and manage their own risks independently but by providing this centralised approach, ensure that any risk, new or changing, to flight safety where cross-partner input or activity is assumed as part of any mitigation, that this is visible and understood by all.

		Severity				
		Catastrophic 5	Hazardous 4	Major 3	Minor 2	Negligible 1
PROBABILITY	Frequent 5	25	20	15	10	5
	Occasional 4	20	16	12	8	4
	Remote 3	15	12	9	6	3
	Improbable 2	10	8	6	4	2
	Extremely Improbable 1	5	4	3	2	1
	Unacceptable	The risk is unacceptable and major mitigation measures are required to reduce the level of risk to as low as reasonably practicable.				
	Review	The level of risk is of concern and mitigation measures are required to reduce the level to as low as reasonably practicable. Where further risk reduction/mitigation is not practical or viable, the risk may be accepted, provided that the risk is understood and has endorsement of the Accountable Manager.				
	Acceptable	Risk is considered acceptable but should be reviewed if it recurs.				

Severity of Consequences		
Definition	**Meaning**	**Value**
Catastrophic	Results in accident, death or equipment destroyed	5
Hazardous	Serious injury or major equipment damage	4
Major	Serious incident or injury	3
Minor	Results in minor incident	2
Negligible	Nuisance of little consequence	1

Likelihood of Occurrence		
Definition	**Meaning**	**Value**
Frequent	Likely to occur many times	5
Occasional	Likely to occur sometimes	4
Remote	Unlikely to occur but possible	3
Improbable	Very unlikely to occur	2
Extremely Improbable	Almost inconceivable that the event will occur	1

Figure 2 Flight Trial Risk Measurement Methodology

4. Flight Trial Programme

4.1 Trial programme purpose

CAELUS 2 seeks to demonstrate real-life use cases for NHS Scotland and support the CAELUS Concept of Operations (CONOPS) working towards a rule set for the integration of BVLOS operations with crewed aviation. The enabler for the BVLOS flights which will support both intents is segregated airspace within which to conduct the trial. The airspace has been formally applied for through the CAP 1616 process with a Statement of Need submitted for each use case. The objectives supporting both intents are mapped against the Future Flight Challenge Objectives and have been allocated owners, measures of success and methodology for capturing the evidence required.

4.2 Trial programme Routes

The programme flights can be broken down into 5 trials supported by 5 ACPs:

GLA-Golden Jubilee Hospital (GJNH)

Arran-Crosshouse-Ayr (N2[1])

Borders General-East Lothian (N3)

Dr Gray's-Raigmore (N1)

[1] The trial routes were mapped and allocated a 'N' number which may not follow numerical order when the most suitable dates have been identified. The current order is GJNH, N2, N3, N1, N4. This is subject to change.

Kirkwall-Sumburgh (N4)

Different objectives have been mapped to different airspace trials with a theory of evolution between the ACPs. Different area of operations present different airspace, logistical and use case challenges. It is only by the culmination of the different trial projects that the full body of evidence can be gathered to prove both the NHS Scotland Use Cases and the CAELUS Con-Ops.

Each ACP network operations will be conducted within flying windows agreed with CAA dependant on approval dates. The expected timetable at time of writing is described in Section 5

The number of flights will be detailed in each operational plan document.

4.3 Trial timing

The trial timings have been agreed with the CAA and CAELUS partners to best align with the programme timeline for the Future Flight Challenge and the CAP 1616 process.

4.4 Trial management

The trial management will be in accordance with the WP 7.2 Validation Strategy and the WP 3 Plan for each of the trial ACPs. Each of the Trial Exercise Plans will detail the trial-specific roles and responsibilities. At the conclusion of each of the trials there will be the opportunity to analyse the outcomes and replan the testing and development as necessary, particularly in the case of the non-confirming results.

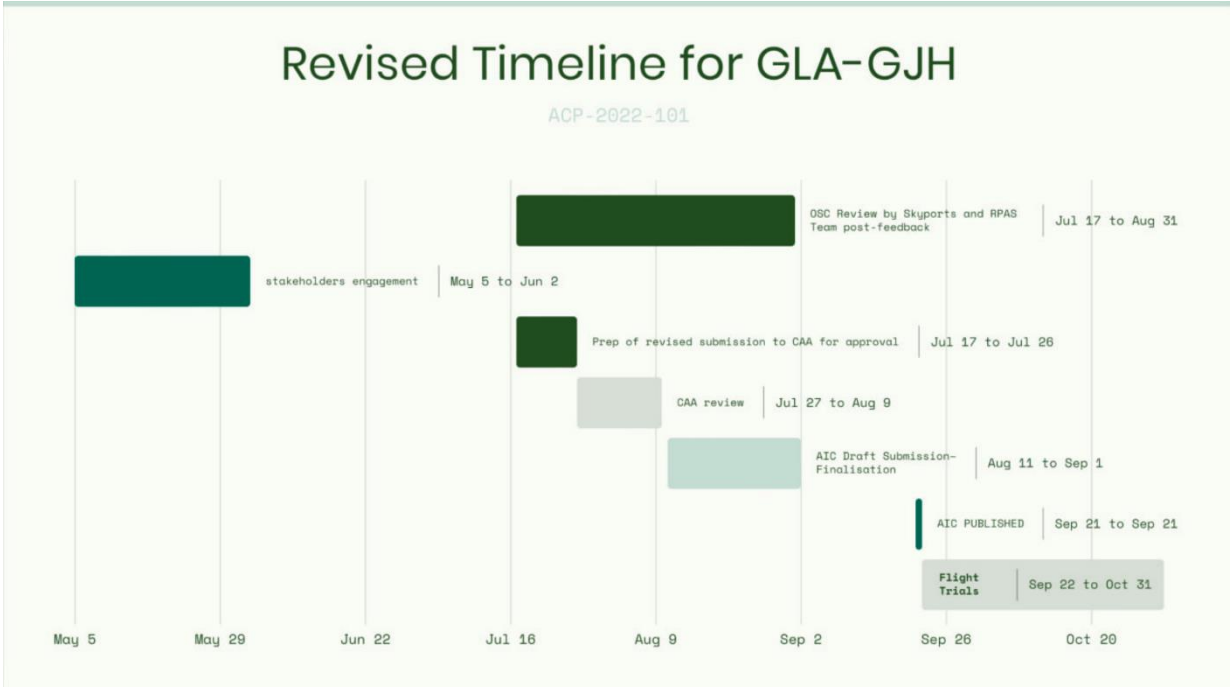
High level flight trial roles and responsibilities are listed in section 2.4

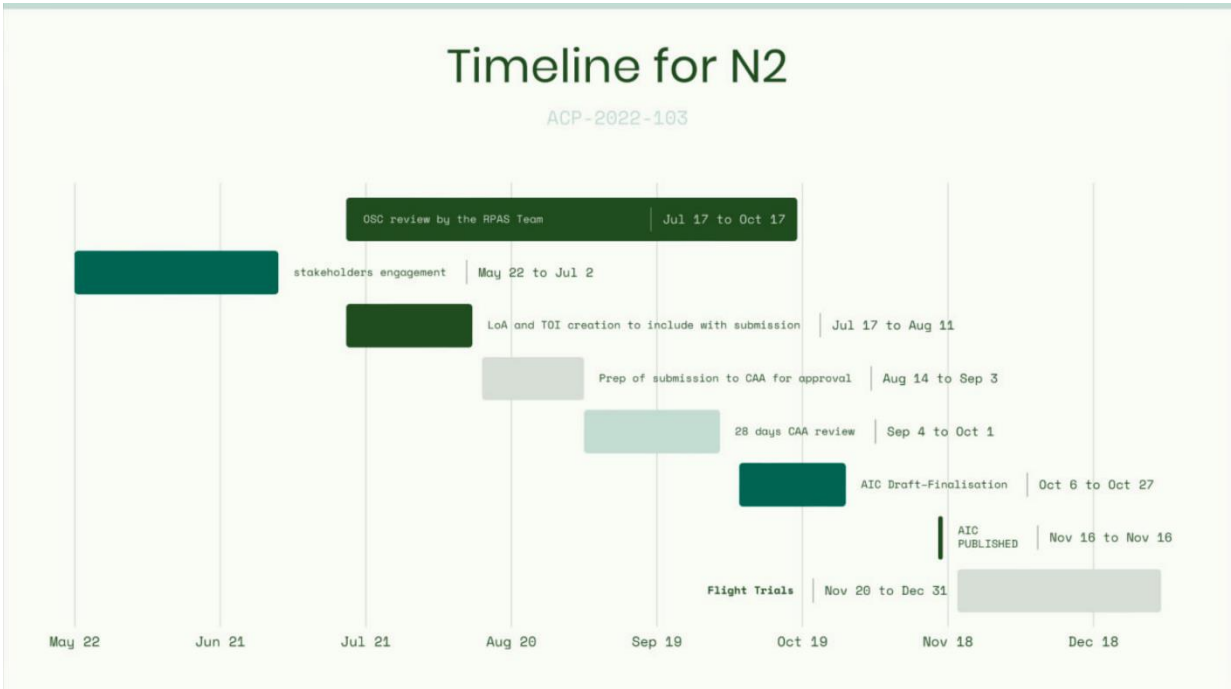
4.5 Trial resourcing

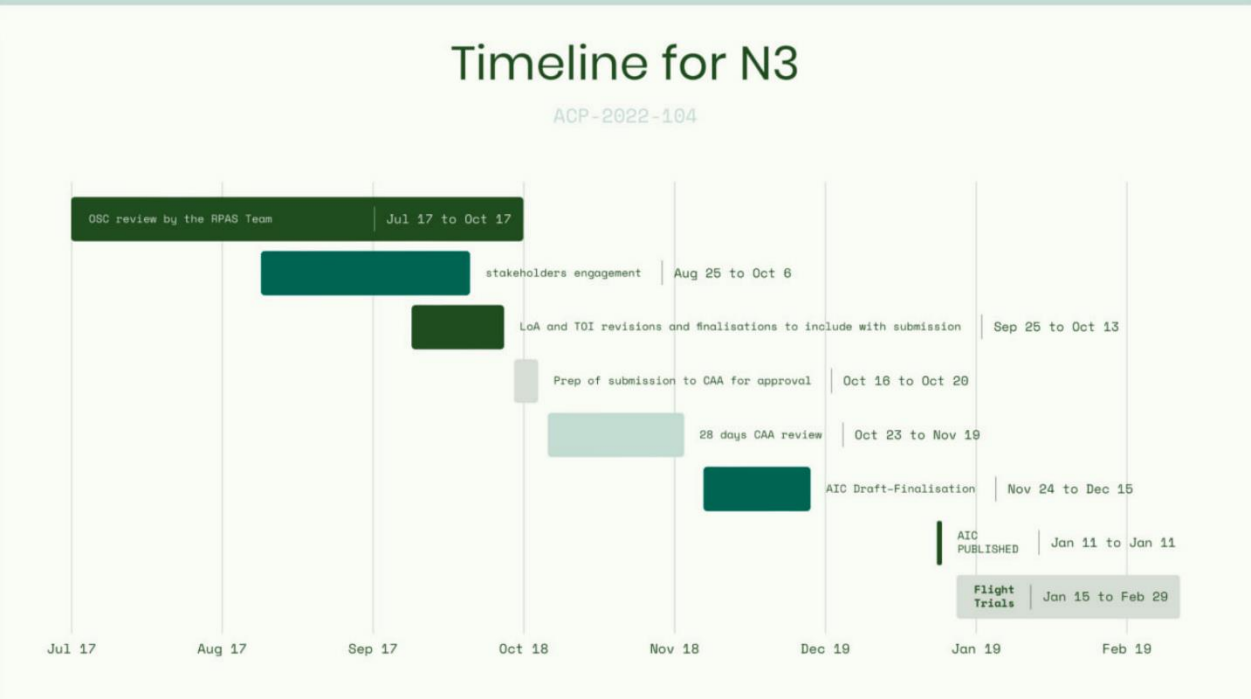
The resourcing of the flight trial programme is provided by the CAELUS partners and any risk to resourcing of the trial plan is discussed through review of the flight plan risk register and reviewed at the Quarterly Reporting Officer Reviews.

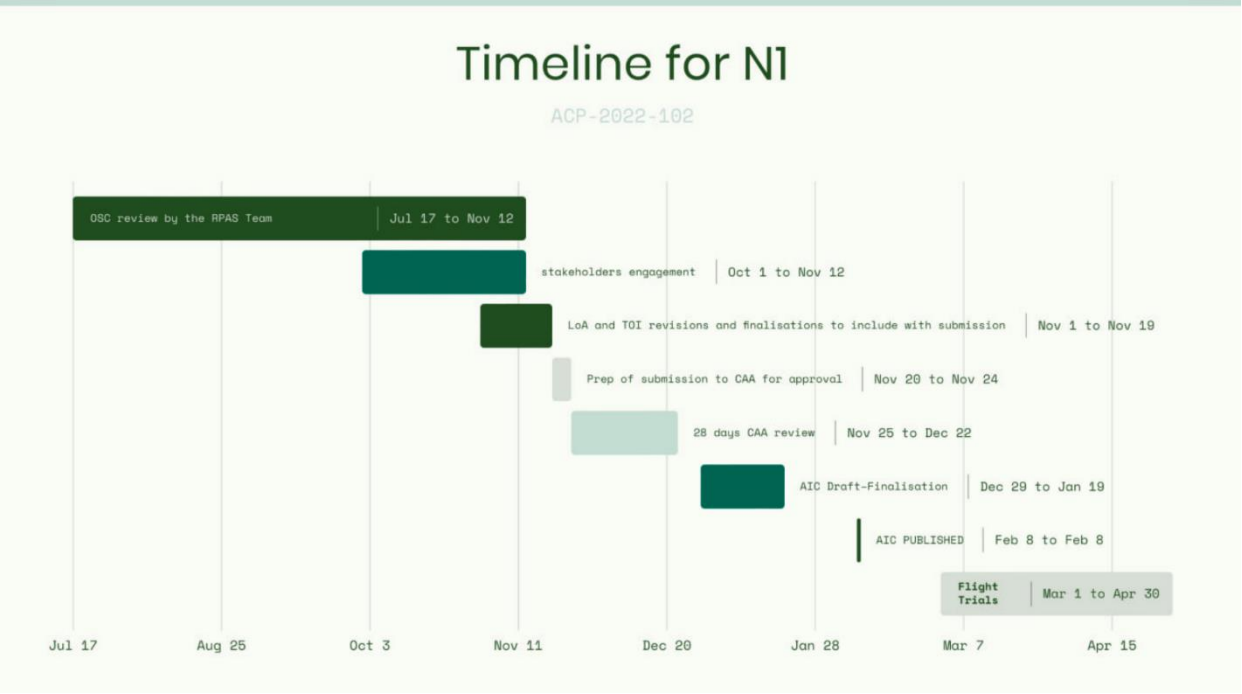
5. Programme

The following programmes are best known at this iteration of the document at time of publication and will be revised and managed by the WP3 team.









5.1 Trial sets

Each of the trial flights will seek to both prove objectives for the NHS Scotland Use Case and the CAELUS CONOPS. The Trial Validation Plan maps the objectives to each flight and this will be reviewed after each flight to ascertain and changes made from learning in each subsequent test to ensure best possible value from the programme.

6. Trial conditions

6.1 Normal conditions

The UAS aircraft within the consortium are defined in the trial plan documents and local operating procedures and operate with limitations in line with the OSC. They will be operated within the operational limitations set out in the OSC or based on agreements reached throughout the engagement, for example where local operating procedures exist and are more restrictive (low visibility at airport for example). This will be detailed in local operating procedures including the NATS TOI to ensure no ambiguity of operating conditions.

6.2 Abnormal

If any of the above conditions cannot be met, and conditions are not forecast to improve then the flights for that day will be abandoned with Skyports or Dronamics (as appropriate) providing the final decision making and advising all CAELUS partners. The airspace and NHS resources will be cancelled by the point of contact for that trial without delay.

6.3 Trial sequencing

The trial has been sequenced in terms of complexity of airspace within which the UAS is looking to operate and over the evolution of the trials the objectives will become more complex or where objectives are repeated, the flights will be used to demonstrate a robust body of evidence.

6.4 Test cards

Each trial will be supported by an Exercise Validation Plan and a series of test cards will be used to capture the intent, responsibility for that objective and a method of capturing outcomes.

6.5 Evaluation

The trials will be supported by a number of test cards which will capture the outcomes of each trial objective from each of the CAELUS partners nominated. The information will be reviewed by the CAELUS partner and then a summary will be provided to the Consortium and shared with all partners.

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