CAELUS

July 2023

Doc v3.2

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1 Introduction

1.1 CAELUS Project

1. This temporary change is in support of the CAELUS Concept of Operations (ConOps) which looks to ensure the safe operations of Beyond Visual Line of Sight (BVLOS), indeed all airspace operations in controlled airspace while validating the important potential improvements in NHS services. The flights for this temporary change are wholly contained within Controlled Airspace (CAS). Uncrewed Aviation (UA) operations will need to scale to meet the demand of the populous associated with conurbations. This temporary change enables the project to evaluate and develop the supporting systems to ensure safe and equitable integration of crewed and uncrewed operations in the future. The Temporary Segregated Airspace (TSA) provides the safety of flight for all airspace users with the intention to move from segregated airspace to accommodation as these supporting systems are validated, developed and approved by the regulator.

1.2 CAP 1616 ACP Submission

2. CAELUS submitted a DAP 1916 22 Dec 22 for a trial Airspace Change Proposal (ACP) for BVLOS operations in the vicinity of Glasgow Airport to facilitate UA operations between Glasgow Airport and Glasgow Golden Jubilee Hospital. On confirmation that the Operating Safety Case (OSC) for the Uncrewed Aircraft System (UAS) had been submitted to the CAA RPAS team an assessment meeting was arranged and held virtually on 16 Mar 23 between members of the CAELUS Consortium and the CAA Airspace Regulation (AR) team and RPAS Team. During the Assessment Meeting it was agreed that it would be appropriate for ACP 2022-101 to follow the Temporary Change process as per CAP 1616. A version 2 of the DAP 1916 was submitted to the CAA by the CAELUS Consortium to reflect this change and subsequently uploaded to the CAA Portal. A redacted version of the minutes of that meeting was uploaded to the CAA portal on the 3rd Apr with a redacted version of the presentation uploaded to the CAA portal on the 6th Apr.

3. This document forms part of the CAELUS Consortium submission to the CAA for consideration under the CAP 1616 process for a temporary change. The UA is subject to an OSC which has been submitted to the CAA for approval.

1.3 Statement of Need

4. The Statement of Need v2 submitted is replicated below for ease of reference:

'Project Overview

The CAELUS (Care & Equity – Healthcare Logistics UA 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 UA 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.

Opportunities/Need

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 (UA) 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 considerable 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.

Informing Regulation

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

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 future concept of integrated airspace. For this proposal, we intend to fly in the immediate Glasgow Airport vicinity representing use cases for West NHS Innovation board and Scottish Ambulance Service. One aspect of the

project is to understand how UA operations can be integrated with commercial airport operations inside Controlled Airspace whilst ensuring minimal operational impact on the current airspace users whilst maintaining existing levels of safety. Once the appropriate procedures and associated safety assurances are developed, the intention is to trial those procedures in a live operational environment. The use cases will require a Temporary Segregated Airspace (TSA) within Glasgow CTR to be in place for a maximum of 2 weeks with expected flying for 4 days.

Our proposal is that we activate the TSA for limited duration. The TSA 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[1] will be deployed to demonstrate an additional layer of situational awareness to the UA pilot along the flying routes and contribute to the Detect and Avoid solutions that will form part of the demonstrations.'

1.4 Flight Objectives

5. The CAELUS project is supported by a ConOps that has been provided to the CAA and the flights conducted during the activation of the TSA will be used to support this in order to work towards the accommodation phase of BVLOS flights in unsegregated airspace and to meet the following objectives:

6. Demonstrate safe integrated BVLOS operations in the vicinity of commercial airport operations inside Controlled Airspace.
7. Determine level of impact for crewed aviation
8. Demonstrate UA Remote Pilot (RP) can communicate with ATC to ensure airspace is only segregated when absolutely necessary, minimising impact to other airspace users.
9. Demonstrate the UTM capabilities that could enable upscaling and integration in the future through adoption of technology (such as sharing of flight intent data, mission requests, conformance monitoring)
10. Produce final report which can be used by CAA to inform a pathway to regulation.

[1] It should be noted that this is part of the CAELUS trial and will in no way be used in operational context for separation standards, detect and avoid or any other safety measure but it will be used to gather data in support of the ConOps and CAELUS project.

11. The CAELUS consortium has developed a mapping of the trial objectives that will be assessed during the flights planned for this ACP. This work has been completed through a number of workshops held within the CAELUS Consortium. A summary of this output is attached to the ACP submission as Appendix 1 and demonstrates how each objective maps to a Future of Flight 3 ‘parent’ objective.

12. The following data will be gathered in order to validate success of the defined objectives and to inform any advice and recommendations to the stakeholders/regulators involved in similar trials:

a. Operations fully conducted as per identified procedures. Any deviations from ideal uninterrupted flights are in agreement with pre-defined contingency procedures
b. Record any events that would not have occurred if the UA trial did not take place. That includes aircraft delays, refused/delayed clearances, transits of airspace.
c. Collection of feedback via interview/questionnaire by ATC, RP and hub operators.
d. Supervision of the UTM system by non-operational ATC. Collection of feedback via interview/questionnaire by ATC and RP. Confirm reliability of the system as well as accuracy/delay of the streamed data.
e. Gather CAA feedback on the received results. Agree on acceptable repetition required to confirm the concept; agree on any acceptable changes to the processes that would bring the trial a step closer to being considered "routine operations".
f. Calculations and data recording to determine the surveillance (non-operational) and UTM partners (Plane Finder and ANRA) systems benchmarks.

2 Airspace

2.1 Overview of Operations

13. The activity undertaken will consist of a series of live flights between Glasgow Airport (GLA) and Golden Jubilee Hospital (GJH) over the course of 3 days with a dummy medical payload provided by the NHS. The live trial will see the Skyports UA flying between 22 Sep and 31 Oct 23 to enable contingency days due to issues such as poor weather. The summary of BVLOS operations is detailed in Table 1 and will take place between:

a. Glasgow Airport, Compass Base (GLA) and
b. Golden Jubilee National Hospital, Clydebank (GJH).

Figure 1 Locations of the on airport and hospital landing sites

14. The hospital is situated at the north bank of the river Clyde and at approximately 2 NM direct distance from GLA runway (see Figure 1). The sorties will be wholly contained within a Temporary Segregated Area within the GLA CTR – Class D Controlled Airspace and at the same time wholly contained within the Glasgow Flight Restriction Zone (FRZ). The sortie requires operation Beyond the Visual Line of Sight (BVLOS).

Table 1 Summary of Activity

Location 1	**Address**	Glasgow Airport (EGPF) Taxiway Z&Y Intersection
	Coordinates	55.87283958, -4.44474423
Location 2	**Address**	Glasgow Golden Jubilee National Hospital
	Coordinates	55.9049125, -4.42435782
Dates		3 flying days across 2 weeks (which would be at some point between 22 Sep - 31 Oct 2023 Window of Opportunity subject to CAA approvals)
Times		Between 0400 and 0800 L
Landowner Permission		Yes, for take-off and landing sites
Summary of Planned Operations		UA BVLOS A-B operations in Temporary Segregated Airspace (TSA) established within Glasgow ATZ.

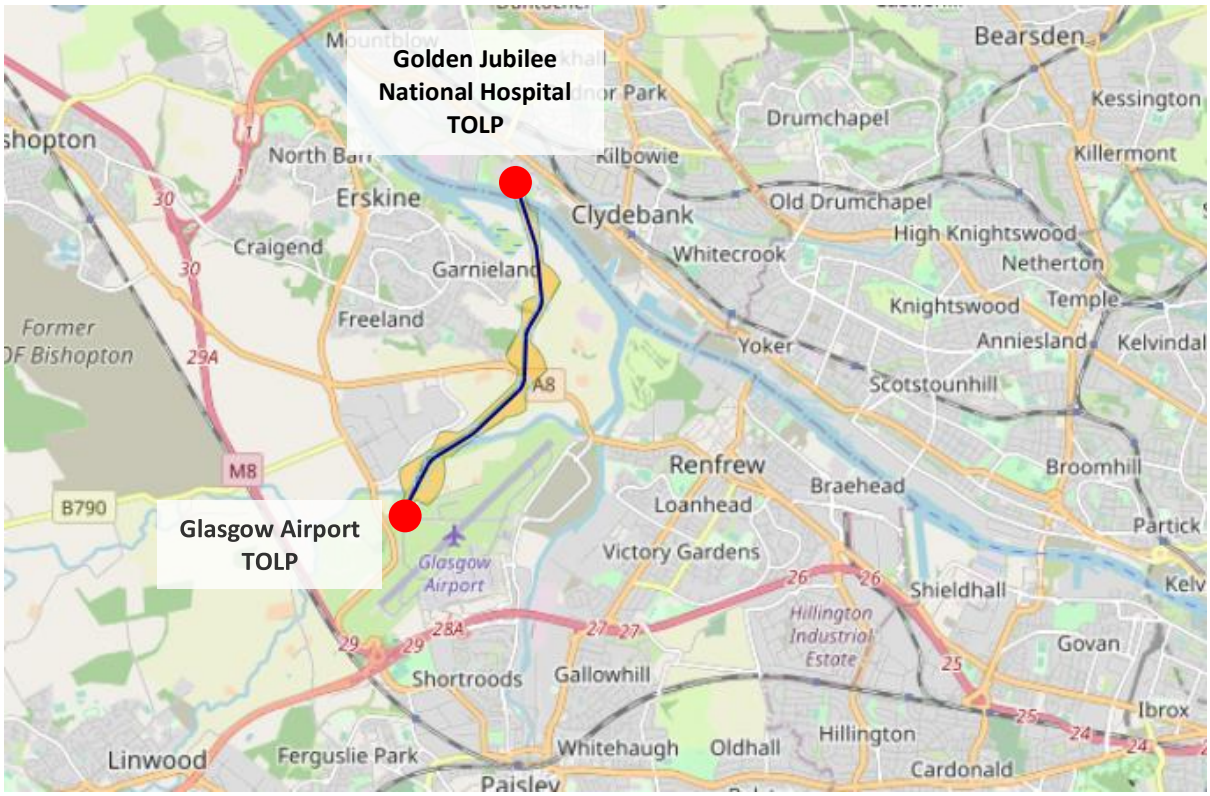

Figure 2 Route Overview

2.2 Airspace

15. The entirety of the flight will remain in Glasgow Airport's ATZ (Fig 3). The ATZ is controlled due to it being within a Class D CTR, and for this reason, Skyports DS will coordinate with Glasgow Airport and operate the UA within temporary segregated airspace (TSA). The volume of airspace to be segregated is larger than the UA operating area. The Temporary Segregated Area (TSA) coincides laterally with the portion of the Aerodrome Traffic Zone (ATZ) to the North and West of the centerline of Runway 05/23, but from surface to altitude 1000ft AMSL. The TSA shall be a sector of the ATZ circle with a 2.5nm radius: centred on 555218N 0042601W and an arc running anticlockwise from 555033N 0042916W to 555402N 0042247W

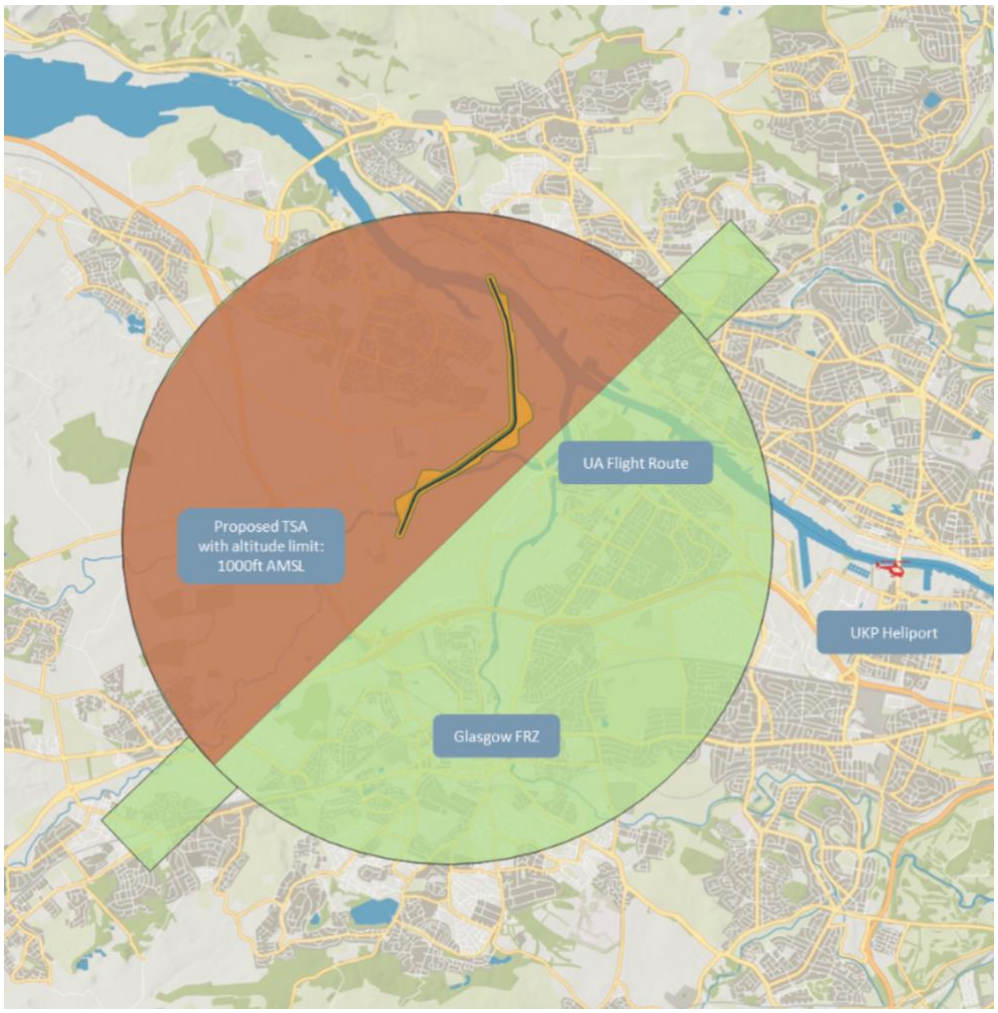

Figure 3 Airspace Overview

2.2.1 Glasgow ATZ/CTR

16. The ATZ boundary has a radius of 2.5nm and extends up to 2026 feet AMSL. The immediate airspace beyond the ATZ is the CTR extending from surface to 6000 feet. Glasgow's ILS/DME/VOR approaches tend to use a base-turn procedure following a potential hold abeam GOW or GLW (NDB). Despite this being directly above the UA's planned route, they have a min altitude of 3000 feet and will therefore be vertically separated.
17. The activity within the TSA is a hazardous activity in accordance with the CAA Buffer Policy. However, since Glasgow ATSU are the controlling authority and are content with the operation taking place – CAELUS2 is seeking dispensation from the buffer policy for the ACP-2022-101 given the above and that the UA is subject to an OSC approval, which contains the evidence that the hazardous activity of BVLOS flight can be contained within the planned volume of airspace. See Table 2 for a detailed airspace analysis.

2.2.2 Coordination with Glasgow Airport and other airspace users

18. GLA ATC shall ensure that other VFR flights remain clear of the TSA when active. GLA ATC shall ensure that other IFR flights within the Glasgow Control Zone remain outside the TSA when it is active. IFR inbounds making an approach should not be descended below 3000ft until the TSA has been deactivated. Radar shall retain control of VFR and IFR aircraft operating in the vicinity of the TSA while it is active to allow them to monitor their position and ensure they remain clear.

19. Skyports DS will adhere to the notification and deconfliction procedures jointly developed and agreed with Glasgow Airport and other airspace users (such as HEMS operators) in form of temporary operating instructions (TOI) and letters of agreement respectively which have been submitted to the CAA.

Table 2- Airspace Details

Location	In vicinity of heliport /other airports	Airspace	Terrain	Obstacles	Airways	Restricted Areas	Actions/Remarks
Glasgow Airport TOLP	• Yes, TOLP within Glasgow airport (EGPF)	• Glasgow Class D controlled ATZ, active continuously (GND-2026ft AMSL). • CTR operated up to 6000ft.	N/A	• Enroute 214ft (119ft height)	• N560 MEA FL200. No factor. • L602 MEA FL70, No factor.	NTA	• Agree TOI/LOA with EGPF airport.
Golden Jubilee National Hospital TOLP	• Yes, EGPF 1.5nm to S. • Operating adjacent to Glasgow Jubilee National Hospital Public Heliport		N/A	• 1nm NE of TOLP (411ft elevation, 408ft height)		NTA	• Agree TOI with Glasgow Jubilee National Hospital Heliport.

2.2.3 Route Overview

Table 3 - Route Overview

Route (reciprocal)	Distance (km)	Altitude (AGL)	Avg. cruise speed (kt)	Estimated Time (mins)	% of Max Endurance (68 mins)
Glasgow Airport to Golden Jubilee National Hospital	4	< 400 ft	55	4	6%

Figure 4 Route Overview

Figure 5: Glasgow Airport to Golden Jubilee National Hospital Flight Route

2.2.4 Landowner permission

20. Before commencing the operations, a nominated Skyports DS representative will obtain permission from landowners where flight operations are to be conducted on their property. The permission will either be in the form of a printed email attached to the Pre-Deployment Site Survey Form (contained within the Operations Manual) or as a written signature obtained from the client captured on the On-Site Survey Form (contained within the Operations Manual). No flight operations will commence without permission from the relevant landowners.

2.2.5 Route Profile

21. The route profile is shown below.

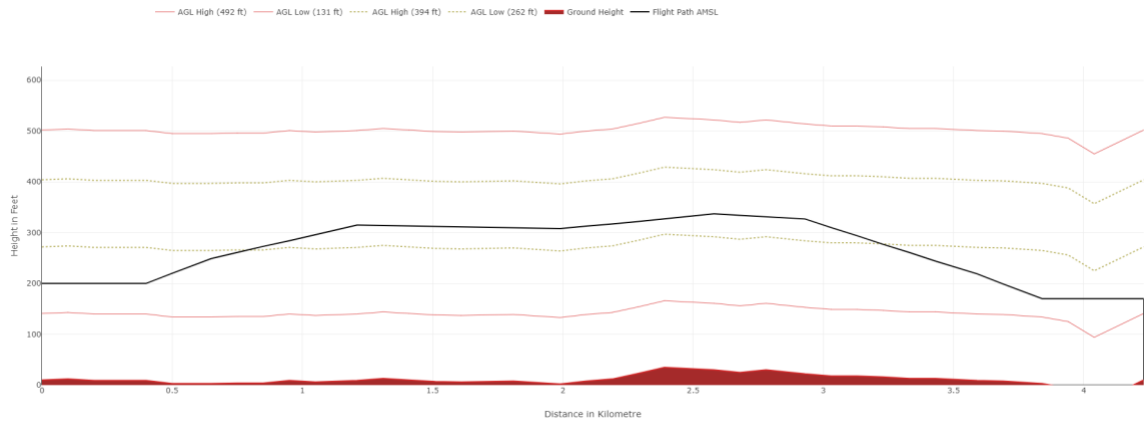

Figure 6: Flight elevation overview of Glasgow Airport to Golden Jubilee National Hospital Flight Route

22. The departure/arrival routes and TOLPs at Glasgow Airport and Golden Jubilee National Hospital flight route are shown in Figure 7 and Figure 8.

23. The TOLP is situated on the disused extension of taxiway Z at Glasgow Airport. The UA will avoid overflying the congested industrial areas situated directly to the North of the TOLP by conducting a turn over the river.

Figure 7: Arrival and Departure from Glasgow Airport

24. The Hospital landing site is positioned in a patch of grass in front of the hospital building. To ensure members of the public don't enter the TOLP, a fenced area will be created along with signs alerting passers-by to the UA operations. The members of staff at the Hospital will already be aware of the flights taking place. In addition, Skyports DS crew member will be present during TO and Landing at this location to act as a marshal against potential ground incursions into the area.

Figure 8 - Arrival and Departure from Golden Jubilee National Hospital

Table 4 - Waypoints to be Flown.

Waypoints Flown – Glasgow Airport to Golden Jubilee National Hospital						
	Straight lines joining:					
WP	**Lat (N)**	**Lon (S)**	**Lat (N)**	**Lon (W)**	**Maximum Altitude Flown**	**Remarks**
1	55.87283958	-4.44474423	55° 52' 22.22" N	004° 26' 41.07" W	400 feet AGL	Activity: UA Beyond Visual Line of Sight (BVLOS) Hours: When notified Sponsor: AGS
2	55.87602717	-4.4417872	55° 52' 33.69" N	004° 26' 30.43" W		
3	55.87801928	-4.43993906	55° 52' 40.86" N	004° 26' 23.78" W		
4	55.88066767	-4.43230066	55° 52' 50.40" N	004° 25' 56.28" W		
5	55.88545291	-4.42324432	55° 53' 07.63" N	004° 25' 23.67" W		
6	55.89079077	-4.42290794	55° 53' 26.84" N	004° 25' 22.46" W		
7	55.89353086	-4.4200086	55° 53' 36.71" N	004° 25' 12.03" W		
8	55.89936031	-4.42113012	55° 53' 57.69" N	004° 25' 16.06" W		
9	55.90149586	-4.42237154	55° 54' 05.38" N	004° 25' 20.53" W		
10	55.9049125	-4.42435782	55° 54' 17.68" N	004° 25' 27.68" W		

3 UA Aircraft

25. Skyports will be using the Swoop Kookaburra Mk III for drone delivery operations, supplied by unmanned aircraft system (UA) manufacturer, Swoop Aero. The vehicle has proven capability through numerous BVLOS projects around the world, covering thousands of kilometres, including emergency medical supply and humanitarian relief efforts for the likes of the UN to US Aid, the Gates Foundation and the UK NHS recently, flying over 400 flights and covering over 12,000km across the world. The UA has been specifically selected by Skyports to further enhance air safety through the addition of ADS-B IN and OUT to further reduce the air risk profile of our operations and improve situational awareness. It should be noted that ADSB is not being relied upon for operational flight or detect and avoid capabilities as the trial flight is being wholly contained within segregated airspace and there will be no other aircraft operating within the airspace structure as defined.

26. Skyports have submitted their OSC to the CAA RPAS team and further details of this UA can be found within Skyports DS OSC Vol.2 Swoop Kookaburra Mk III v1.2. It is acknowledged that any approval of the ACP will be subject to the OSC approval, and no activation of the airspace will be possible without it. Skyports will not operate this vehicle beyond the limitations set out in Table 5.

27. An image of the Swoop MK III EVTOL RPAS is at Figure 9 and Table 5 below shows UA specifications.

Figure 9: Swoop MK III EVTOL RPAS

Table 5: Swoop MK III EVTOL RPAS Specifications

Type	Hybrid – Powered Lift transitional platform (VTOL)
Max speed	68kt
Cruise speed	55kt
Max endurance	68 mins (forward flight limit at MTOW)
Max payload	3kg
MTOM/MTOW	17kg
Lighting	Navigational lights and a white strobe
Max. wind	27 kts (14 m/s) from any direction
Min. visibility	Min. 1500m at Take-off and Landing Points. Flights will comply with visual meteorological conditions (VMC)[2].
Precipitation	Moderate rainfall (2mm – 10mm per hour)

[2] It should be noted that this is the UA capability and not the operational parameters for the flights for this ACP.

	0-2mm – indefinitely 2-10mm – up to 30 mins 10mm or above – no flight
Cloud ceiling	No limitation
Min. / Max. Operating Temperature	0°C / +45°C
Electronic Conspicuity	The UA is fitted with ADS-B IN and OUT, which can process uncertified ADS-B signals, namely SIL/SID=0. The UA ADS-B transponder transmits on 1090Mhz, this system can also receiver other ADS-B signals from certified and non-certified sources, giving the widest range of visualised signals using the ADS-B protocol. The UA will not visualise Mode S only devices.
RTH Logic	Should the UA need to RTH, it will automatically evaluate the quickest time to landing (this may be to proceed to the destination, or to turn around and return to the origin). The UA returns (or proceeds forward) via the existing flightpath (i.e., it does not 'straight line' towards the landing location as per more traditional RTH workflows). This ensures the UA remains in the designated operating zone and will not overfly built-up areas.

4 Operations

28. There will be no change to aircraft routes below 7000ft, no change to existing promulgated airspace including holds or VFR reporting points. A Temporary Operating Instruction (TOI) will be in place for NATS ATC and Letters of Agreement will be held between NATS, the UA operator (Skyports) and Airborne Emergency Services. The following Letters of Agreement are being drafted and will be in place prior to any operations taking place and have been submitted to the CAA for approval.

29. Babcock (HEMS) – operate the helicopter for the SAS air ambulance service from their base at Glasgow Airport. A draft Letter of Agreement has been agreed with NATS to ensure that the Final Approach and Takeoff (FATO) procedures are maintained.

30. Babcock (Police Scotland) – operate the helicopter for Police Scotland from their base at the Glasgow heliport. A draft Letter of Agreement has been agreed with NATS to ensure that the Police helicopter can maintain current procedures for accessing airspace.

31. Gama Aviation – own the building and apron areas from which the air ambulance service operates from at Glasgow Airport. A draft Letter of Agreement has been agreed with NATS to ensure that the FATO operation can continue unhindered.

4.1.1 Deconfliction Principles

32. As the ANSP, NATS ATC will provide the segregation of the TSA and other airspace users. The volume of airspace to be segregated is larger than the UA operating area. The Temporary Segregated Area (TSA) coincides laterally with the portion of the Aerodrome Traffic Zone (ATZ) to the North and West of the centreline of Runway 05/23, but from surface to altitude 1026ft AMSL. The TSA shall be a sector of the ATZ circle with a 2.5nm radius: centred on 555218N 0042601W and an arc running anticlockwise from 555033N 0042916W to 555402N 0042247W . ATC will not permit clearances into that portion of airspace whilst UA activities are taking place.

33. The TSA will also be promulgated by AIC and activated by NOTAM with at least 24 hours' notice. The schedule of activity will be refined 2 weeks before the activity is due to take place with GLA and CAELUS and will be promulgated to those with whom such an agreement has been reached.

34. The TSA will be activated prior to the UA being launched and Skyports DS will inform ATC when UA flights have completed to allow the TSA to be deactivated. No runway movements (aircraft arrivals or departures) are permitted when the area is active. Only the Skyports UA will be permitted in the TSA. Further details will be included in the TOI which will be subject to approval by the Aerodrome Inspector and will be part of the condition upon which the TSA may be activated.

4.1.2 Cat A Flights Agreements

35. Special procedures agreed for Cat A Helicopter FATO departure. A trial flight can be terminated at short notice in the event of Police Cat A/B flights or emergency aircraft.

36. A person will be embedded within Scottish Ambulance Service HQ for the duration of each trial flight. They will notify ATC and/or the UAS PIC if there is a likelihood of a Cat A

HEMS response to any incident. It is anticipated that this might give up to 5 minutes advance warning to aid decision making regarding trial flight windows of opportunity.

37. The UA will not be permitted to fly if there is a Cat A flight expected to occur within the requested time window.
38. On occasions when there has been insufficient notice of a Cat A flight to hold the UA on the ground, it has been agreed with the UA operator, Gama and Babcock that VFR or IFR Cat A FATO departures requiring to route North or West of runway 05/23 centreline may take place when the TSA is active with the following stipulation:

    FATO departure climb straight ahead until after passing altitude 1000ft before turning on track to overfly the TSA.

4.1.3 Infringements

39. In the event of an aircraft in emergency/priority flights or infringement of CAS by unknown aircraft, the ATCO follow the procedures as set out in the TOI which will be approved by the CAA Aerodrome Inspector. It is acknowledged that the approval of this ACP will be conditional upon the approval of the of the TOI.

4.1.4 Communications

40. The Pilot in Command (PIC) will be located in a vehicle on the airfield and equipped with 118.805 on a handheld radio supplied by AOU. They will remain in two-way communication with ATC throughout. They are responsible for control of the UA and communication with ATC. If required, they can select an alternative frequency. In the event of RT communication issues, the pilots are contactable via telephone. The UAS operator will provide contact numbers will be provided ahead of time (there will be two contact numbers available at any one time for redundancy).

4.1.5 Weather

4.1.6 Visibility of 5000m and cloud base 1500ft according to Glasgow METAR or higher (except when FEW) are the required minima for the UA flight to take place. The wind limitation is 27kts (14m/s) from any direction. Moderate rainfall can be tolerated (2mm-10mm per hour) and temperatures between 0 degrees and 45 degrees Celsius.

4.1.7 Emergencies

41. In the event of an aircraft in emergency/priority flights or infringement of CAS by unknown aircraft, the ATCO will assess whether there is sufficient time for the UA trial flight to continue to its conclusion before the aircraft enters the TSA (bearing in mind a nominal UA flight time of 4 minutes), or if it is necessary to instruct the UA to land using the same procedure as for UKP51.
42. An aircraft emergency involving the UA will be treated by ATC in the same way as for a crewed aircraft.
43. In the event of the UA escaping from its geofenced area, ATC shall apply the procedures for Reports of Unauthorised Small Unmanned Aircraft (SUA) Activity detailed in MATS Part 2 Section 10, Chapter 4.

In the event of loss of communication link between the UAS PIC and the UA, the UA will continue to follow its programmed route all the way to landing at destination.

44. Glasgow Airport has a set of Emergency Orders (EO's) which provide the required information and are agreed by all the responding agencies involved. The Glasgow Airport EO's have been updated to take account of incidents involving UAs in the category of "Aircraft Accident". In the newest (draft) version of the EO's, following agreement with partner agencies, this will become a "Local Ground Incident" thus only affecting a response by the Glasgow Airport Rescue & Firefighting Service (RFFS).

45. Skyports DS OSC Vol.1 Operations Manual V3.0 details actions to be taken in the event of an accident or serious incident; Post Crash Management (PCM) Aid Memoire. Incident reporting (including airprox incidents) and mandatory occurrence reporting (MOR) in accordance with CAA CAP 382 (MOR Scheme) are also detailed.

4.1.8 Noise Impacts

46. As part of ConOps' development, the flights were carefully planned to minimise noise in the areas of operations. Skyports do not envisage any adverse impact on tranquility when operating over inhabited areas due to the following reasons:

4.2 Noise of the UA

47. According to previous measurements, the mean maximum sound pressure level (L_{ASmax}) of the Swoop Kookaburra Mk III UA during take-off and landing is 76dB, and that when the UA is cruising at a height of 200ft AGL is 49dB, which is virtually undetectable from ground[3]. The most audible part of the flight, i.e., take-off and landing, typically takes 17.57 seconds at standard climb/descend rate, and 8.98 seconds at maximum climb/descend rate. The UA is a hybrid-powered lift transitional platform which takes off and lands vertically. In normal circumstances, the UA will cruise at a height of 360ft AGL. During the activation period, Skyports will operate a maximum of 3 return flights per day, which means 6 take-offs and 6 landings at any particular site. Skyports believes the noise impact with such a short span of time, and small noise footprint, is negligible.

4.3 Routes and TOLPs planning

48. The routes were carefully designed so that Skyports prioritise operating over sparsely populated areas (see Figure 10 below; the colours denote population density). At key locations such as TOLPs, they were also chosen to be located outside/away from residential areas to minimise the noise impact during take-off and landing (see Figures 10 and 11).

[3] 86dB and 59dB if a 10dB noise penalty is added to account for the tonal nature of drones.

Figure 10: Population density map with flight routes overlaid.

49. The Glasgow Airport TOLP is 180m from the nearest building, which is a car servicing and repair garage; the nearest sensitive noise receptor is a residential building 480m away. The noise emitted by the UA is negligible compared to the aircraft noise at Glasgow Airport.

Figure 11: TOLP, Arrival and Departure Route at Glasgow Airport

50. The Golden Jubilee National Hospital TOLP is located between the hospital helipad and the eye centre building. Despite being close to a sensitive noise receptor, the UA needs to take off and land as close to the hospital as possible as it is a medical delivery operation. The TOLP was selected at a distance from the hospital that is acceptable to the NHS, which minimises the noise impact while still retaining the benefits of the operation.

Figure 12: TOLP, Arrival and Departure Route at Golden Jubilee National Hospital

5 Stakeholders and Engagement

51. The CAA CAP 1616 includes the requirement for Sponsors to engage with aviation stakeholders and relevant stakeholders and give due consideration to the potential impacts of the change on airspace users. The proposal is subject to those requirements for a temporary change as detailed in CAP 1616. This section provides a summary of the stakeholder engagement exercise that CAELUS completed between 4 May 23 and 2 Jun 23 to allow stakeholders to comment on the design and operational proposal.

5.1 Methodology

52. The stakeholder engagement plan below sets out the way in which CAELUS identified the relevant aviation stakeholders and anyone else who the proposed changes may impact and sets out how CAELUS gathered and considered their views.

5.2 Previous engagement

53. During 2022 CAELUS began to explore an application for BVLOS operations within the vicinity of GLA. At that time significant stakeholder engagement took place, together with an assessment of operations for a BVLOS flight between GLA and GJH. Stakeholder

feedback on the proposal, which mirrored this ACP, can be found summarised in Table 6 below and further detail regarding the original engagement is found at Appendix 2:

Table 6: Summary of Stakeholder Engagement for CAELUS Operations in 2022

Stakeholder	Significant Feedback/Agreement
Glasgow ATC	TOI/CONOPS produced to ensure UA operations are addressed.
HEMS: Gama (HLE2, HLE5) & Babcock (HLE 76, HLE79)	Proposed FATO changes accepted.
Coastguard: Bristow (CGD199/RSC199)	RSC flights give sufficient warning that they will not be affected by trial flights
Police (Babcock – UKP51)	UA is required to land within 2 minutes.
Leading Edge	No issues.
Glasgow Flying Club	No issues.
University of Glasgow & Strathclyde Air Squadron	No issues.
Flight Safety meetings with: NATS, GAL, EasyJet, TUI, Stobart, Police Scotland, Leading Edge, Glasgow Flying Club, Signature, FALCK, Jet2, Loganair	No issues.
CAA	Ability to comply with VFR in Class D hence requirement for a TSA.
CAA Aerodrome Inspector	No significant objections raised.
DAATM	Not affected by operations in the current form.

54. The original proposal, which included operations of BVLOS flight in a TSA, although was approved by the CAA, did not take place due to technical issues with the BLVOS system allocated for the flight. At that point the project moved to CAELUS 2 and the GLA-GJH proposed BVLOS flights developed into part of a wider ConOps and ACP applications. Given the nature of this ACP, in that it mirrored the proposal under the initial CAELUS project, the stakeholders identified for the inaugural flights were again contacted for

comment and their responses are included in the stakeholder summary below and full details contained the stakeholder evidence submitted with this document.

5.3 Identification of Stakeholders

55. Stakeholders engaged were those CAELUS considered to be directly affected and potentially impacted as well as those would have an interest in the ACP. The method by which these were identified were through a combination of the experience from CAELUS 1 proposal, consideration of the NATMAC list, advice from the CAA during the Assessment Meeting and advice from GLA ANSP (NATS) who hold considerable knowledge and understanding of the airspace users and are the operators of the CTR. It was assessed that no additional stakeholders had been identified.

56. The stakeholders can be broken down into the following:

57. ANSPs – NATS GLA are the ANSP provider for the CTR within which the TSA will wholly be contained.
58. Defence Airspace and Air Traffic Management
59. NHS Golden Jubilee Hospital
60. Other airspace users:
61. Glasgow Flying Club
62. EasyJet
63. TUI
64. Jet 2
65. Loganair
66. Signature
67. Leading Edge
68. University of Glasgow & Strathclyde Air Squadron
69. Emergency Services:
70. UK Police
71. GAMA Helimed Aircraft (HLE 2 & HL 5)
72. Babcock Aviation (HLE 76 & HL 79)
73. Bristow Coastguard
74. FALK Fire Services

75. Scottish Ambulance Services

76. The NATMAC list as provided by the CAA was assessed as part of the original approved CAELUS operations in 2022 and rationale for the organisations discounted at that time has been reviewed for those who may have been impacted by the proposed ACP and remains extant. The decision was made not to engage with the following NATMAC members for the following reasons:

77. Military Organisations. Engagement with DAATM had taken place for CAELUS 1 and so the decision was made to keep the approach for military input via DAATM who had historic knowledge of the CAELUS proposals and is the single point of contact for Defence. The decision was therefore made not to engage with the Military Aviation Authority (MAA), United States Visiting Forces (USVF), HQ United States Country Rep-UK (HQ USCR-UK), or Navy Command HQ.
78. Airport operators' association groups. The TSA is wholly contained within the GLA CTR and engagement with GLA airport and the operations has been key. It was therefore decided not to engage with the Airport Operators Association (AOA), Aircraft Owners and Pilots Association (AOPA), Light Aircraft Association (LAA), Airfield Operators Group (AOG), Airspace4All, Association of Remotely Piloted Aircraft Systems UK (ARPAS-UK), Aviation Environment Federation (AEF), Drone Major, Helicopter Club of Great Britain (HCGB), Iproserve and Guild of Air Traffic Controllers for this ACP as all particular organisations operating within GLA have already been identified.
79. British Airline Pilots Association (BALPA), British Balloon and Airship Club, British Business and General Aviation Association (BBGA), British Gliding Association (BGA), British Helicopter Association (BHA), British Hang Gliding and Paragliding Association (BHPA), British Microlight Aircraft Association (BMAA), British Model Flying Association (BMFA) and British Skydiving were not engaged with directly for this ACP in particular given that the nature is wholly contained within the GLA CTR and any engagement necessary would have been highlighted with the SME input from GLA.
80. Passenger and Commercial airlines not operating in the vicinity of GLA. The operations of GLA are being co-ordinated by GLA airport and GLA ATC with regards to impact on airlines. Airlines that operate from GLA have been contacted as part of the engagement as per the above.

81. Other industry bodies. It was decided that Airspace Change Organising Group (ACOG), Honourable Company of Air Pilots (HCAP), Aviation Environment Federation (AEF), PPL/IR (Europe) and UK Flight Safety Committee (UKFSC), UK Airprox Board hold a strategic purpose and will not be impacted by the proposed ACP.
82. Isle of Man CAA does not operate in the region and will not be impacted by the TSA and therefore was not included in the engagement.

5.4 Stakeholder material

83. On the 4 May 23 each of the stakeholders detailed at paragraph 47 above were contacted via email from a dedicated engagement email address (caelus2airspace@traxinternational.co.uk). It was decided that given the nature of the airspace, the short duration of the activation and the limited number of stakeholders for this ACP that each of the stakeholders would be treated as a stakeholder whose agreement needed to be reached.

84. The email contained reminders of previous engagement from the first phase of CAELUS but asked for their consideration given that considerable time had passed since their initial agreement and their operations may have changed. A stakeholder briefing pack was attached to the email in PDF format for review and initial responses were requested by 19 May 23. An opportunity for the stakeholder to reply with questions and or confirmation that they had no objections were given, along with an invitation should any organisation feel that they needed an LOA.

85. During the Assessment Meeting and the subsequent timeline, it was proposed that the timeline for engagement ran from 5 May to 2 Jun. The email sent to the stakeholders asked for feedback by 19 May to allow for two-way engagement on any issues that should arise. Given the stakeholders previous engagement with the CAELUS project, the nature of the airspace and the limited flight and duration it was felt that 4 weeks was a proportionate engagement window. Should any of the stakeholders have requested an extension to the feedback window that this would be addressed and responded to accordingly.

5.5 Level of engagement

86. Overall, the level of engagement was positive with all stakeholders identified. The engagement can be summarised in the following table:

Table 7: Stakeholder Summary

Sponsor	Initial Email Response	Reminder Email Response	Additional Engagement – see blow	Agreement
AGS	17 May 23	Not Needed	Not Needed	Yes
DAATM representing MoD	5 May 23	Not Needed	Not Needed	Yes
GFC	No	Sent 22 May 23	Yes – 22 - 25 May	Yes
EasyJet	No	Sent 22 May 23	No – agreement received 22 May	Yes
TUI	No	Sent 22 May 23	No – agreement received 24 May	Yes
Jet2	No	Sent 22 May 23	No – agreement received 23 May	Yes
Logan Air	No	Sent 22 May 23	No – agreement received 23 May	Yes
Signature	4 May 23	Sent 22 May 23	Yes 22 – 23 May	Yes
Leading Edge	No	Sent 22 May 23	Yes 22 – 31 May	Yes
UGSAS	No	Sent 22 May 23	Yes 22 – 23 May	Yes
Falk Fire Services	No	Sent 22 May 23	No – agreement received 31 May	Yes
Bristow Coastguard	11 May 23	Not Needed	Yes – 11 – 23 May	Yes
NHS	No	Sent 22 May 23	Yes 23 May	Yes
Scottish Ambulance Service	17 May 23	Not Needed	Yes 17 May	Yes
UK Police 51	No	Sent 22 May 23	Yes 23 May – 1 Jun	Yes

Babcock HLE 76 & 79	9 May 23	Not Needed	Yes 9 May to 24 May	Yes
GAMA HLE2 & HLE5	No	Sent 22 May	Yes 22 May – 8 Jun	Yes

87. The above table demonstrates that from the 17 stakeholders identified, all are in agreement to the TSA as proposed. As can be seen, AGS and DAATM replied in response to the first email confirming that they had no objections. A further 5 stakeholders; EasyJet, TUI, LoganAir, Jet2 and Falk Fire Services replied in response to a reminder email sent on the 22 May confirming that they had no objections to the TSA as proposed. Of note, Jet2 asked to ensure that the changes were properly NOTAMed by GLA to ensure 'out of based pilots' were aware of the operations. However, they thanked CAELUS for their engagement on the existing project and were looking forward to seeing how it develops. The following 10 stakeholders were subject to bespoke engagement which can be summarised as follows with the copy emails being found in the stakeholder evidence submitted with this document:

88. Glasgow Flying Club. A reminder email was sent on the 22 May 23 as no reply to the initial engagement was received. On the 25 May 23 a reply was received which was supportive and acknowledged that their concerns appeared to be 'catered for' but they asked for further information regarding ADSB and ATC instructions which was responded to the same day via email providing the information sought. A reply was received thanking for the additional information and confirming that they anticipated to be above the area of operation in any event. The Glasgow Flying Club were supportive of the ACP.

89. Signature. An initial response to the email on the 4 May was received to confirm that they intended to review the attached documentation and return with comments. When nothing was received an email was send on the 22 May as a reminder. A response was received on 23 May raising the question of safeguarding. A response was sent the same day outlining the regulatory process of the CAA regarding the OSC, the additional assurance work conducted by Atkins on behalf of AGS, the HAZID process undertaken by NATS, the geo-fencing capabilities of the UA and the routing of the air system. A diagram was sent to reiterate the routing. GLA also confirmed that they would keep an appropriate area adjacent to the UA operations clear of parked aircraft. A positive response from the

stakeholder was received the same day with no further questions and wishing the project well. Signature were supportive of the ACP.

90. Leading Edge. Leading Edge did not respond to either the email sent on the 4 May, nor the reminder sent on the 22 May. On the 26 May the emails were followed up by a telephone call to the Leading Edge Offices. A conversation took place whereby Leading Edge apologised for not replying but they had been busy and unable to send an email. The CAELUS project proposal was outlined, as were the operations as per the briefing pack. Leading Edge confirmed that they recalled the proposed operations under the initial CAELUS trial, and they confirmed that they held no objections. Leading Edge were agreeable to sending an email with confirmation but despite a further reminder email sent on the 31 May no email has been received. Leading Edge have no objections as per verbal confirmation.

91. University of Glasgow and Strathclyde Air Squadron. No response to the email sent on the 4 May was received but a reply was received on the 23 May in response to the reminder email send on the 22 May. The reply confirmed that there was no significant impact on their operations envisaged with a number of mitigating factors in place, namely the presence of ATC to deconflict operations and the anticipated hours of operations would take place before their planned operations (0930hrs). The stakeholder asked for continued engagement should the ACP be approved to ensure continued deconfliction with timings and provided a contact number. This was acknowledged and CAELUS undertakes to ensure continued engagement.

92. Bristow Coastguard. Initial response to the engagement was received 11 May whereby the stakeholder confirmed that they had no objections to the ACP on the basis that they had the ability to access the airspace in the event of SAROP. This was acknowledged on 16 May with further details regarding the response time for the UA to be grounded and confirmation sought that this would be acceptable. The stakeholder confirmed that they had no objections. Further information was provided on by a CAELUS Consortium Member and former GLA ATCO working on the TOIs/LOA and further information and context was provided regarding airspace access. This was responded to by the stakeholder confirming that they held no objections.

93. NHS Golden Jubilee. No response was initially received to the email sent on the 4 May. However, following the remainder email sent on 22 May confirmation was received that the project was due to be signed-off by the Executive Committee to ensure that sufficient risk mitigation processes had been adopted. Endorsement was received on 31 May with no queries raised.

94. Scottish Ambulance Service. A response was received on the 17 May confirming that the stakeholder had no objections on the basis that the helipad at GJH was not being utilised for the ACP. Confirmation was sent by return that the helipad would not be used, and no further information was requested.

95. Babcock contacted CAELUS via email following separate communications with Scottish Ambulance Service and requested a meeting between CAELUS and the emergency services operating to GLA. A virtual meeting was arranged for 31 May and the following organisations attended:
96. CAELUS – Trax, AGS, NATS & SAS.
97. UK Police representing also BABCOCK
98. GAMA

99. During the meeting two key topics were discussed. GAMA felt that they needed to agree the proposed FATO procedures as there was a change in the UA provider. The Police confirmed that they would give as little as 2 minutes notice before requiring access to the TSA for emergency operations. They were also concerned about communications. The Police stated that their preference would be to have communications with the Remote Pilot via VHF. The Police stated that they would try but could not promise that they would provide advance warning of operations to the Remote Pilot. CAELUS can provide personnel in the vicinity of the Police operations and therefore liaise with Skyports about any immediate activity. Various iterations of solutions were considered during the meeting and subsequent emails between CAELUS and the Police. An agreement was reached via email that the Police do not hold any objections to the TSA subject to LOAs being established for emergency access to the airspace.

100. From the list of stakeholders identified CAELUS worked hard to ensure that all concerns raised were addressed and resolved. There will be a number of LOAs in place

prior to the TSA being activated and it is understood that the approval of the ACP will be conditional upon these LOAs being signed and in place.

101. Post engagement window CAELUS were contacted by LAA. An email was received on 7th Jun stating that the LAA had an objection to all CAELUS ACPs. The concerns were generic, and no specific objections were raised in relation to this ACP. A response was sent on the 8th Jun after discussion with CAELUS partners addressing each of the concerns and asking for specific comments regarding this ACP but also inviting two-way engagement for the duration of the other ACP engagement windows. An out of office response was received citing that the LAA contact would not be back in office until 14 Jun. CAELUS will continue engagement with the LAA to understand whether there are specific concerns on the other ACP routes. It is felt that the issues raised by the LAA are generic to BVLOS operations in Class G airspace and do not impact the BVLOS operations proposed in the TSA/CTR for this ACP. If the individual raises any concerns regarding this ACP, then these will be recorded and an addendum report submitted to the CAA. Copies of the email can be found in the engagement material attached.

5.6 Informing stakeholders

102. CAELUS undertakes to engage with stakeholders post the decision of the CAA regarding this ACP to inform them of the outcome. CAELUS undertakes to also inform stakeholders of updated operations 2 weeks prior to any planned flying to remind them of the operations and enable schedule deconfliction. Promulgation will also take place via the AIC which will be published in accordance with the cycle and NOTAMs issued at least 24 hours prior to any activation.

5.7 Complaints

103. It is understood by CAELUS that complaints may be received regarding the activation of the TSA and that these complaints need to be recorded and addressed appropriately. The stakeholders engaged so far have corresponded successfully via the caelus2airspace@traxinternational.co.uk email address and this email address will be provided in the email informing the stakeholders of the outcome as a method by which complaints can be raised. The AIC will contain this email address and ask that all

complaints are forwarded to the same for addressing. All complaints, together with any infringements, will be addressed and recorded accordingly. The CAA AR team will be furnished with copies of any complaints, infringements and the outcomes of the same. The CAELUS consortium is made up of in part NATS and AGS and Skyports and there is a mature relationship between all parties which will allow the raising of any complaints that have been made by other methods, such as through AGS direct, and the recording and addressing of the same. Again, the CAA will be furnished with copies of any complaints that are brough to the attention of any of the CAELUS partners in connection to this ACP.

6 Safety Assessment

104. Safety is the foremost priority for the CAELUS partners and each trial is subject to safety assurance. The Flight Trial Management document describes the safety assessment process and governance structure for management of the flight trials. Skyports and Dronamics hold their own safety management processes which are described though their OSCs. 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.

105. AGS Airports, on behalf of, and as lead partner in the CAELUS project has requested that a comprehensive Safety Assurance overview of drone operators be conducted for the duration of the project. This work is undertaken by Atkins under direction from AGS Airports and is documented in the CAELUS Drone Operator Safety Assurance Report. This report provides a third-party verification that safety assurance practices and principles are in place. Where applicable, assurance statements within the document should be regarded as confirmation that every effort has been made to ensure risks are as Low as Reasonably Practicable (ALARP). The review included technical evaluation of hardware, documentation – including safety cases and operations manuals – hazard identification workshops and tabletop exercises.

106. An extract of the completed report states 'it has been determined that a strong safety culture exists within the Skyports DS and across the CAELUS consortium,

consistently demonstrating a commitment to safety as a top priority. Their management and personnel exhibit a proactive approach to identifying and mitigating risks, fostering a safety-conscious environment and compliance monitoring.

107. 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.

108. Temporary Operating Instructions by NATS for the ATCOs (to be approved by the aerodrome inspector) and Letters of Agreement with the UA operator are in place place to ensure safe operations subject to CAA approval.

109. Skyports DS OSC Vol. 3 Swoop Kookaburra Mk III Safety & Risk Assessment v2.0 contains further details of each hazard, mitigations, evidence, statements of tolerability and the safety risk summary statement.

7 Summary

110. This temporary change is in support of the CAELUS Concept of Operations (ConOps) which looks to ensure the safe operations of Beyond Visual Line of Sight (BVLOS), indeed all airspace operations in controlled airspace while validating the important potential improvements in NHS services. The flights for this temporary change are wholly contained within Controlled Air Space (CAS). Uncrewed Aviation (UA) operations will need to scale to meet the demand of the populous associated with conurbations. This temporary change enables the project to evaluate and develop the supporting systems to ensure safe and equitable integration of crewed and uncrewed operations. The Temporary Segregated Airspace (TSA) provides the safety of flight for all airspace users with the intention to move from segregated airspace to accommodation as these supporting systems are validated, developed and approved by the regulator.

111. CAELUS has followed the CAP 1616 process for a temporary change and has scaled the engagement activity taking into consideration the size and duration of the change as well as the anticipated impact on other airspace users. The operational size

and shape of the TSA wholly contains the activity and will be supported by LOAs which will be provided to the CAA and the TOI which will be subject to the approval of the CAA Aerodrome Inspector. The noise impact assessment has been completed and has been deemed to be of negligible impact. The change, if approved, will be articulated to stakeholders and will be promulgated to the wider aviation community via an AIC and the airspace will be activated via NOTAM by GLA. It should be noted that the TSA is a requirement due to the nature of the activity and the location of the activity, as discussed with, and advised by the CAA. However, all efforts have been made to ensure that the dimensions and timing of activation is of the least impact possible to other aviation users whilst maintaining the ability to support the ConOps moving towards accommodation rather than segregation and supporting the NHS development of NHS services.