



Bristow Helicopters Airspace Trial Proposal

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Introduction

- BHL are evaluating the utility of unmanned aerial systems (UAS) in the search and rescue (SAR) environment.
- A fundamental component is the integration of UAS into the wider UK airspace environment
- There is an opportunity to facilitate evaluation of both within this airspace proposal with a view to developing 'next level' opportunities for the employment of UAS in support of UK SAR, other blue light emergency services and government departments.

Aim

1. Establish trials airspace to enable:
 - a) The testing and evaluation of UAS as a complementary asset to the current and future UK SAR capability.
 - b) The wider integration of UAS into UK airspace (non-segregated).

Objectives

1. The evaluation of beyond visual line of sight (BVLOS) operation of the Schiebel S-100 Camcopter and sensors/payloads as a potential UK SAR asset.
2. Trial and evaluate novel and innovative technologies to allow a UAS to see, sense or detect conflicting traffic or other hazards and take the appropriate action. The specific technologies are focused on the detection and avoidance of other air users and support the underlying principles of:
 - a) Ensuring the platform is safe to operate (principally prevention of loss of safe separation)
 - b) Non-restrictive to other air users
 - c) Regulatory compliance
3. Contribute to a body of evidence to support UAS safety case development and the transition to more inclusive and flexible airspace.



UAS Operations in NW Wales

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Bristow UAS Operations

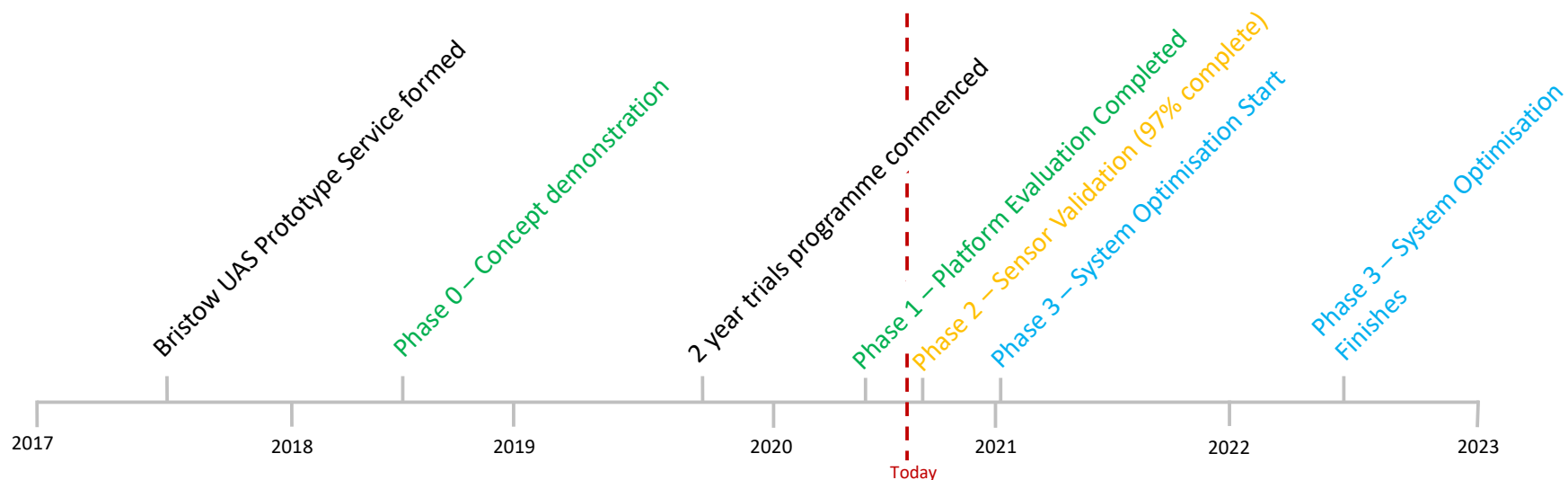
Bristow UAS Operations

- Bristow established the UAS Prototype Service (PS) in 2017 to explore the utilisation of UAS for UK SAR.
 - Undertaking UAS flights in the North West Wales since 2018.
 - In 2019 the company embarked on a 2-year trial to develop a UAS capability for UK SAR.

Bristow UAS Prototype Service

- Phase 0 - Concept demonstration (Complete 2018 – Llanbedr)
- Phase 1 - Platform evaluation (Complete 2020 – Caernarfon)
- Phase 2 - Sensor validation (Commenced 2020 – Caernarfon)
- Phase 3 - System optimisation for UK SAR (Forecast Q4 2020)
 - Stage 1 – Airspace access.
 - Stage 2 – Payload / Sensor optimisation for S-100 Camcopter.
 - Stage 3 – Employment of UAS for UK SAR.

Trials Programme – Overview



Ph 2 Sensor Validation completion

Ph 3

Stage 1 Evaluation and assessment of novel technology to support UAS integration into UK airspace.

Stage 2 Payload / Sensor optimisation for S-100 Camcopter.

Stage 3 Employment of UAS for UK SAR.

Ph 3 –
Stage 1a

Ph 3 –
Stage 1b

Ph 3 –
Stage 1c

Ph 3 – Stage 2

Ph 3 – Stage 3

Bristow UAS PS

Phase 0 – Concept Demonstration

- In July 2018 Bristow secured CAA permissions to demonstrate the beyond visual line of sight (BVLOS) capability of the Schiebel S100 Camcopter UAS from Llanbedr Airfield.
- Utilising a Temporary Danger Area (TDA) provided by Snowdonia Aerospace Centre:
 - Simulate Search and Rescue operations;
 - Simulated Manned Unmanned Teaming (MUM-T) exercises with Bristow SAR(H).
- Delegates invited to the trials included key members from the CAA, MCA, DfT and UK emergency services.
- The lessons identified and learned formed the next stages of Bristow's trial and evaluation of UAS for UK SAR.
- Following the successful concept demonstration Bristow committed to supporting the development and evolution of UAS operations.

Bristow UAS PS

Phase 1 – Platform Evaluation

- Col-located with Bristow SAR at Caernarfon Airfield, commencing operations in early 2020.
- Operating two civil registered Schiebel S100 Camcopters in support of the UAS PS project.
- Completed May 2020.

Phase 2 – Sensor Validation

- Validate appropriate sensor capabilities embodied within the S-100 Camcopter.
- Endorsed by the MCA, Bristow UAS have also begun State UAS operations in support of UK SAR and HM Coastguard. Initial flight operations were carried out within the previously approved Caernarfon TDA and MCA UOR airspace.
- 97% complete.

Bristow UAS PS

Phase 3 - System Optimisation for UK SAR

- Undertake simulated scenario-based SAR sorties, as part of a three staged approach to optimise a UAS SAR capability:

- **Stage 1** – Evaluation and assessment of novel technology to support UAS integration into UK airspace.
 - Stage 1a (Crawl) - Test and evaluate novel electronic conspicuity technologies. *This airspace submission.*
 - Stage 1b (Walk) - Test and evaluate an established Surveillance Mandatory Zone (SMZ) within a TDA. *Next submission.*
 - Stage 1c (Run) - Test and evaluate an established SMZ within non-segregated airspace. *Future submission.*
- **Stage 2** – Payload / Sensor optimisation for S-100 Camcopter.
- **Stage 3** – Employment of UAS for UK SAR.

Trial Airspace Proposal (Phase 3 - Stage 1a)

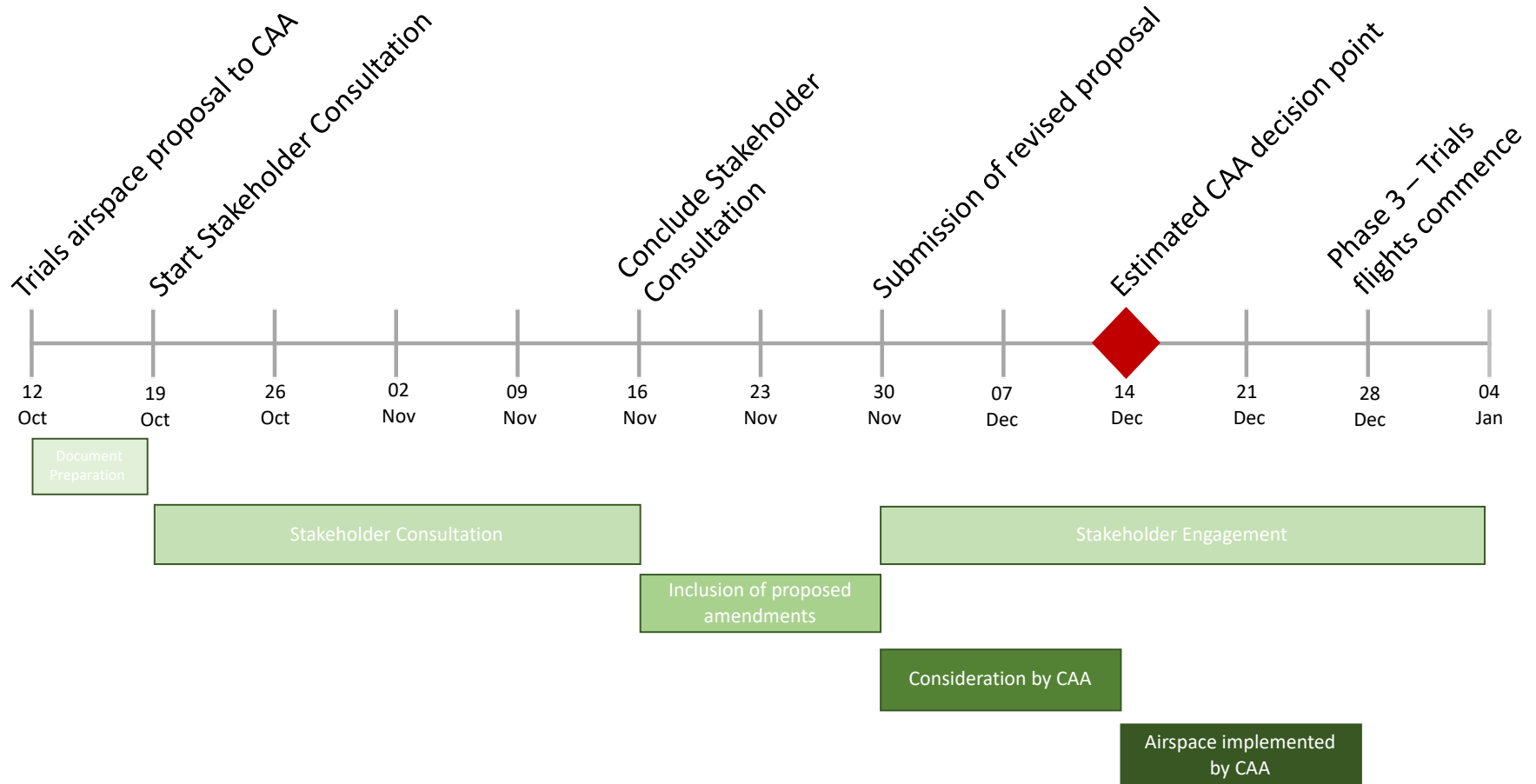
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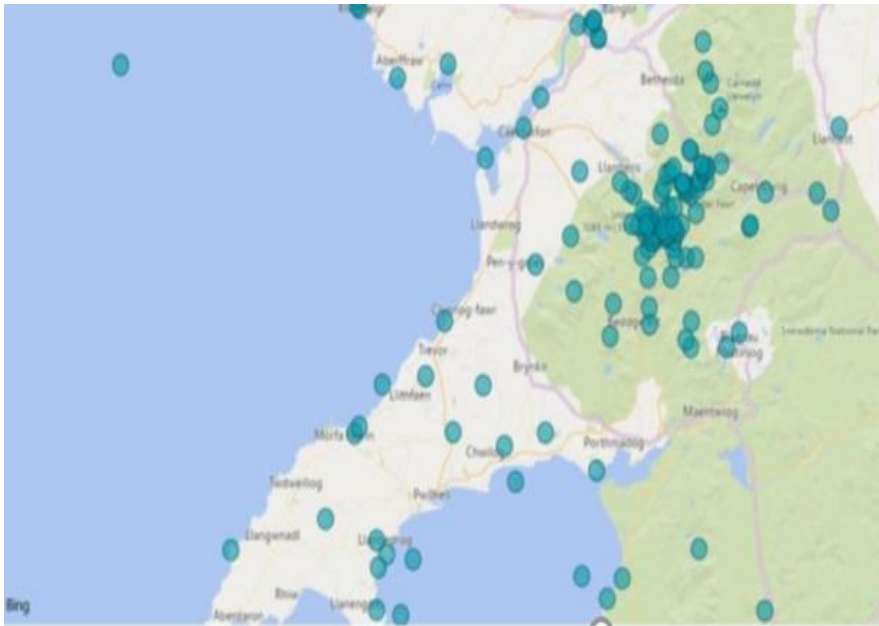
Airspace Trial Proposal

- Test and evaluate novel electronic conspicuity technologies (Phase 3 - Stage 1a).
- Novel technologies to be tested and evaluated:
 - Integration of S-100 location data with third party software to improve situational awareness.
 - Transponders with detect and avoid capability.
 - Airspace surveillance systems.
 - Air-to-air communications system, to enable communications between UAS platform and other air users.
- Test and evaluate sensors for UK SAR utility.

Proposed Stage 1a Submission Timeline



Location - Why Caernarfon?

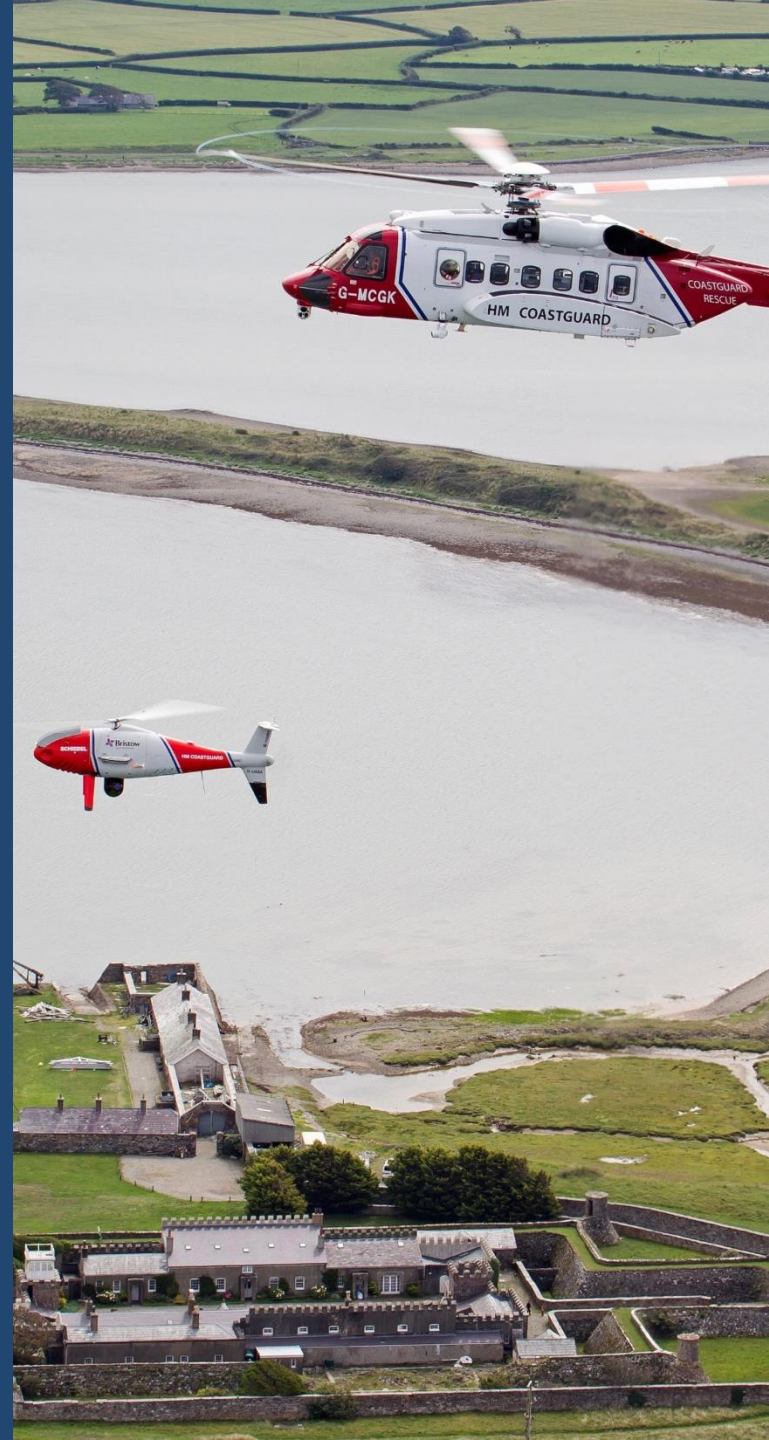


Department for Transport - SAR Incidents 2018.
<http://maps.dft.gov.uk/sarh-statistics/interactive-dashboard/>

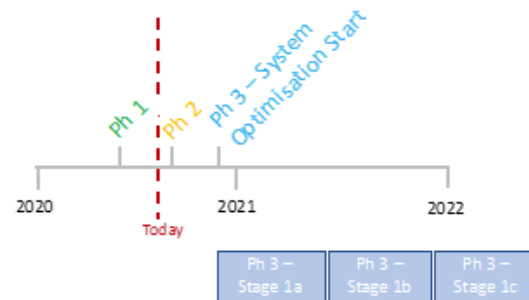
- Leverage current airfield facilities, regional air traffic control and established Bristow infrastructure on site. Caernarfon will provide Bristow with the opportunity to co-locate both manned and unmanned SAR assets together in a region of high operational commitment.
- Provide opportunity for cohesive trial operations and further airspace CONOP development with Bristow SAR(H) and other local air users.
- Provide a realistic and varied environment for both maritime and mountainous operations within the Irish Sea and Snowdonia National Park.
- Provide opportunity to complement existing SAR capability in the region.

Trials Programme

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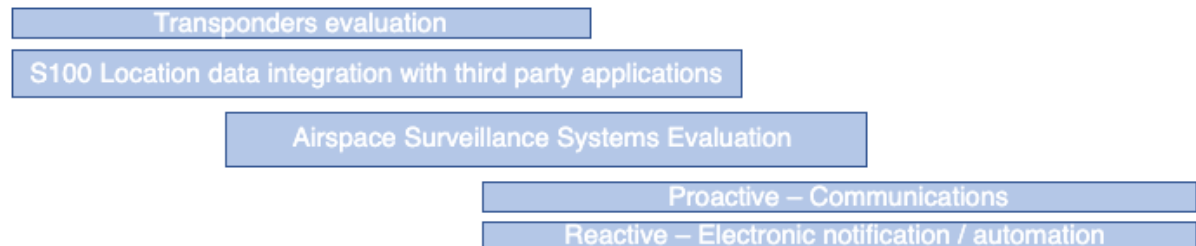
Trail Programme – Schedule Stage 1a



Ph 3 – Stage 1a

DETECT Electronic conspicuity,
Establishing recognised air
picture and sharing.
Establishing recognised air
picture and sharing.

AVOID Recognised air picture and
electronic conspicuity



Proposed Trial Airspace Design

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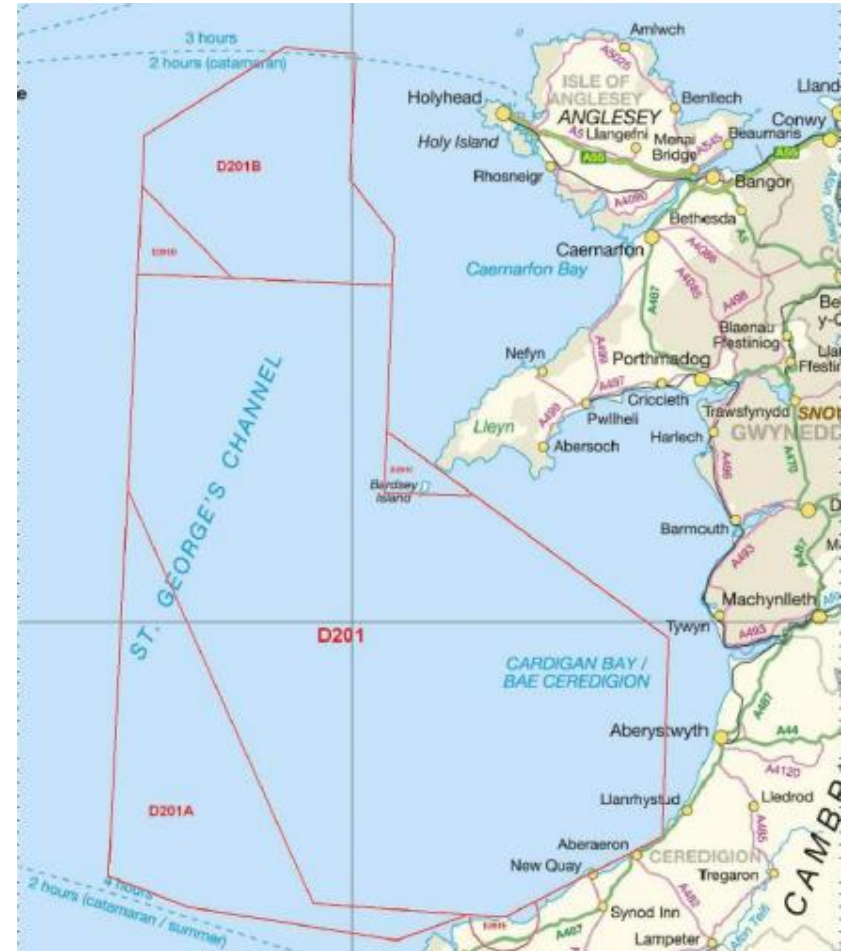


UAS Trials – Preferred Airspace Requirement

- Stage 1a – Novel Technology evaluation and Stage 2 – Sensor optimisation for S-100 UAS.
- Maritime operating area
 - Over sea and coastal area
 - Airspace 7nm by 7nm
 - SFC to 8000ft AMSL
- Land / mountainous operating area
 - Over mountainous terrain
 - Airspace 4nm radius
 - SFC to 7000ft AMSL

Airspace Constraints

- RAF Valley
 - Visual and Instrument, approaches, departures and holds.
- Caernarfon ATZ
- Aberporth Danger Area
 - D201
 - D201B
 - D201C
- Terrain and system line of sight.



Proposed Airspace Maritime – Trial Area



Proposed TDAs:

- **Transit 1 – (SFC-2000ft AMSL)**
N53°03'55.00"W04°25'31.00", N53°05'8.00"
W04°23'8.00", N53°04'24.00" W04°21'57.00",
N53°03'4.72"W04°24'21.11", N53°03'55.00"W04°25'31.00"
- **Transit 2 – (SFC-3000 ft AMSL)**
N52°59'46.23" W04°33'38.79" , N53°03'55.00" W04°25'31.00",
N53°03'4.72" W04°24'21.11", N52°58'53.54" W04°32'25.18",
N52°59'46.23" W04°33'38.79".
- **Transit 3 – (SFC-3000 ft AMSL)**
N52°55'18.90" W04°42'20.03", N52°59'46.23" W04°33'38.79",
N52°58'53.54" W04°32'25.18", N52°54'24.65" W04°40'59.60",
N52°55'18.90" W04°42'20.03".
- **Transit 4 – (SFC-4000 ft AMSL)**
N52°52'23.63". W04°48'20.93", N52°55'18.90"
W04°42'20.03", N52°54'24.49" W04°40'59.55", N52°50'50.53"
W04°48'20.26", N52°52'23.63". W04°48'20.93".

DACS / DAAIS

- Provided by RAF Valley or Caernarfon Tower

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Proposed Airspace Maritime – Trial Area...



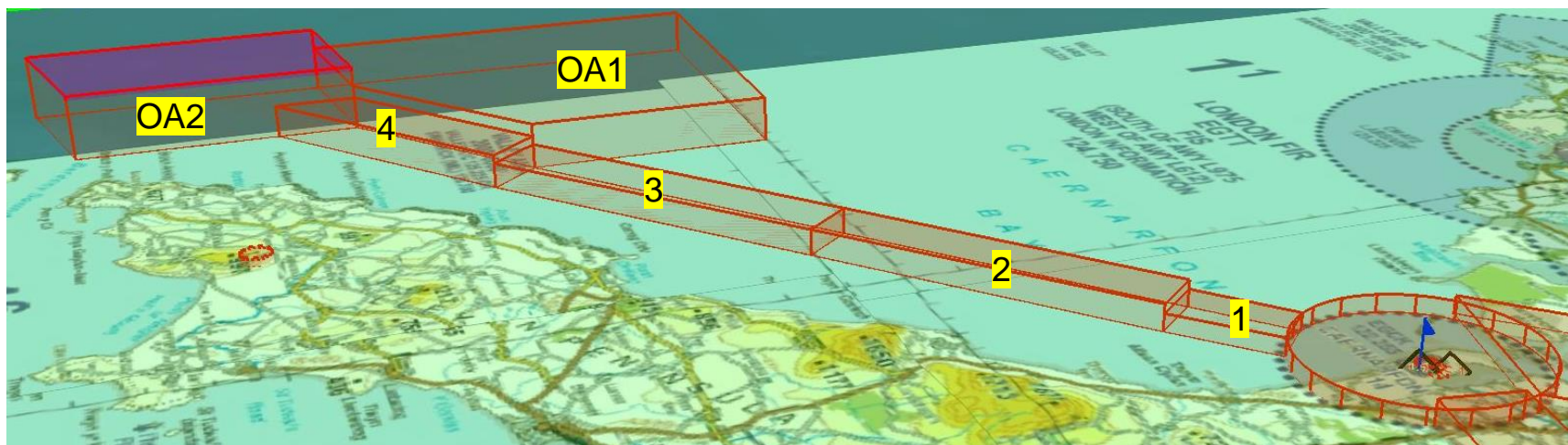
Proposed TDAs:

- **Operating Area 1 (North) – (SFC-5500ft AMSL)**
N53°00'0.00" W04°53'21.00", N53°00'0.00"
W04°42'19.00", N52°55'18.90" W04°42'20.03", N52°52'23.63".
W04°48'20.93", N52°51'55.00" W04°53'20.99", N53°00'0.00"
W04°53'21.00".
- **Operating Area 2 (South) – (SFC-8000ft AMSL)**
N52°52'23.63". W04°48'20.93", N52°46'59.00" W04°48'20.00",
N52°46'12.00" W04°53'21.00", N52°51'55.00" W04°53'21.00",
N52°52'23.63". W04°48'20.93".

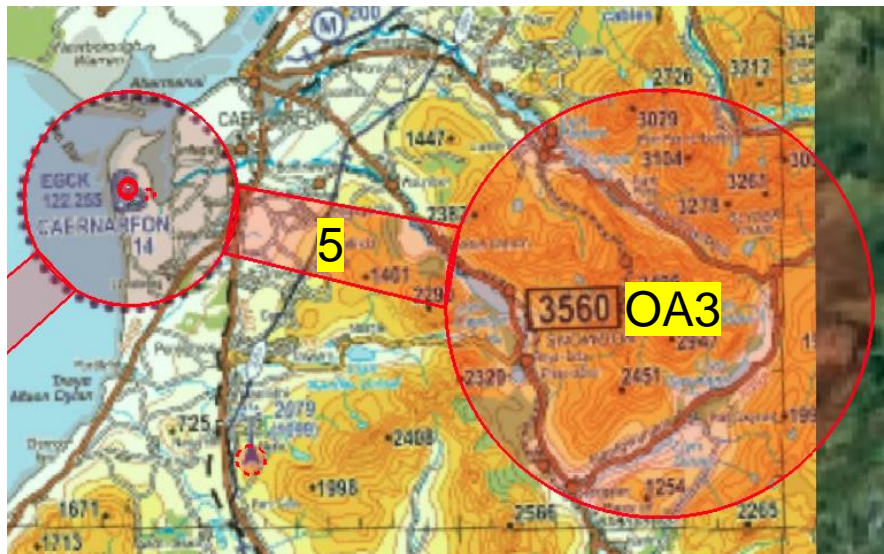
DACS / DAAIS

- Provided by RAF Valley or Caernarfon Tower

Proposed Airspace Maritime – Trial Area...



Proposed Airspace Mountainous – Trial Area



Proposed TDAs:

- **Transit 5 – (SFC-3000ft AMSL)**
530405N 0041029W, 530506N 0041721W thence anti-clockwise by the arc of a circle radius 2 NM centred on 530607N 0042015W from 530506N 0041721W, 530627N 0041657W, 530627N 0041657W, 530535N 0041003W thence anti-clockwise by the arc of a circle radius 4 NM centred on, 530409N 0040351W from 530435N 0041003W, 530505N 0041029W.
- **Operating Area 3 – (SFC– 7000ft AMSL)**
A circle, 4 NM radius, centred at 530409N 0040351W

DAIS

- Provided by RAF Valley or Caernarfon Tower

Airspace predicted usage

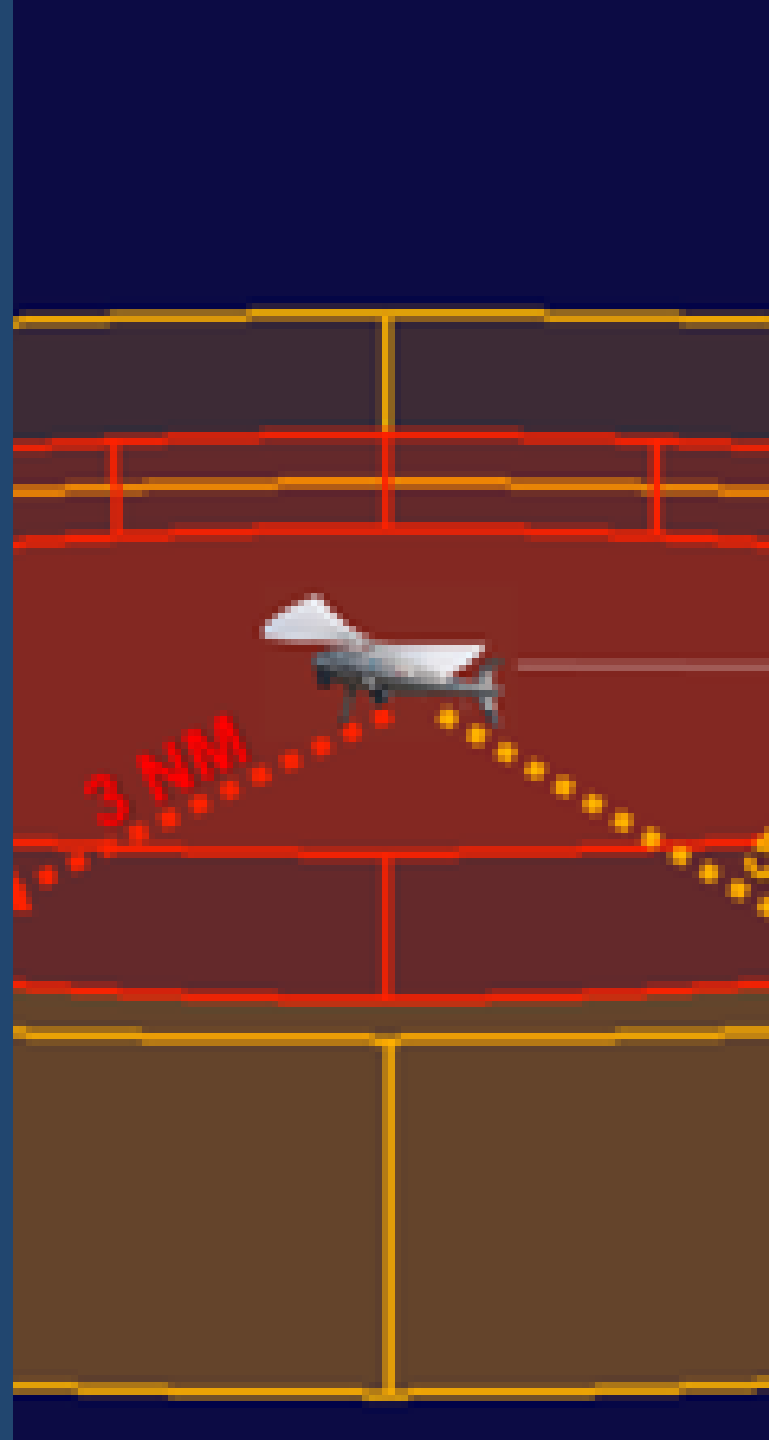
- **Maritime Complex**
 - Areas: Transit 1 - 4, OA1 and OA2.
 - DACS provided by RAF Valley during opening times.
 - Estimated average usage 2 to 3 days per week.
 - Monday – Sunday. Weekend use likely to be 1 weekend per month.
- **Land / Mountainous Complex**
 - Areas: Transit 5 and OA3.
 - DAIS provided by Caernarfon Tower during opening times.
 - Estimated average usage 1 day per week, subject to LOA.
 - Monday – Sunday. Weekend use likely to be 1 weekend per month.

Consultation (Timeline)

- Consultation – 19 Oct to 16 Nov 20.
- Four week consultation.
- Existing visit programme as part of consultation:
 - 21 October – Caernarfon Airport (Visit 1)
 - 21 October – Caernarfon Airport (Visit 2)
 - 9 November – RAF Valley
 - North Wales Air Ambulance TBC
- Feedback consideration and amendments –17 to 30 Nov 20.
- Target flight operations start – 28 Dec 20.

Novel Technologies

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Transponder Evaluation

- Schiebel collision avoidance system
 - Conflict / collision warning and automated avoiding action.
- Transponder with detect and avoid capability.

Airspace Surveillance System

- Mode S, ADS-B, FLARM, AIS integration to give air/maritime picture (situational awareness).
- Surveillance mandatory zone established to support BVLOS operations.

S-100 Location Data Integration

- The integration of S100 location data in real-time with third party software applications to improve situational awareness and facilitate the creation and electronic distribution of a 'known traffic environment'

Air to Air Communications

- Test and evaluate VHF rebroadcast system for S-100.
- System to enable Air-to-Air and Air-to-Ground VHF communications from the UAS.
 - Current architecture is ground-to-ground and ground-to-air from the ground control station.

Bristow UAS Prototype Service

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