



**Snowdonia Aerospace Airspace Change Proposal
Consultation Document (Stage 3A), ACP-2019-58
Llanbedr Danger Area (DA)**

Document Details

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Executive Summary

This report is the Consultation Document, developed as part of the “Stage 3A Consultation Preparation” element of the Snowdonia Aerospace LLP submission for an Airspace Change Proposal, Reference: ACP-2019-58, Llanbedr Danger Area (DA), under the Civil Aviation Authority (CAA) CAP1616 Airspace Change Process.

Snowdonia Aerospace LLP is continuing to progress and further develop a number of complementary business opportunities at Llanbedr Aerodrome relating to aerospace Research, Development, Test and Evaluation (RDT&E) and military aircraft training. To support these operations (and others) action is required to upgrade and formalise the current airspace around the Aerodrome as the present provision is insufficient to meet the identified future need and risks restricting opportunities that are in the strategic economic interest of the UK and Welsh governments and required to sustain long term employment in the region. Snowdonia Aerospace LLP (hereafter also referred to as the Change Sponsor) is therefore developing two Airspace Change Proposals (ACPs) to underpin these activities:

- ACP-2019-58, Llanbedr Danger Area (DA), which can be accessed online via: <https://airspacechange.caa.co.uk/PublicProposalArea?pID=193>
- ACP-2020-02, Llanbedr Aerodrome Traffic Zone (ATZ), which can be accessed online via: <https://airspacechange.caa.co.uk/PublicProposalArea?pID=211>

The two Proposals are independent of each other and are being progressed separately.

The ACP-2020-02, which is specific to supporting ongoing and future military aircraft training, has presently been Paused and is NOT part of this forthcoming consultation. An opportunity to participate in the ongoing consultation of this ACP will follow at some stage in the future.

The forthcoming consultation and the basis of this document is specific to ACP-2019-58, which is solely in support of the RDT&E opportunities (and not related to military aircraft training), with a view to creating a permanent Danger Area that will enable Llanbedr Aerodrome to increase support to the RDT&E for next-generation UK aerospace - e.g. drones (particularly non-military “drones for good”), electric aircraft, urban/regional air mobility vehicles, balloons, airships, near-space testing *etc.*

The CAA Civil Aviation Publication CAP1616 defines a six-stage process through to implementation of a permanent airspace change, some of which have more than one step. Snowdonia Aerospace has successfully completed Stage 1 (Define) and Stage 2 (Develop and Assess) and all the supporting documentation can be found on the CAA Airspace Change Portal. Stage 3 is where the change sponsor prepares and launches its formal consultation and this report is the principal Consultation Document. The Consultation Document is the primary mechanism via which SAC wishes to offer local communities and other airspace users an opportunity to review and influence the final designs that will then be submitted to the CAA at Stage 4 for approval. Stage 5 will be the CAA Review and Stage 6 the implementation of the approved airspace change.

This Consultation Document is structured as follows:

- Section 1: background information;
- Section 2: details about the consultation process;
- Section 3: a description of the proposed Airspace Change, including detailed maps of the areas within the airspace change boundaries;
- Section 4: an estimate of the utilisation of the proposed airspace change to determine any potential impact on other airspace users, the local community and the surrounding environment;
- Section 5: analysis of any potential environmental impact against six key criteria;
- Section 6: analysis of economic impact and summary of options appraisal;
- Section 7: details on what is being asked and how to respond.

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1. Introduction

1.1. Welcome

Welcome to the Consultation Document prepared by Snowdonia Aerospace LLP (SAC) to support an Airspace Change at Llanbedr Aerodrome, Reference ACP-2019-58. Within this Document we will explain the background to our consultation, we will tell you what we are consulting on and we will explain how you can have your say.

This consultation is open to everyone; if there is anyone you know who you feel may be affected by these proposed changes, and may not have heard about our consultation, please feel free to share this document with them or let them know that they can find all the information regarding this consultation on the CAA airspace change portal¹. If you require this information in an alternative format, please ask at one of our public events listed in Section 6 or write to us at the following address:

Airspace Change
Snowdonia Aerospace Centre
Llanbedr
LL45 2PX

1.2. Background

Llanbedr Aerodrome, Gwynedd (Figures 1a-1d), is sited on a coastal promontory at the northerly end of Cardigan Bay² with bi-directional over-water approaches to the 2000m+ main runway (17/35), which is at an elevation of 8m above mean sea level. There are two additional cross runways 05/23 and 15/33. Under upcoming aerodrome licensing proposals, it is currently intended the runways will be 2,188m, 1,199 and 799m respectively. The local geography is predominantly coastal lowland and farmland within Snowdonia National Park that is bounded to the east by the Rhinog mountains, which rise to 756m at a distance of 9500m (approx.) from the main runway. The village of Llanbedr (population 645, 2011 census) is 2000m (approx.) to the north-east of the northern threshold and there's also a transitory population during summer months at the Shell Island campsite (approx. 1000m to the north-west of the main runway northern threshold) and the Dyffryn caravan park (approx. 500m to the south of the main runway southern threshold). The overall population density is consistent with that for Gwynedd as a whole - *i.e.* <50 people per square km^{3,4}.

Llanbedr Airfield has a long history and established use for the research, development, test and evaluation (RDT&E) flying activities, particularly associated with the use of target drones, and also as a secondary or tertiary operating site for RAF Valley (approx. 58km north/north-west). An Aerodrome Traffic Zone (ATZ) and the original Danger Area D202 supported these activities prior to QinetiQ/MOD vacating the site in 2004, along with extant Cardigan Bay Danger Area D201, the closest edge of which is 25km (approx.) south-west of Llanbedr⁵. Despite the connotations of its name, a Danger Area is an airspace safety mechanism that keeps novel aircraft and aerospace activities, such as drones, physically segregated from other aircraft. The airfield currently supports an increasing mix of small (<20kg) and light (<150kg) drone RDT&E and General Aviation (GA) operations together with visiting military aircraft (fixed wing and rotary) and others including the search and rescue (SAR) helicopter from Caernarfon (approx. 35km north/north-west), Police helicopter and Air Ambulance. The airspace is currently Class G. A local Flight Information Service (FIS) has been provided to support day-to-day operations and a Temporary Danger Area (TDA)⁶ has previously been consulted on and implemented as and when required, either as a whole or in part, to support RDT&E activities and also to provide a safe corridor to D201.

¹ Ref: <https://airspacechange.caa.co.uk/PublicProposalArea?plD=193>

² [View on Google Maps](#)

³ Ref: [National Statistics Wales, June 2018](#)

⁴ Ref: [Annual Lower Super Output Area \(LSOA\) Population Estimates, 2018](#)

⁵ Ref: <https://www.aurora.nats.co.uk/htmlAIP/Publications/2018-08-02/html/eAIC/EG-eAIC-2018-087-Y-en-GB.html>

⁶ Ref: "Request for TDA "Approval in Principle" For UAS operations at Llanbedr Aerodrome", QINETIQ/MS/AD/LET1404197, Sept 2014

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There are GA aircraft operations most flyable days with an average of 100 to 200 movements per month. The airfield has also been designated as one of the candidate sites for a UK Spaceport by the Department for Transport (DFT) and Snowdonia Aerospace LLP has recently received a grant award from the UK Space Agency to generate a Horizontal Spaceport Development Master Plan.



Fig. 1a - aerial view looking west



Fig. 1b - aerial view looking east



Fig. 1c - aerial view looking north



Fig. 1d - aerial view looking south

1.3. Opportunity to be addressed and Statement of Need

Snowdonia Aerospace LLP is continuing to progress and further develop a number of complementary business opportunities at Llanbedr Aerodrome relating to aerospace RDT&E and military aircraft training. To support these operations (and others) action is required to upgrade and formalise the current airspace around the Aerodrome as the present provision is insufficient to meet the identified future need and risks restricting opportunities that are in the strategic economic interest of the UK and Welsh governments and required to sustain long term employment in the region. Snowdonia Aerospace LLP (hereafter also referred to as the Change Sponsor) is therefore developing two Airspace Change Proposals (ACPs) to underpin these activities:

- ACP-2019-58, Llanbedr Danger Area (DA), which can be accessed online via: <https://airspacechange.caa.co.uk/PublicProposalArea?pID=193>
- ACP-2020-02, Llanbedr Aerodrome Traffic Zone (ATZ), which can be accessed online via: <https://airspacechange.caa.co.uk/PublicProposalArea?pID=211>

The two Proposals are independent of each other and are being progressed separately. The ACP-2020-02, which is specific to supporting ongoing and future military aircraft training, has presently been Paused and is NOT part of this forthcoming consultation. An opportunity to participate in the ongoing consultation of this ACP will follow at some stage in the future. The forthcoming consultation and the basis of this document and the Strategy now being proposed is specific to the ACP-2019-58 which is solely in support of the RDT&E opportunities (and not related to military aircraft training), with a view to creating a permanent Danger Area that will enable Llanbedr Aerodrome to increase support to the RDT&E for next-generation UK aerospace - e.g. “drones-for-good”, electric aircraft, urban/regional air mobility vehicles, balloons, airships, near-space testing etc.

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The Statement of Need for the application is declared as follows:

- *To provide an environment for safe operation of all ongoing aerospace-related Research, Development, Test and Evaluation (RDT&E) activities in the vicinity of Llanbedr Airfield (EGFD) and the ability for associated aircraft to transit safely to/from Danger Area D201 to undertake extended range/endurance/altitude testing (in accordance with extant D201 procedures) without concern for other air traffic.*

The proposal explicitly supports the Airspace Modernisation Strategy (CAP1711) by creating a permanent test zone in which to explore the airspace integration issues associated with new airspace users such as drones that are currently identified as “unknowns” in Chapter 5 of CAP1711.

1.4. The cause of the opportunity and associated factors or requirements

The preface to the UK Government Aerospace Industrial Strategy, 2018, states that:

- *‘Environmentally-friendly aircraft will increasingly incorporate electric technologies, and we anticipate more aircraft operating autonomously in the future. New markets for drones and Urban Air Mobility vehicles will be developed. We want the UK to be at the cutting edge of these exciting developments much as we were when Sir Frank Whittle developed the world’s first jet engine’.*

Llanbedr has long been a UK national asset for aerospace RDT&E and there has been increased demand in recent years given its ideal location for Beyond Visual Line-of-Sight (BVLOS) drone testing. These activities have been satisfied to date by use of a Temporary Danger Area, but both customer demand and the need for confidence and reliance are now such that an application for a Permanent Airspace Change is warranted. The combination of safety, operational, technical and environmental factors already pertaining to low volume RDT&E activities is not expected to change. Moving to a permanent Danger Area will allow an increase in throughput to satisfy the market need and provide UK businesses in these sectors with a surety of being able to operate in the UK on a reactive basis. Many UK businesses have chosen to undertake their testing abroad due to the uncertainties around availability of adequate and appropriate commercial trials environments. Figures 2a – 2h below gives an indication of some of the wide variety of novel aerospace systems and applications that have previously been tested at Llanbedr Aerodrome and which would benefit from a permanent Danger Area to help accelerate development and commercial exploitation.

1.5. Governmental Guidance and Process for making an Airspace Change Proposal

Snowdonia Aerospace is not seeking to increase the volume of segregated airspace around Llanbedr Aerodrome relative to previous recent TDA implementations, but is seeking a permanent designation of a new Danger Area to obviate the need for multiple future TDA applications, none of which would be guaranteed and for which there would be a significant administrative process involved for both CAA and the Change Sponsor that will noticeably reduce the flexibility and responsiveness to market demand. At the beginning of 2018, the CAA introduced a new process via Civil Aviation Publication (CAP) 1616 “Airspace Change”⁷ that the regulator and sponsors of airspace change proposals should follow when proposing any airspace change. This new process was developed to ensure a greater level of transparency and two-way engagement with local communities. CAP1616 defines a six-stage process through to implementation of a permanent airspace change, some of which have more than one step. Snowdonia Aerospace has successfully completed Stage 1 (Define) and Stage 2 (Develop and Assess) and all the supporting documentation can be found on the CAA Airspace Change Portal¹.

Stage 3 is where the change sponsor prepares and launches its formal consultation and this report is the principal Consultation Document. The Consultation Document is the primary mechanism via which SAC wishes to offer local communities and other airspace users an opportunity to review and influence the final designs that will then be submitted to the CAA at Stage 4 for approval. Stage 5 will be the CAA Review and Stage 6 the implementation of the approved airspace change.

⁷ Ref: https://publicapps.caa.co.uk/docs/33/CAP1616_Airspace%20Change_Ed_3_Jan2020_interactive.pdf



Fig. 2a – Penguin B used to explore the potential for aeromedical delivery drones



Fig. 2b – Vertical Aerospace electric Urban Air Mobility (UAM) vehicle



Fig. 2c – Scheibel S100 Camcopter used to explore the potential for search/rescue drones



Fig. 2d – Astigan solar-powered high altitude, long endurance (HALE) vehicle



Fig. 2e – C-Astral Bramor used to explore the potential for mapping and surveying drones



Fig. 2f – BAE Systems/University of Manchester MAGMA aerodynamics test drone



Fig. 2g – The CASCADE university consortium with their collection of R&D drones



Fig. 2h – The view of Cardigan Bay from the B2Space near-space testing balloon

2. About this Consultation

2.1. Overview

The aim of this consultation is to seek the views of any groups or individuals who may be interested in the Airspace Change Proposal (ACP) and any affect it may have on them. Snowdonia Aerospace (SAC) is proposing to introduce a permanent Danger Area at Llanbedr Aerodrome to increase support to the research, development, test and evaluation (RDT&E) of next-generation UK aerospace - e.g. Beyond Visual Line-of-Sight (BVLOS) drones, electric aircraft, urban/regional air mobility vehicles, balloons, airships, near-space testing *etc.*

We are not seeking to increase the volume of segregated airspace around Llanbedr Aerodrome associated with the current Temporary Danger Area approach. Changing to a Permanent Danger Area will allow us to increase throughput to satisfy the market need and provide UK businesses in the aerospace sector with a surety of being able to operate in the UK on a reactive basis. However, this change does offer an opportunity to identify the Flexible Use of Airspace (FUA) needs of other aviation stakeholders and to identify and minimise the environmental impacts of aircraft operations for all stakeholders, wherever possible.

Please note that General Aviation and conventional manned fixed-wing and rotary-wing operations from the aerodrome do not require use of a Danger Area and hence are not included in the scope of the consultation.

2.2. Key definitions

There are a few airspace / aviation terms that are used extensively within the documentation and which are key to understanding the consultation. These are explained in more detail here using standard CAA definitions:

- Drones / Unmanned Aircraft Systems (UAS): Unmanned aircraft are a new and evolutionary component of the aviation system, offering several new and exciting opportunities, as well as a number of challenges. They come in a variety of shapes and sizes, ranging from small handheld types up to large aircraft, and, just like manned aircraft, they may be of a fixed wing design, rotary winged, or a combination of both. Unmanned Aircraft may also be referred to as Drones, Remotely Piloted Aircraft Systems (RPAS), Unmanned Aerial Vehicles (UAV), Model Aircraft or Radio-Controlled (RC) Aircraft. Drone has become the most prevalent nomenclature and is used throughout this document. Regardless of the name used, they all share the common characteristic that the person responsible for piloting the aircraft is not onboard it. Just like any other aircraft however, an unmanned aircraft must always be flown in a safe manner, both with respect to other aircraft in the air and also to people and properties on the ground.
- Beyond Visual Line-of-Sight (BVLOS): The CAA's Drone Code⁸ describes how remote pilots should keep their drone in sight. This means that they can see and avoid other things while flying. This is known as flying within Visual Line-of-Sight (VLOS). However, there are significant opportunities of greater efficiency, productivity, safety and economic value from operating a drone without the need or ability to keep the aircraft within view – known as Beyond Visual Line-of-Sight (BVLOS). Operating BVLOS is not explicitly prohibited or restricted by regulation, however it does require permission from the CAA to do so. CAA CAP722 Unmanned Aircraft System Operations in UK Airspace – Guidance & Policy states that “Unless able to comply with the current requirements of the Air Navigation Order (ANO), including the Rules of the Air, Unmanned Aircraft System (UAS) flights which are operated beyond the visual line of sight (BVLOS) of the remote pilot are required to be contained within segregated airspace. The UK uses Danger Areas as the primary method of airspace segregation for UAS operations”.

⁸ Ref: <https://register-drones.caa.co.uk/drone-code>

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- **Danger Area:** A Danger Area (DA) whether established on a permanent or temporary (TDA) basis, is defined as "airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times", although certain activities, whilst not inherently dangerous, may require a degree of segregation from other airspace users and a DA/TDA may be utilised to facilitate this requirement (see BVLOS above). Only those activities for which the DA/TDA has been specifically approved by the CAA are to be conducted within the DA/TDA and are subject to the safety management processes implemented by the DA/TDA Authority to ensure the containment of hazardous activity within the defined area. The vertical and lateral dimensions and the operating hours of a notified DA/TDA shall be the minimum practicable necessary to enable the tasks to be undertaken within it, subject to the need to avoid over-complication of airspace structures and any environmental considerations. The proposed Llanbedr DA is discussed in more detail in Section 3.
- **Flexible Use of Airspace:** Flexible use of airspace is an airspace management concept described by the International Civil Aviation Organisation (ICAO) and developed by the European Organisation for the Safety of Aviation (Eurocontrol), according to which airspace should not be designated as either purely civil or purely military airspace, but should rather be considered as one continuum in which all users' requirements have to be accommodated to the maximum extent possible. FUA and its application to the Llanbedr Danger Area is discussed in more detail in Section 4.

2.3. Our stakeholders

Stakeholders are third-party groups or individuals interested in the Llanbedr ACP. As part of the Stage 1 and 2 engagement process in May and June 2020, we have already reached out to 200+ aviation and non-aviation stakeholders. A full list of these organisation and individual stakeholders can be found in Appendix A of the Consultation Strategy, which has been published on the CAA airspace change portal. We are contacting these stakeholders directly as part of the consultation, but any other individual or organisation is still welcome to contribute via the CAA web portal or via one of our in-person drop-in events (see Section 6).

2.3.1. Aviation stakeholders

The following aviation stakeholders will be contacted:

- SAC-based operators;
- Local Airports and Aerodromes (*e.g.* Valley, Caernarfon, Welshpool, Talybont *etc.*);
- General Aviation clubs and associations;
- Air Navigation Service Providers (NATS, GATCO);
- Ministry of Defence.

2.3.2. Non-aviation stakeholders

We have asked the following community stakeholder organisations to participate by representing the interests of their local communities and residents:

- Local and Combined Authorities (Gwynedd Council, Welsh Government);
- Nationally Elected Representatives (Member of Parliament, Senedd Cymru Assembly Member)
- Town and Parish Councils;
- Snowdonia Enterprise Zone Board.

2.3.3. Environmental stakeholders

We are also consulting with those organisations whose primary interest concerns any environmental impacts of these changes (e.g. noise, local air quality and tranquillity).

2.4. Engagement activities so far

2.4.1. Stage 1

SAC undertook a number of stakeholder engagement activities to help shape the Danger Area design principles as part of the Stage 1 ACP process. In addition to targeted stakeholder meetings, a questionnaire was also sent out to over 200 stakeholders and interested parties. The following points summarise the key outcomes from these activities:

1. The questionnaire responses were consolidated for analytical consistency so as to consider a single response from each separate organisation. This resulted in a total of 36 independent responses, of which 29 (81%) were positive, 7 (19%) were neutral, and 0 (0%) were negative;
2. The engagement process was a valuable activity as it allowed SAC to refresh and widen relationships with local stakeholders and highlighted the key issues that will help shape the remainder of the ACP process;
3. Positive responses were received both from the aerospace community who are seeking to make use of the permanent Danger Area to enhance their products and services and also from the local community who can see the benefit that this business would bring to the regional economy;
4. The neutral responses raised issues / questions relating to two principle factors, (i) the impact of segregation on the flexible use of airspace for other aviation operators, and (ii) the potential noise/general nuisance impact on non-aviation leisure activities in Snowdonia National Park;
5. The draft design principles were reviewed and revised in light of (4);
6. SAC agreed to consider how engagement/consultation materials are developed to suit a range of audiences, such as how technical information will be communicated in an accessible way to non-aviation stakeholders.

Further details and analysis can be found in the Stage 1B report⁹.

2.4.2. Stage 2

SAC prepared two design options for the Danger Area (DA) as part of the Stage 2A ACP process and requested further feedback and comment from the stakeholders and interested parties previously engaged on the Design Principles. The following points summarise the key outcomes from this activity:

1. Option #1 described a baseline for the permanent Danger Area design based on the extant Temporary Danger Area. Option #2 is a further refinement based on feedback received as part of the two-way engagement process on the Design Principles;
2. We received a further 32 responses to the request for stakeholder feedback on the design options. Of these 32 responses, 3 (9%) expressed a preference for Option #1, 9 (28%) expressed a preference for Option #2, 6 (19%) expressed no preference, 2 (6%) opposed both options, and 12 (38%) felt unable to comment pending further clarification (mostly non-aviation). We again noted that future engagement / consultation materials are developed to suit a range of audiences;
3. Option #1 was considered to be easier to interpret and to provide greater flexibility for operators using the DA, whereas Option #2 was considered to be more complex but offered more advantages in terms of flexible use of airspace (FUA);

⁹ Ref: <https://airspacechange.caa.co.uk/umbraco/Surface/DocumentSurface/DownloadDocument/2244>

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4. Other local airspace users, both military and general aviation, and a local landowner identified possible potential conflicts with both options. SAC wrote back to all of these stakeholders with additional information that will allow a mutually acceptable solution to be achieved.

Further details and analysis can be found in the Stage 2A report¹⁰. Additional analysis was conducted as part of the Stage 2B Options Appraisal (Initial) and this has also been communicated to stakeholders that identified potential conflicts as part of the follow-up letters detailed in (4) above:

1. The assessment highlighted a strong economic case for implementation of a permanent Danger Area on the basis that it will (a) significantly enhance the UK RDT&E capability in environmentally-friendly aircraft and electric technologies in accordance with the 2018 Aerospace Industrial Strategy, and (b) generate jobs and related economic benefit in local communities;
2. The number of novel aerospace system flight movements is expected to double, but the numbers are relatively small (~100 days of Danger Area activation per annum and <200 flights per annum), the vast majority of operations (~90%) will be over the aerodrome or out over the sea and the vehicle size (the majority <150kg) and propulsion type (50%+ electric) mean that any noise and environmental impact is expected to be negligible;
3. Despite a predicted increase in both novel aerospace RDT&E flying and RAF/MOD training, there is still considered to be sufficient capacity to accommodate all activities safely, including additional General Aviation. The estimate of approximately 100 days of Danger Area activation per annum translates to 2 days per week and with operations above 2000ft likely only 33% of the time. Appropriate air traffic management principles have already been identified to ensure spatial and temporal deconfliction across all elements of the Danger Area.

Further details and analysis can be also found in the Stage 2B report¹¹.

2.4.3. Next steps

The stakeholder engagement feedback gained as part of Stages 1 and 2 have been taken forward into Stage 3A of the CAP1616 process and we have used it to help plan our stakeholder Consultation Strategy and prepare this Consultation Document, including the second-phase full options appraisal with more rigorous environmental evidence.

¹⁰ Ref: <https://airspacechange.caa.co.uk/umbraco/Surface/DocumentSurface/DownloadDocument/2288>

¹¹ Ref: <https://airspacechange.caa.co.uk/umbraco/Surface/DocumentSurface/DownloadDocument/2290>

3. Proposed Airspace Change

3.1. Summary of historical airspace use

Llanbedr Aerodrome opened in 1941 as part of RAF Fighter Command's 12 Group and pre-dates the creation of Snowdonia National Park by 10 years. From 1942 it was an operational base for towed targets and later became part of the Royal Aircraft Establishment, Defence Evaluation & Research Agency and QinetiQ, providing target drone services to the UK Armed Forces through to October 2004. In terms of airspace, these activities were previously supported by an Aerodrome Traffic Zone and Danger Area (D202) as illustrated in Figure 3 (from 2002). These airspace constructs lapsed when QinetiQ/MOD vacated the site in 2004.



Figure 3 - UK aviation chart from 2002 showing the ATZ and Danger Area (D202) at and around Llanbedr Aerodrome prior to QinetiQ/MOD vacating the site in 2004

As well as target drone operations, Llanbedr also supported training activities from RAF Valley, a range of other military operations, General Aviation and a variety of other novel aviation during this period and “Target Rolling: A History of Llanbedr Airfield”¹² provides a detailed record of activity. A further article in Target Magazine¹³ by the Senior Air Traffic Control Officer at Llanbedr notes that over 67,000 aircraft movements were recorded in the period from 1998 through to QinetiQ/MOD vacating the site in 2004, an average of approximately 9500 movements per annum.

3.2. Current situation

From the transfer of the aerodrome into private ownership in 2012, Snowdonia Aerospace LLP has and continues to develop the aerodrome to create a multi-use aerospace centre. Llanbedr currently supports an increasing mix of small (<20kg) and light (<150kg) drone RDT&E activities, examples of which are illustrated in Figures 2a to 2h, and a Temporary Danger Area (TDA)⁶ (Figure 4) was previously consulted on in 2014 and has been activated via Notice to Airmen (NOTAM) as and when required, either as a whole or in part, on multiple occasions since 2015. Continuing with the TDA is the “do nothing” baseline option for the proposed airspace change, but this has significant limitations.

¹² Ref: Wendy Mills, “Target Rolling: A History of Llanbedr Airfield”, Midland Publishing. pp. 128. ISBN 1-85780-136-9

¹³ Ref: Target, Souvenir Edition No. 10, Autumn 2004

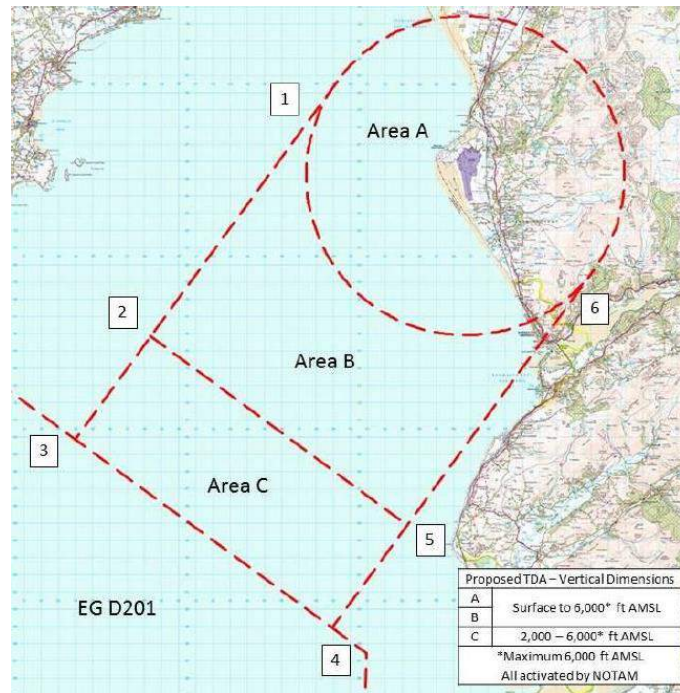


Figure 4 – The Temporary Danger Area at Llanbedr that has been activated as required since 2015

Llanbedr is the premier site in the UK for extended range, “Beyond Visual Line-of-Sight” (BVLOS) testing and we’ve seen on-site novel aerospace RDT&E occupancy increase from 30 days in 2017/18 to 40 days in 2018/19 and to 80 days in 2019/20. We have now reached the point where a request for activation of a TDA is a business limitation. Approval of future TDA applications in accordance with CAP 1616 (Part 1a Temporary changes to the notified airspace design) is not guaranteed and there would be a significant administrative process involved for both CAA and the Change Sponsor that will noticeably reduce the flexibility and responsiveness to market demand and not provide UK industry with the required surety of being able to operate in the UK on a reactive basis. Looking ahead to the immediate future, we can foresee that support to the UK Research and Innovation Future Flight Challenge¹⁴ is, as a minimum, going to double on-site occupancy to 160 days/annum in the period 2020 to 2024 and that growth in the novel aerospace industry is likely to sustain this figure into the longer term.

3.3. Baseline

The established use for the site is as an operational airfield and its recognised historic and current / ongoing uses. The site has an existing Certificate of Lawfulness (Ref: NP5/62/LU372) for research and development for testing, evaluation and development of drones and has a current planning consent for a mixed use incorporation, both its established use and for aircraft maintenance, including decommissioning and disassembly, parts recovery, refitting and engineering training (Ref: NP5/62/372A).

Within the Eryri (Snowdonia) Local Development Plan (2016 – 2031) (ELDP), the site is allocated as:

- *“The preferred location for high quality aerospace and low carbon technology enterprises, maximising the unique characteristics and strategic asset of the site; building upon its location at the heart of the National Park to help transform the area’s economic prospects”*

¹⁴ Ref: <https://www.ukri.org/innovation/industrial-strategy-challenge-fund/future-flight1/>

And for:

- operations and uses associated with the aviation and aerospace industry, including those associated with airfield infrastructure and services and airspace management;
- new uses including employment use (B1, B2, B8) and other uses associated with research and development (including aviation and aerospace industries);
- employment-related training and education purposes;
- other uses ancillary to the uses identified above including accommodation, catering and leisure.

The existing consents and Local Plan allocations have been through extensive community and stakeholder engagement previously particularly in the context of the sites use and its location and no particular issues have been raised in the context of the planned and allocated uses against these matters.

3.4. Airspace Change Design Options

The purpose of the airspace change proposal is to create a permanent Danger Area that will enable Llanbedr Aerodrome to increase support to the RDT&E for next-generation UK aerospace - e.g. drones (particularly non-military “drones for good”), electric aircraft, urban/regional air mobility vehicles, balloons, airships, near-space testing etc.

SAC has prepared two design options that reflect (1) a maximum extent for the DA, and (2) a maximum segregation/minimum extent for the DA, and that additional design options could be generated by combining elements of both options. The only option that has been discounted is promulgation of the TDA in an unaltered form. The design options have been developed in light of the feedback received from stakeholders and interested parties at Stage 1B, but also taking into account those comments relating to the technical definition of the proposed airspace change that we have received from aviation stakeholders who already have a degree of familiarity with the TDA and the second of our airspace change proposals that relates to provision of an Air Traffic Zone (ATZ).

The initial stakeholder engagement also raised issues/questions relating to two principle factors: (i) the impact of segregation on the flexible use of airspace (FUA) for other aviation operators, and (ii) any potential noise/general nuisance impact on non-aviation leisure activities in Snowdonia National Park. We have also sought to address these issues in the design options.

The design requirements are discussed in Section 3.3.1 and details of the two options are set out in Sections 3.3.2 and 3.3.3. Section 4 discusses the predicted utilisation of the sub-areas identified in Design Options #1 and #2 to determine any potential impact on other airspace users, the local community and the surrounding environment. Based on this utilisation model, Section 5 then provides further analysis of any potential environmental impact against the six key criteria identified by the CAA.

3.4.1. Design requirements

The airspace design will be promulgated as a Danger Area (DA), rather than as a Radio or Transponder Mandatory Zone (RMZ/TMZ) in order to be compliant with CAA CAP722 Unmanned Aircraft System Operations in UK Airspace – Guidance & Policy. CAP722 states that:

- *“Unless able to comply with the current requirements of the Air Navigation Order (ANO), including the Rules of the Air, Unmanned Aircraft System (UAS/drone) flights which are operated beyond the visual line of sight (BVLOS) of the remote pilot are required to be contained within segregated airspace. The UK uses DAs as the primary method of airspace segregation for UAS operations”.*

With regard FUA and its application to the Llanbedr Danger Area (see also Section 4.3), the key requirement is stated in CAP740, Appendix A (UK Flexible Use of Airspace Strategy), Paragraph 7b:

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- *Minimise airspace segregation by activating airspace volumes based on need rather than routine activation through set times defined in the AIP11. Where possible the routine activation should be by Notice to Airmen (NOTAM) to facilitate Strategic Airspace Management.*

This drove the requirement to identify multiple DA airspace segments that will allow us to both minimise time and volume of segregation. Horizontal and vertical segmentation of the DA will also allow us to minimise any impact on the environment, Snowdonia National Park and associated leisure activities

In response to this requirement we have identified an Area A in the immediate vicinity of the aerodrome that is common to all design options. Area A has the same dimension as an ATZ - a standard and well understood airspace safety management feature – and an area that reflects a minimum volume for anticipated DA activities. This will also allow the DA and ATZ (assuming successful conclusion of ACP-2020-02) to be managed in a consistent fashion.

As far as possible, beyond Area A, the shape of the DA has been designed to be easy to interpret and implement and the size has been designed to satisfy the following requirements from existing and potential users of the DA for a range of different novel aerospace systems:

- i. System testing: the ability to conduct short-medium range testing (10km to 20km) of aircraft systems, particularly ground-to-air communications, and to have sufficient altitude for testing of drone stall and spin characteristics and small-scale rocketry;
- ii. Extended system testing: the ability to transit to D201 to conducted extended range, altitude and/or endurance testing of aircraft systems;
- iii. System-of-systems testing: the ability to conduct systems-of-systems testing supporting wider airspace integration – e.g. Unmanned Traffic Management (UTM), detect-and-avoid etc.
- iv. Operational testing: a range of geographic features that enable testing of systems and sensors and evaluation of potential customer use cases in a range of operationally relevant environments – e.g. maritime/offshore, inshore/coastal, coastal/lowland, and upland/mountain.

With regard size, we have also had requests from other airspace users to allow transit over the top of the DA, and/or to be able to pass along the coast to the west of the aerodrome if the DA is activated over land, and/or to be able to pass over the coastal lowland to the east if the DA is activated over water. Non-aviation stakeholders also wished to minimise the overland activation of the DA.

The combination of a segregated area for RDT&E activities local to Llanbedr Aerodrome together with a corridor connecting that area to the existing D201 Cardigan Bay Danger Area means that the Llanbedr DA will always have a natural “keyhole” shape angled to the south-west. It doesn’t make sense for the corridor to be anything other than a rectangular/cuboid feature and we have chosen to adopt a circular/cylindrical format for the area local to the Aerodrome to be consistent with expansion of the ATZ volume, but also to maximise internal area/volume whilst minimising the segregated perimeter as far as possible. This is also consistent with FUA principles of minimisation, easy to interpret and implement, and avoids awkward corners that are difficult to navigate around. It should also be noted that whilst specific geographic locations may nominally sit within the DA, operating procedures can be put in place to ensure any novel aerospace flying activities are constrained to non-sensitive areas or managed via Letters of Agreement (LOA) with specific stakeholders.

3.4.2. Airspace Design Option #1

Option #1 (Figure 5) describes a baseline for the permanent Danger Area (DA) airspace change based on the TDA, but with an additional volume to reflect the proposed Aerodrome Traffic Zone (ATZ). Four separate volumes of airspace are referenced under the same DA identity, but each take a separate suffix - e.g. Areas A to D:

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- Area A: a cylinder of 2.5 nautical mile radius, centred on the main runway 17/35, from surface to 2000 feet altitude above mean sea level (AMSL) - *i.e.* coincident with the proposed Aerodrome Traffic Zone (ATZ).
- Area B: a cylinder of 5 nautical mile radius, centred on the main runway 17/35, from surface to 6000 feet altitude. Area B provides an extended area for inshore, coastal, lowland and mountain operational testing.
- Area C: a rectangle of 10 nautical mile width and 4.91 nautical mile length that extends from Areas A and B tangentially out toward Danger Area D201, from surface to 6000 feet altitude. Areas A, B and C collectively extend to approximately 10 nautical mile in length (measured from the centre of the main runway 17/35). Areas A+B+C combined provide an extended area for offshore/maritime operational testing.
- Area D: a rectangle of 10 nautical mile width and 4 nautical mile length that further extends Areas A+B+C to create either an extended straight-line testing route and / or a “bridge” into the existing Danger Area D201, from an altitude of 2000 feet up to 6000 feet. Access to D201 provides an ability for extended range/endurance/altitude testing. This will be managed via Letter of Agreement with QinetiQ/MOD. The 6000 feet upper altitude limit is defined so as to enable an engine out recovery without leaving segregated airspace in Area D for glide profiles <1000 feet per nautical mile.

3.4.3. Airspace Design Option #2

As a result of the two-way engagement process, Option #2 (Figure 6) is also put forward for the permanent Danger Area (DA) airspace change with additional airspace segments that will allow us to further minimise the time and volume of segregation:

- Area A1: a cylinder of 2.5 nautical mile radius, centred on the main runway 17/35, from surface to 2000 feet altitude - *i.e.* coincident with the proposed Aerodrome Traffic Zone (ATZ), the subject of the current second Airspace Change application ACP-2020-02.
- Area A2: extends Area A1 from an altitude of 2000 feet up to 6000 feet.
- Area B1: a partial annulus of 2.5 nautical mile inner radius, 5 nautical mile outer radius, centred on the main runway 17/35, extending to the west and angled west/south-west, from surface to 2000 feet altitude. Areas A+B combined provide an extended area for inshore/coastal operational testing. The Area B/E division cuts north/south from the Area A/C intersect to maximise the coastal coverage of Area B whilst minimising the overland area. The Area B/F division is nominally aligned with the coastline, but offset from the coast by approximately 1 nautical mile to minimise the impact on any paragliding and hang-gliding activities in the vicinity of Harlech.
- Area B2: extends Area B1 from an altitude of 2000 feet up to 6000 feet.
- Area C1: a rectangle of 5 nautical mile width and 4.91 nautical mile length that extends from Area A tangentially out toward Danger Area D201. Area A and C1 collectively extend to approximately 10 nautical mile in length (measured from the centre of the main runway 17/35), from surface to 2000 feet altitude. Areas A+C combined provide an extended area for offshore/maritime operational testing.
- Area C2: extends Area C1 from an altitude of 2000 feet up to 6000 feet.
- *Area D1: it is proposed that this area remains outside the DA to maintain a “tunnel” from surface to 2000 feet for low-level air traffic transiting to / from RAF Valley as per current TDA operations.*

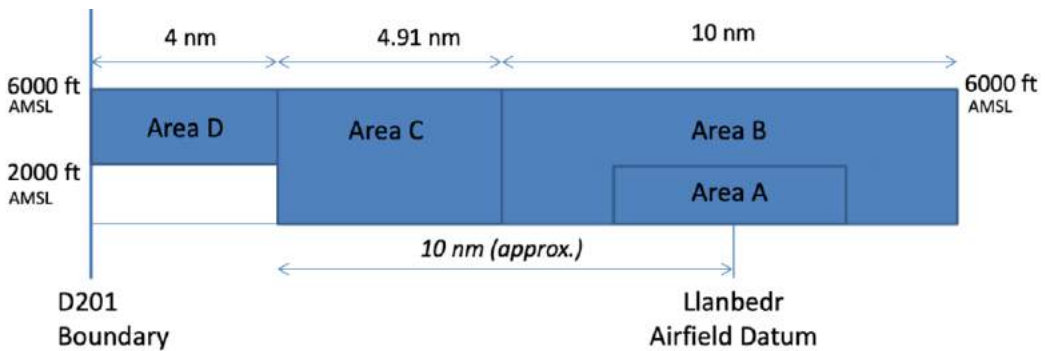
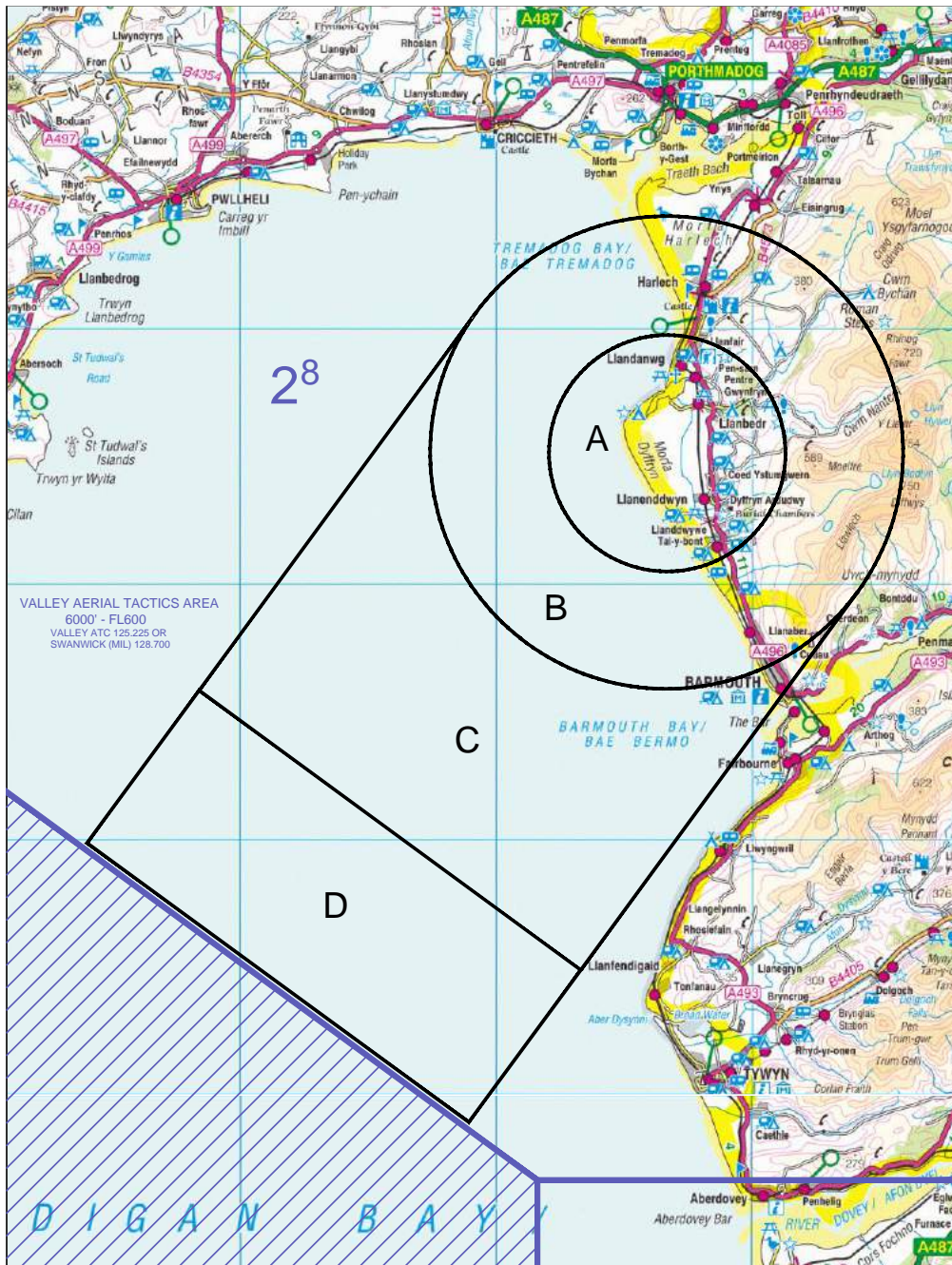


Figure 5 – Draft airspace design Option #1 for ACP-2019-58, Llanbedr Danger Area (DA)

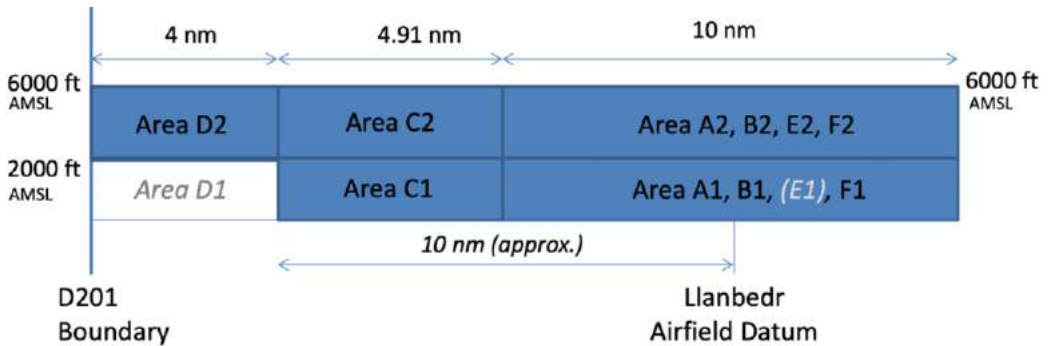
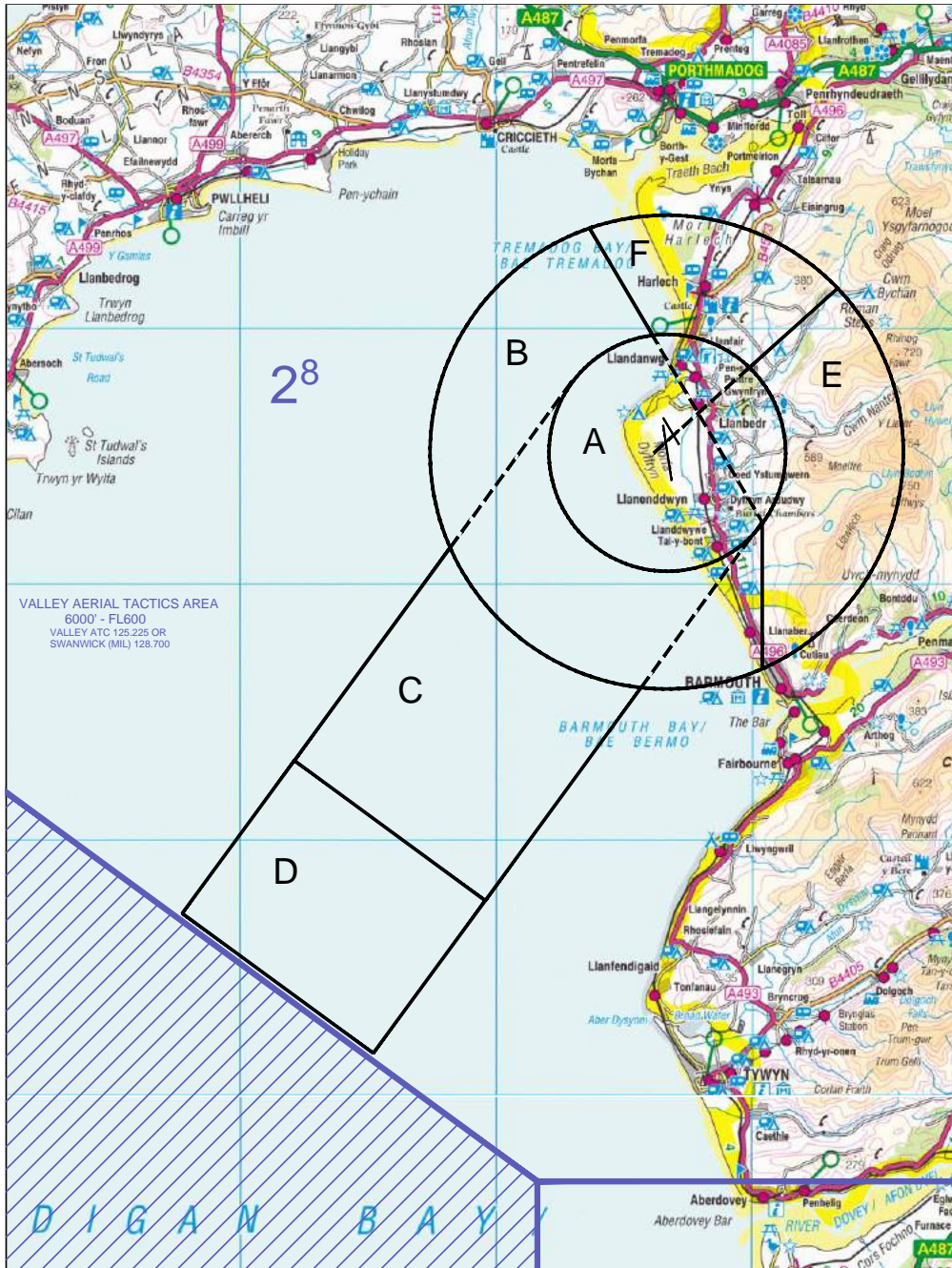


Figure 6 – Draft airspace design Option #2 for ACP-2019-58, Llanbedr Danger Area (DA)

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- Area D2: a rectangle of 5 nautical mile width and 4 nautical mile length that further extends Areas A+C to create either an extended straight-line testing route and / or a “bridge” into the existing Danger Area D201, from an altitude of 2000 feet up to 6000 feet. Access when required to D201 will provide an ability for extended range/endurance/altitude testing, which will be managed via Letter of Agreement with QinetiQ/MOD. The 6000 feet upper altitude limit is defined so as to enable an engine out recovery without leaving segregated airspace in Area D for glide profiles <1000 feet per nautical mile.
- Area E1: *it is proposed that this area remains outside of the DA to keep experimental aircraft clear of the Rhinog mountains.*
- Area E2: a partial annulus of 2.5 nautical mile inner radius, 5 nautical mile outer radius, centred on the main runway 17/35, extending to the east, from an altitude of 2000 feet up to 6000 feet. Areas A+E combined provide an extended area for upland/mountain operational testing. The Area E/F division is nominally aligned with the extended centreline from Runway 05/23 and represents a natural division between upland/mountain and coastal lowland environments, again seeking to minimise the impact on any paragliding and hang-gliding activities in the vicinity of Harlech.
- Area F1: a partial annulus of 2.5 nautical mile inner radius, 5 nautical mile outer radius, centred on the main runway 17/35, extending to the north, from surface to 2000 feet altitude. Areas A+F combined provide an extended area for coastal/lowland operational testing
- Area F2: extends Area F1 from an altitude of 2000 feet up to 6000 feet.

3.5. Design Option Preference

The options stated above are intended to reflect (#1) a maximum extent for the DA, and (#2) a maximum segregation/minimum extent for the DA, and that additional design options could be generated by combining elements of both options. Multiple such combinations could be identified, but SAC considers the two current options to best represent the distinct alternatives.

As per previous feedback, Option #1 is easier to interpret and provides greater flexibility for operators using the DA, whereas Option #2 is more complex but offers more advantages in terms of flexible use of airspace for other aviation operators (see Section 4). The Environmental impact (see Section 5) and Economic Impact (see Section 6) are the same for both.

Both options satisfy the Statement of Need and hence SAC does not feel the need to declare a preference at this point, but rather consider the feedback from a wider group of stakeholders before submitting a final design.

3.6. Reversion Statement

The Change Sponsor considers this proposal to be the 'do minimum' option. The reversion to the 'do nothing' option would see SAC continue to rely on identification and activation of a Temporary Danger Area in accordance with CAP 1616 (Part 1a Temporary changes to the notified airspace design). Granting of a TDA is by no means guaranteed and there is a significant administrative process involved for both CAA and the Change Sponsor / designated TDA Authority that requires additional consultation and noticeably reduces the flexibility and responsiveness to market demand. This will degrade the UK RDT&E capability in environmentally-friendly aircraft and electric technologies and negatively impact jobs and related economic benefit in the local communities.

Note that a post-implementation review (PIR) is also a requirement of CAP1616 Airspace Change Process (Stage 7 of the process).

4. Assessment of future DA airspace utilisation

The Danger Area (DA) design options have been broken into a number of sub-areas. With regard Design Option #1, the DA can be promulgated either as Area A, A+B, A+B+C or A+B+C+D. For Design Option #2 there are multiple possible combinations, the most likely being: A, A+B, A+C, A+C+D, A+E, A+F, A+B+E+F. In-line with Flexible Use of Airspace principles, none of the areas of the proposed DA will be permanently active and will only be activated by NOTAM when RDT&E flying activities are due to take place. The following analysis makes an estimate of the breakdown for the probable utilisation of the sub-areas identified in Design Options #1 and #2 to determine any potential impact on other airspace users, the local community and the surrounding environment

4.1. Assessment of future DA airspace activation

As noted previously, with regard novel aerospace RDT&E activity at Llanbedr, we've seen on-site occupancy increase from 30 days in 2017/18, to 40 days in 2018/19, to 80 days in 2019/20, and we're predicting a further doubling to 160 days/annum in the period 2020 to 2024 and for that growth to be sustained into the longer term.

Translating this forecast of on-site occupancy into the demand for activation of the permanent Danger Area is not straightforward because of the wide variation in types of novel aerospace systems and the associated type-specific flight test and evaluation requirements. Any estimate is obviously going to have a degree of uncertainty, but we believe a reasonable approach is to apply a simple multiplicative cascade - *i.e.* we would expect the sub-areas further away from the aerodrome and / or at higher altitude to be used less - and that the respective probabilities associated with each step have been determined based on a mix of prior experience and market knowledge:

- We expect there to be a 66.6% probability (*i.e.* twice as likely as not) that we will need to activate the DA on any day when the airfield is supporting a novel aerospace system activity;
- We then expect there to be a similar 66.6% probability that we would need to activate more than one sub-area (Area A + Area B/C/D *etc.*);
- We further expect there to be a 66.6% probability that the additional sub-areas will be adjacent to Area A - *i.e.* Area B for Option 1 or Area B/E/F for Option 2 - and a corresponding 33.3% probability that the novel aircraft system would need to enter the Area C/D corridor;
- For Option #2 we would also expect there to be a 75% probability (*i.e.* three time as likely as not) that Area B would be activated in preference to Areas E or F;
- Again, for Option #2, if over-land sub-areas of the DA need to be activated, there is expected to be a 50% probability that it will be Area E or F;
- Finally, regardless of Design Option or sub-area, we expect there to be a 66.6% probability that the maximum altitude required will be 2000ft and a corresponding 33.3% probability that the maximum altitude required will be 6000ft.

To complete the forecast, it would also be reasonable to estimate that it's again twice as likely as not (66.6%) that the novel aerospace systems operating at Llanbedr Aerodrome will have a maximum take-off weight less than 150kg (*i.e.* small / light drones) and that the split between internal combustion engine/jet-powered aircraft and electric-powered aircraft will be roughly 50:50, but with an increasing bias toward electric-powered aircraft over time.

Assuming a minimum target of 160 days occupancy per year, this gives the following predicted number of days Danger Area activation per year for each the various sub-areas (Table 1):

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	Design Option #1	Design Option #2
Area A* (over the aerodrome)	107	107
Area B** (inshore+)	47	35
Area C/D (offshore corridor to D201)	24	24
Area E (coastal lowland / Harlech)	<i>Included in Area B**</i>	6
Area F (toward Rhinog mountains)	<i>Included in Area B**</i>	6
Max. altitude <2000ft	71	71
Max. altitude <6000ft	36	36

* Area A will always be activated and hence the total number of days reflects both standalone and combined usage

** Option #1, Area B is equivalent to Option #2, Area B+E+F

Table 1 - Estimate of DA sub-area annual daily usage

Please note that these activation estimates are indicative only and intended primarily to show the usage of the various sub-areas relative to each other and to allow any potential impact on other airspace users, the local community and the surrounding environment to be determined. We have quoted daily occupation as the key metric as this is easier to predict and there are historical records for the past three years to back this up, but in terms of actual flights / aircraft movements, it would be reasonable to assume two flights on any given day as a guide. This estimate is also based primarily on a forecast of drone and electric aircraft operations in the period up to 2024. Beyond this period, we would expect a small but increasing number of space-related activities to increase the proportion of operations using the air corridor to connect to the D201 Cardigan Bay Range.

The estimate of 100 days of Danger Area activation per annum and 200 novel aerospace system flights per annum (approximately) also needs to be set in the context of 1000 total aircraft movements at Llanbedr during 2019 (approximately) and a historical average of 9500 movements per year (approximately) in the period prior to QinetiQ/MOD vacating the site in 2004.

4.2. Hours of operation

The standard operating hours for Llanbedr Aerodrome are 0900 to 1700 on Monday to Friday and typically we would only expect the Danger Area to be activated during these periods and then only when required. However, there may be a requirement for some trials platforms (e.g. HALE platforms, an example of which is shown in Figure 2d) to take advantage of lighter wind conditions, typically early morning or late evening, and consequently the operating hours will be extended as required to accommodate this activity. In these circumstances the aim again would be to promulgate the activity Monday to Friday, but these operations are expected to have very little impact (if any) on other airspace users. Furthermore, there may also be situations - e.g. where a short duration trial has been delayed by weather - where a limited amount of weekend flying may be required. We anticipate that any operations outside of standard hours will only be in exceptional circumstances and very rare in occurrence. As much notice as possible will be given to other airspace users.

4.3. Flexible Use of Airspace

European Commission Regulation (EC) No 2150/2005 of 23 December 2005¹⁵ lays down common rules for the flexible use of airspace (FUA), defined as follows:

- *“Flexible use of airspace is an airspace management concept described by the International Civil Aviation Organisation (ICAO) and developed by the European Organisation for the Safety of Aviation (Eurocontrol), according to which airspace should not be designated as either purely*

¹⁵ Ref: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32005R2150&from=EN>

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civil or purely military airspace, but should rather be considered as one continuum in which all users' requirements have to be accommodated to the maximum extent possible".

In the UK, CAP 740, UK Airspace Management Policy¹⁶, serves as a means of compliance to the essential requirements of both Reg (EC) 2150/2005 (Flexible Use of Airspace Regulation) and Reg (EU) 373/2017 (Common requirements for providers of air traffic management / air navigation services). CAP 740 also ensures compliance with supporting Eurocontrol guidance. With regard FUA and its application to the Llanbedr Danger Area, the key requirement is stated in CAP740, Appendix A (UK Flexible Use of Airspace Strategy), Paragraph 7b:

- *Minimise airspace segregation by activating airspace volumes based on need rather than routine activation through set times defined in the AIP11. Where possible the routine activation should be by Notice to Airmen (NOTAM) to facilitate Strategic Airspace Management.*

It is the Change Sponsors intention to fully follow these stated principles within the design and operation of the proposed ACP-2019-58 for the Llanbedr Danger Area. Appendix C (Military ASM Policy) shall also be considered, where possible, when it applies to a civil DA.

4.4. Impact of DA activation on general aviation stakeholders

The majority of GA activity at and around Llanbedr occurs at the weekend and is unlikely to be affected by DA activation. Even on weekdays, we only anticipate needing to activate the DA two days out of every five on average (approximately 100 days per year in total), although this will tend to be concentrated into short intensive periods and be biased more toward activities during British Summer Time (BST). Displacement of other aviation as a result of Danger Area activation is principally going to affect those aircraft wishing to overfly Llanbedr, of which 77 instances were recorded in the airfield movement log for 2019. Aircraft wishing to transit past Llanbedr will still be able to do so even if the DA is active. The combination of the ATZ (assuming successful conclusion of ACP-2020-02), the FIS service, and the explicit horizontal and vertical segmentation of the Danger Area in Option #2, will allow other air traffic to safely transit over the DA (above 2000ft) and past the DA to the west or east depending on which areas have been activated. The same capability to transit over the DA will also exist with Option #1 as the full 6000ft altitude will only be activated if required. On the estimated 36 days/year when the 6000ft maximum altitude may be in effect (*i.e.* 10% of the year, affecting 7 overflying aircraft on average), the maximum lateral deviation from path will only be the 2.5 nautical miles required to avoid Area A.

The Airspace Change is therefore anticipated to have a low/negligible impact on general aviation stakeholders and displacement of other aviation.

4.5. Impact of DA activation on military aviation stakeholders

Our forecast of future DA airspace utilisation indicates that we will need to activate the Danger Area on approximately 100 days per year, but that operations above 2000ft will only be likely 33% of the time (*i.e.* roughly once every 10 days) relative to a base level of 4000ft for Texan T1 and 5000ft for Hawk T2¹⁷. Similarly, activation of the sub-areas C and D creating a corridor to D201 is likely only 33% of the time and engagement with the MOD Danger Area Airspace Manager has identified no fundamental issues other than a need to provide sufficient notice to allow coordination with MOD test activities. On this basis, it is considered that RDT&E flying within the Llanbedr DA and RAF/MOD training can safely co-exist (as it did very successfully pre-2004 with much higher numbers of aircraft movements) and that any related operational integration issues can be managed via Letters of Agreement.

¹⁶ Ref: [https://publicapps.caa.co.uk/docs/33/CAP740_Issue7_Am1_Nov_2019\(cor\).pdf](https://publicapps.caa.co.uk/docs/33/CAP740_Issue7_Am1_Nov_2019(cor).pdf)

¹⁷ With regard the vertical dimensions, RAF Valley aircraft operate on the Regional Pressure Setting (RPS) when they are conducting their medium level activity and OC STANAT has confirmed that expressing the upper height as XXXX ft as opposed to Flight Level (FL) XX will make it easier for RAF Valley to safely deconflict.

The Airspace Change is therefore anticipated to have a low impact on military aviation stakeholders.

4.6. Impact of DA activation on sports aviation stakeholders

During the initial stakeholder engagement, some concern was expressed about the potential impact on sports aviation activities (hang-gliding and paragliding) in the vicinity of Harlech. We would like to reiterate that whilst specific geographic locations may nominally sit within the DA, the aircraft typically follow pre-programmed, waypoint-defined routes (see also Section 5.3 on “Overflight”) and operating procedures will be put in place to ensure flying activities are kept clear of sensitive areas – e.g. the town of Harlech, established flying around Harlech cliffs and Harlech Merthyr Farm etc. In addition, whilst our forecast of future DA airspace utilisation indicates that we will need to activate the Danger Area on approximately 100 days per year, the vast majority of these operations (approximately 90%) will be over the aerodrome or out over the sea and that the inland Areas E and F will only need to be activated approximately half a dozen times a year. We therefore believe there is a great deal of scope for novel aerospace activities within the Llanbedr Danger Area and local hang-gliding and paragliding to safely co-exist without impact on either party.

The Airspace Change is therefore anticipated to have a negligible impact on sports aviation stakeholders.

4.7. Impact of DA activation on non-aviation stakeholders

As noted above, whilst our forecast of future DA airspace utilisation indicates that we will need to activate the Danger Area on approximately 100 days per year, the vast majority of these operations (approximately 90%) will be over the aerodrome or out over the sea and that the inland Areas E and F will only need to be activated approximately half a dozen times a year. For the more frequent operations within Area A we will also seek to constrain flying operations to the west of the railway line where possible.

Section 5 details the environmental analysis, but simply based on the over-water / over-land split in utilisation, the Airspace Change is anticipated to have a negligible impact on non-aviation stakeholders.

4.8. Air Traffic Management principles and Safety Assessment

By definition and design a Danger Area (or Temporary Danger Area) is intended to enhance the safety of aviation operations by creating a small volume of segregated airspace that gives protection to experimental aircraft that are not “able to comply with the current requirements of the Air Navigation Order (ANO), including the Rules of the Air” as per CAA CAP722 Unmanned Aircraft System Operations in UK Airspace – Guidance & Policy.

None of the areas of the proposed DA will be permanently active and will only be activated by Notice to Airmen (NOTAM) when novel aerospace flying activities are due to take place. There is a safety advantage in having a permanent Danger Area as opposed to a Temporary Danger Area as it will be published in standard Aeronautical Information Regulation and Control (AIRAC) documentation as well as being promulgated via NOTAM ahead of activation. Snowdonia Aerospace will work actively with other local airspace users – e.g. via the regular RAF Valley Airspace Users Symposium and local Stakeholders where appropriate – to raise awareness of Danger Area activities at Llanbedr.

Once active, the following outline Air Traffic Management principles are expected to apply for both Danger Area Design Options #1 and #2 to ensure safe operation with regard (a) novel aerospace systems remaining within the DA, (b) other air traffic is kept out of the DA, and (c) any transfer between the Llanbedr DA and D201 is managed safely:

The following Air Traffic Management principles will apply for both Design Options #1 and #2:

- Although reference is made to a Permanent Danger Area (rather than the current Temporary Danger Area) this does not mean it is permanently active. It merely means the designation is

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Permanent and does not have to be applied for on a repeated basis. None of the areas of the proposed DA will be permanently active. They will only be activated by NOTAM when novel aerospace flying activities are due to take place. Outside these times the Airspace will remain Class G and open to ALL air users.

- A FISO service will be provided by Snowdonia Aerospace from take-off to landing for all novel aerospace operations within the proposed DA. The core FIS will be augmented with an Unmanned Traffic Management (UTM) system with a minimum ADS-B Out monitoring capability. Llanbedr FIS will also provide a Danger Area Activity Information Service (DAAIS) for all airspace users in the vicinity of the DA;
- It is anticipated that the novel aerospace system will be equipped with an ADS-B Out transponder as a minimum electronic conspicuity capability when operating outside of Area A for both Options #1 and #2;
- QinetiQ/MOD Aberporth Air Traffic Control (ATC) will be notified of all novel aerospace operations and their services will be engaged via Letter of Agreement (LOA) for operations that intend to transit through Area D for both Options #1 and #2 to operate in D201 or further into D202. The transfer of control from Llanbedr FIS to QinetiQ/MOD Aberporth ATC will be at the boundary of D201J;
- The novel aerospace system crew is responsible for monitoring flight systems and communicating directly with Llanbedr FIS or QinetiQ/MOD Aberporth ATC;
- In addition, the novel aerospace system crew (with advice and support from SAC as the DA Manager) is to ensure that the aircraft remains within the confines of the segregated airspace during both normal operation and in the event of any routine emergency. The novel aerospace system will be expected to “geo-fence” and maintain a buffer to prevent inadvertent departure from the DA. A buffer of at least 500m to the edge of the DA is nominally advised, but this will vary depending upon the speed of the drone and the latency of the command and control loop. This, and other safety-related issues, will need to be addressed within the Operating Safety Case (OSC) for the novel aerospace system and will be subject to review and approval by the CAA before operation within the DA will be allowed.

Strategic management of the airspace will be addressed through Collaborative Decision Making (CDM) with other local airspace users and this will primarily be achieved via the previously mentioned Letters of Agreement (LOA). The LOAs will set out the basis for sharing information on upcoming activities with neighbouring airspace users, the mechanisms for potential conflict resolution, and the process by which the Llanbedr DA will be activated, managed and de-activated.

A permanent DA will also warrant closer attention from the CAA Innovation Hub with regard their “Regulatory Sandbox” activities and is likely to see a case officer nominated to support RDT&E activities at Llanbedr and provide advice to individual operators on an appropriate approach to safety management (independent of the subsequent OSC review).

A permanent Danger Area at Llanbedr is therefore considered to be the most appropriate mechanism to address safety in the face of increasing demand for novel aerospace test and evaluation capability in the UK.

5. Assessment of Environmental Impact

CAP 1616 requires consideration of the following environmental factors for Level 1 proposals (which includes ACP-2019-58):

- Noise
- Overflight
- CO2 emissions
- Local air quality
- Impacts on tranquillity
- Impacts on biodiversity

Each of these is addressed in turn in the Sections 5.1 to 5.6 below.

5.1. Noise

Noise measurement and interpretation is a hugely complex matter. In the following sections, in order to help non-technical stakeholders better understand any potential impact of the proposed airspace changes and the type of air vehicles that will be operating from Llanbedr as a result, we will *(i)* start with some basic definitions and rules of noise measurement and perception, *(ii)* show how drones (and other novel aerospace systems) compare to a range of other familiar noise sources, and *(iii)* give an indication of how the noise from such aircraft may impact the environment around Llanbedr. Overflight over other areas within the proposed Danger Area beyond Llanbedr will be addressed in Section 5.2. The analysis is necessarily simplified as there is a lack of definitive source data and noise propagation from any given source is subject to a large number of influencing factors (which are outside of scope at present), but it is considered sufficient to give a representative and quantifiable assessment of scale and impact for the purposes of the ACP consultation.

5.1.1. Definitions

Decibel: the decibel (symbol: dB) is a relative unit of measurement corresponding to one tenth of a bel (B). It is used to express the ratio of one value of a power or field quantity to another on a logarithmic scale and is commonly used in acoustics as a unit of sound pressure level.

The decibel scale: the reference pressure for sound in air (0dB) is set at the typical threshold of perception of an average human and there are common comparisons used to illustrate different levels of sound pressure or “noise” (Figure 7).

3dB rule: every time you double a pressure level there is a 3dB increase. Conversely, cutting the pressure level in half will result in a 3dB decrease. For example, if a pin dropping has a sound pressure level of 10dB then two pins dropping would have a level of 13dB.

10dB rule: an increase of 3dB doubles the sound pressure level, but a 10dB increase is usually required before a sound is perceived to be “twice as loud”. For example, with reference to Figure 7, office noise at 70dB will be perceived by a listener to be twice as loud as normal conversation at 60dB, and a noisy restaurant at 80dB will be perceived to be four times as loud.

A-weighted or dB(A): a measurement that has been adjusted to consider the varying sensitivity of the human ear to different frequencies of sound where low and very high frequencies are given less weight than on the standard decibel scale. Many regulatory noise limits are specified in terms of dBA, based on the belief that dBA is better correlated with perception of noise and the relative risk of noise-induced hearing loss.

85dB / 85dB(A) threshold: UK employers must provide hearing protection at 85dB(A) (daily or weekly average exposure) and the level at which employers must assess the risk to workers' health and provide them with information and training is 80db(A).

Ambient noise: noise from an aircraft is only relevant to the extent that it does not exceed ambient (background) noise levels, which obviously differ from central business districts (CBD) to suburban to rural conditions, as well as from day to night-time (Figure 8).

Noise propagation: Sound is a sequence of pressure waves that propagate (travel) through compressible media such as air or water. (Sound can propagate through solids as well, but there are additional modes of propagation). During their propagation, waves can be reflected, refracted, or attenuated (reduced) by the medium. Typically, sound waves propagate as a sphere and follow an "inverse square law" of level reduction – i.e. the level reduces four-fold (6dB) for every doubling of distance from the source, although additional factors such as wind, temperature and surface barriers (buildings, trees etc.) will also have an effect.

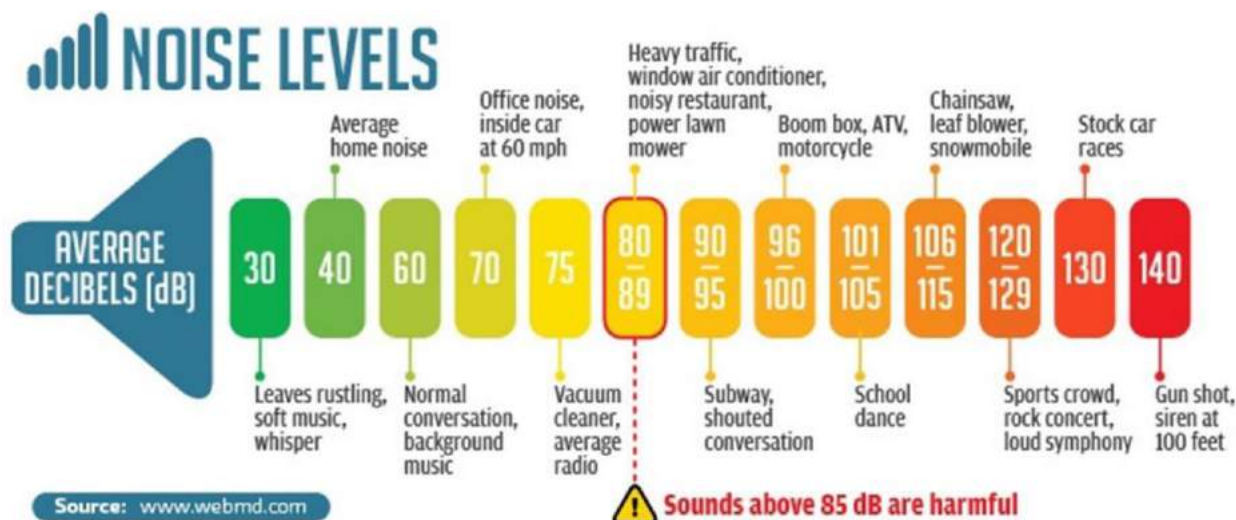


Figure 7 - common comparisons used to illustrate different levels of sound pressure on the dB scale

AMBIENT NOISE RANGES for DIFFERENT TYPES OF BACKGROUND			
dB	Rural	Suburb	CBD
65			Day
60			
55		Day	Night
50			
45	Day	Night	
40			
35	Night		

Figure 8 – Ambient noise ranges for different types of background

5.1.2. Drone noise

There are as yet no standard noise models for drones or standard measurement processes as there are for conventional manned aircraft.

Multiple internet references can be found for drone noise measurements, but these almost exclusively relate to consumer drones (e.g. DJI Phantom, Mavic etc.) and usually quote figures in the 70dB to 75dB range, although this rarely includes the distance from the source at which the noise was measured (although typically it is “close” – i.e. 5 metres or less), which makes comparison with other standard noise measurements difficult.

Having said that, there is a general consensus that small drones have a similar sound level to cars, but can be perceived to be more of an annoyance because of their higher frequency content. Christian and Cabell (2016) determined that this annoyance factor was equivalent to an approximate 6dB offset¹⁸ – i.e. a drone at 70dB is perceived to be as annoying as a car at 76dB. The major sources of drone noise are the engine / motor (petrol or electric) and the propellor (fixed-wing) or rotor(s) (rotary-wing) with the latter also generating noise peaks at multiple harmonics of the blade passing frequency.

Manufacturers have started to address noise as a major issue and simple changes to the rotor shape and motor controller can have a dramatic beneficial effect – e.g. the latest DJI Mavic Pro Platinum is 4dB to 6dB quieter than the previous DJI Mavic Pro¹⁹.

Airborne Drones quote the following comparison of drone noise with conventional aircraft noise (all measured at ground level with the aircraft at an altitude of 100m (330ft))²⁰ (Table 2a):

Aircraft type	Sound Pressure Level @ 100m AGL
Small fixed-wing drone e.g. AeroVironment Raven	50dB
Large quadcopter e.g. DJI Mavic Pro	55dB*
Small manned fixed-wing aircraft e.g. Robin DR400	75dB
Manned helicopter	95dB

*Consistent with the previously quoted measurement of 75dB “close-in” from other sources

Table 2a - Comparison of drone noise with conventional aircraft noise (measured at ground level with the aircraft at an altitude of 100m)

Drones such as the Raven and Mavic are useful benchmarks, but the drones / novel aerospace systems that will fly at Llanbedr are typically larger, as illustrated previously in Figure 2a to 2f. There is even less published noise data for these classes of vehicles, but we have found test data for a light tactical drone, believed to be an AAI Shadow 200, that was collected by the Georgia Tech Research Institute (GTRI) in 2010²¹. The Shadow has a 3.9 metre wingspan, 180kg maximum take-off weight, and is powered by a 38hp Wankel 741 engine. The extensive GTRI dataset showed that the noise profile for the 1990’s vintage Shadow is similar to that of a manned fixed-wing aircraft as quoted in Table 2a above, although advances in propellor and engine technology since then are likely to deliver a similar 4dB to 6dB improvement to that seen in the consumer market if the tests were to be repeated today. Last but not least, the most likely / most frequent type to operate at Llanbedr is the UAV Factory Penguin B drone that Snowdonia Aerospace have used previously to explore the potential for aeromedical delivery drones (Fig. 2a and also Fig. 9).

¹⁸ Christian and Cabell, “Initial investigation into the psychoacoustics properties of small unmanned aerial system noise”, Proceedings of the 17th AIAA Aviation Technology, Integration and Operations Conference, 2016

¹⁹ Ref: <https://dronedj.com/2017/09/28/video-detail-on-the-noise-levels-of-the-dji-mavic-pro-platinum-vs-dji-mavic-pro/>

²⁰ Ref: <https://www.airboredrones.co/drone-noise-levels/>

²¹ Ref: Massey and Gaeta, “Noise Measurements of Tactical UAVs”, Proc. of the 16th AIAA/CEAS Aeroacoustics Conference, 2010



Figure 9 - the Penguin has a 3.3m wingspan, a 21.5kg maximum take-off weight, a dash speed of 36 ms^{-1} (70 knots) and is powered by a 28cc, 2.5hp two-stroke, single-cylinder petrol engine

For the purposes of the consultation, and to give stakeholders a more representative baseline against which to assess any environmental impact, we have interpolated between the existing data to construct additional noise estimates for a 20kg maximum take-off weight drone (e.g. a Penguin) and a 150kg drone (e.g. Shadow or similar) at 100m above ground level (Table 2b):

Aircraft type	Sound Pressure Level @ 100m AGL
Small fixed-wing drone e.g. AeroVironment Raven	50dB
Large quadcopter e.g. DJI Mavic Pro	55dB*
20kg MTOW drone e.g. UAV Factory Penguin B	60dB**
150kg MTOW drone e.g. AAI Shadow 200	70dB**
Small manned fixed-wing aircraft e.g. Robin DR400	75dB
Medium manned helicopter	95dB

* Consistent with a measurement of 75dB "close-in", ** Estimated

Table 2b - Comparison of drone noise with conventional aircraft noise (measured at ground level with the aircraft at an altitude of 100m) for classes of vehicle likely to operate at Llanbedr Aerodrome

As a final point of reference, this Airspace Change is not associated with military aircraft activity, but the jets are a familiar sight and sound at Llanbedr and over North Wales and a high speed, low-level pass would typically register somewhere in the region of 100dB to 120dB²² – i.e. up 32 times louder than the RDT&E activity planned for Llanbedr under this ACP Proposal.

5.1.3. Impact on the local environment

Figure 10 takes the baseline data from Table 2b and estimates the further attenuation of the sound pressure level for each aircraft with increasing horizontal distance based on the inverse square law. Note that increasing altitude would have the same effect.

²² C. Lomax, G. Kerry and D.J. James, "Wideband noise signatures from low altitude military jet overflights", The Journal of the Acoustical Society of America 103(5), 1998

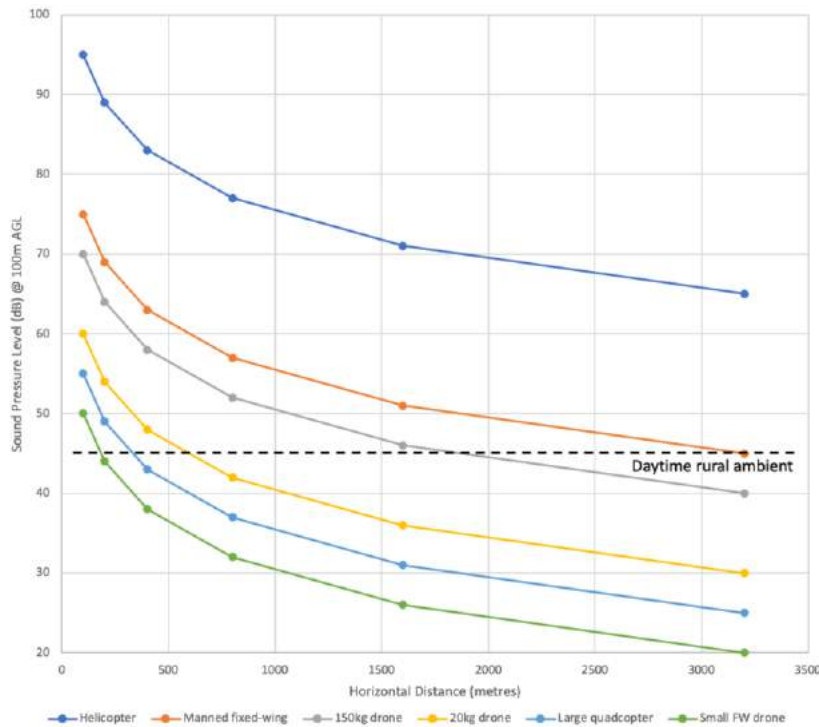


Figure 10 – Estimated attenuation of sound pressure level at 100m above ground level with increasing horizontal distance for various aircraft types likely to operate at Llanbedr

Figure 10 also includes the baseline for ambient noise in a daytime rural environment. This shows that all of the smaller drones are effectively inaudible above background noise beyond a few hundred metres, which tallies with our anecdotal experience. The C-Astral Bramor (a small electric fixed-wing drone, Fig 2e) was inaudible to ground observers when flying at altitudes above 150m / 500ft along the beach at Morfa Dyffryn and the UAV Factory Penguin B was only audible to ground observers on a similar stretch of beach when it came within a range of 500m (approximately) at an altitude of 100m / 330 ft. To put these estimates in the context of the local environment around Llanbedr Aerodrome, we have calculated the shortest distance from the intersection of Runway 15/33 and 05/23, which is our typical drone launch point and centre point for airfield circuits, to a number of local landmarks:

- 1000m: railway line;
- 1500m: Shell Island campsite, Morfa Dyffryn beach;
- 2000m: Victoria Inn public house (Llanbedr village);
- 2500m: Dyffryn Seaside Estate caravan park.

From our projections of future utilisation, we estimate that at least 66% of the drones that will operate from Llanbedr will have a maximum take-off weight less than 150kg and hence airfield operations are unlikely to be audible to local residents (temporary or permanent)²³ during normal daytime operation. Of the remaining 33% of drones / novel aerospace systems, representing about 30 days of operation per year, it is unlikely that noise profiles will be noticeably different from any other conventional fixed-wing general aviation or helicopters that use the airfield. It should also be noted that SAC and Gwynedd Council have not received a single noise complaint since the Temporary Danger Area was first activated in 2015.

²³ Any statutory noise limits only apply to permanent residents

As noted previously, this analysis is very simplified and will be subject to some inaccuracy, but we believe the bounds of that inaccuracy are still sufficient to give a representative and quantifiable assessment of the scale and impact on the local environment.

The Airspace Change is therefore anticipated to have a negligible impact on perceived noise.

5.2. Overflight

Unlike a conventional airport, there are no set flight profiles for the novel aerospace system activities conducted at Llanbedr, so it is highly unlikely that any area will be overflowed on a regular basis. Indeed, due to the experimental nature of the activities, SAC work with each of the flight test teams to minimise overflight of buildings and property and the aircraft autopilots typically have in-built geofencing boundaries that prevent them from overflying sensitive areas or leaving the Danger Area.

To give stakeholders an indication of the type of flight profile that might be typical for RDT&E activity using the Danger Area, Figure 11 shows the flight plan and aircraft track for one of our recent sorties with the Penguin B drone to explore the potential for aeromedical delivery to a remote location. The green dots denote pre-programmed waypoints (WP) for the autopilot that were defined to allow us to fly different circuits over the airfield and confirm the function on the onboard systems before transitioning out over the coast to perform the mission demonstration. The red line shows the aircraft ADS-B (GPS) track that was overlaid on the Ground Control Station mission plan in real-time with the defibrillator drop performed at WP10.

Before conducting this trial activity we gained permission from Gwynedd Council to access the beach, we scheduled the flight for a weekday afternoon when the beach was near-deserted, we made sure that the drone was always more than 50m away from all people and property (as per CAA guidance) and we stationed our own observers on the beach who were equipped with a megaphone, fire extinguisher and first aid kit and who were in continuous ground radio contact with both the drone pilot and the Flight Information Service Officer (FISO) in the Llanbedr Air Traffic Control tower. As noted above, the drone was only audible (and visible) to the ground observers when it came within a range of 500m (approximately) at an altitude of 100m / 330 ft.

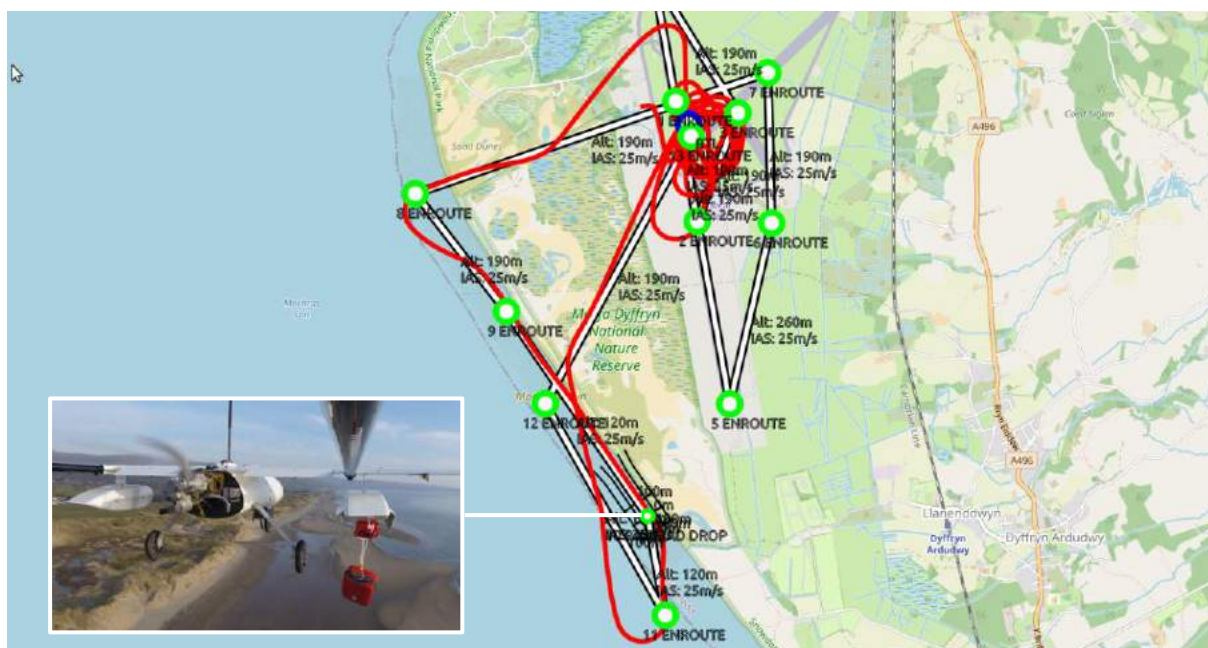


Figure 11 – Ground Control Station pre-mission plan and overlaid aircraft ADS-B (GPS) track for flight of the Penguin B drone to explore the potential for aeromedical delivery to a remote location

With the drone travelling at 25ms^{-1} the “time of exposure” was less than a minute as it completed the loop from WP10 to WP11 before disappearing from sight and sound again near WP12. We also made sure to minimise the flight time over the Site of Special Scientific Interest (SSOI) along the western boundary of the airfield and transitioned over this area at a higher altitude (190m / 625ft) to further reduce the noise profile.

Figure 12 shows a simulation-based flight path visualisation for a more extensive future trial activity with a small jet-powered drone planned for Summer 2021:

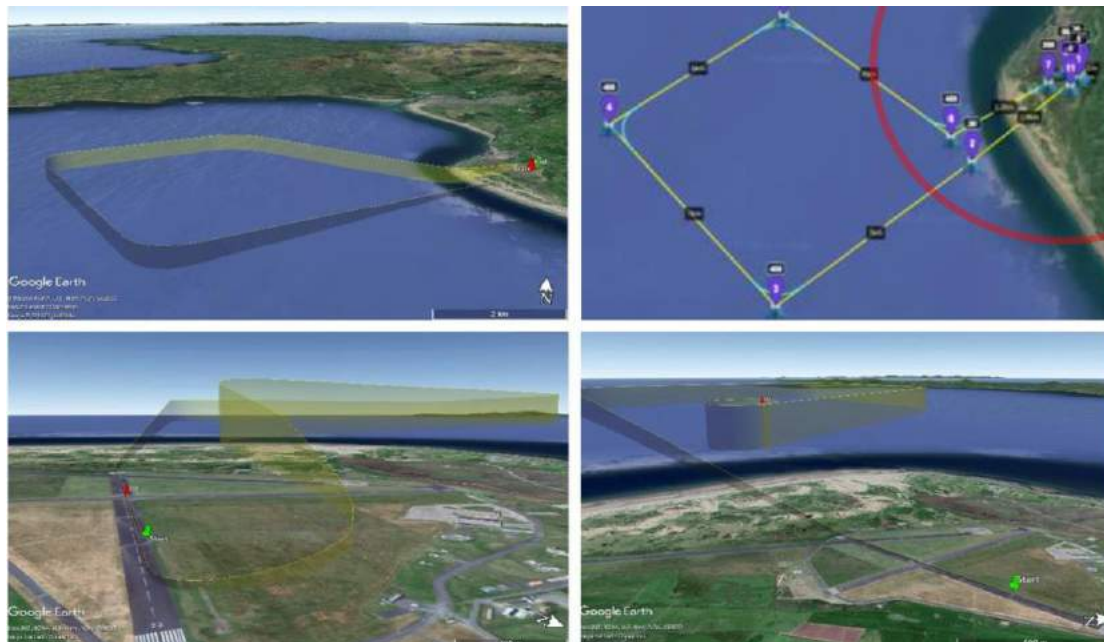


Figure 12 – simulation-based flight path visualisation for a small jet-powered drone flight test

Figure 12 again shows a series of pre-programmed waypoints that will be used to define the aircraft flight track, with a simple circuit in the vicinity of the airfield and the mission profile offset out over the sea. In this instance, the total flight time will be 15 minutes and the aircraft track length will be 35km with the clipped red circle (top-right subfigure) representing the boundary of Area A that is a core feature of both Design Option #1 and #2.

We estimate that approximately 90% of flight trials using the Danger Area will be conducted over the aerodrome or out over the sea in a similar manner to the examples shown in Figures 11 and 12 (or transition down the Area C/D corridor into the larger D201 Cardigan Bay Danger Area). In addition to simple circuits and linear transits, we might also expect to see standard mapping and search profiles as shown in Figure 13. These will typically be of the order of 1km square (although the creeping line mapping profile might be further extended), anchored to a pre-programmed waypoint and flown automatically via the autopilot (under the full supervision of the pilot).

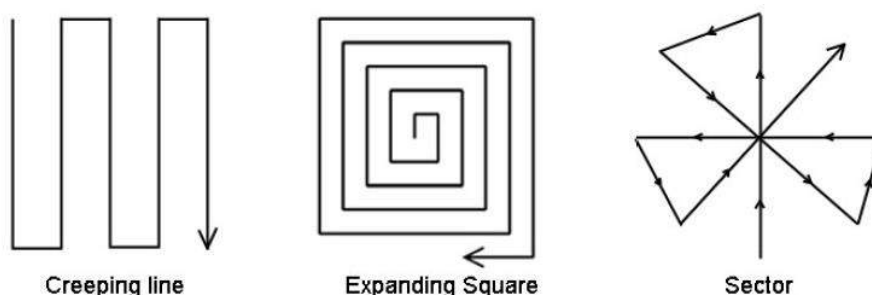


Figure 13 – example mission profile elements

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In approximately 10% of cases (roughly 10 days per year), we estimate that flight trials will need to be conducted over land (*i.e.* east of the railway line) in order to test specific mission sensors and potential customer applications. These flight profiles will use similar building block elements to those illustrated in Figures 11 to 13, but as discussed previously, the tracks and associated waypoints will be crafted to avoid overflight of buildings, property and any other sensitive areas and will be appropriately geo-fenced. SAC will work with visiting teams to ensure that flight plans respect local sensitivities. In all cases, all flights will also be subject to the CAA granting approval of an Operating Safety Case (OSC).

The Airspace Change is therefore anticipated to have a negligible impact on perceived overflight.

5.3. CO₂ emissions

Ordinarily, CO₂ effects are modelled using the Aviation Environmental Design Tool (AEDT) (based on aircraft movement data), then quantified and monetised using WebTAG outputs. CAP1616 requires the calculation of the total annual (and corresponding change in) mass of fuel burned, and hence CO₂ equivalent (CO_{2e}) emissions, resulting from the airspace change. The AEDT modelling software provides a fuel consumption metric that calculates the mass of fuel burned in metric tonnes. The corresponding mass of CO₂ emitted is estimated by multiplying the mass of fuel burned by a factor of 3.18 to provide a value for the mass of CO₂ emitted for the baseline 'do nothing' option and for each airspace design option. The AEDT model represents an average summer day and the value is therefore multiplied by 365 to provide an annual figure.

For the trials activity that culminated in the flight shown in Figure 11, the Penguin B drone used approximately 0.35kg of fuel per flight, travelling an average of 17km and with an average flight time of 12 minutes. Equally, with regard the flight profile for the small jet-engined drone shown in Figure 12, the simulation predicts a fuel burn of 6kg to travel 35km in 15 minutes. Assuming that there will be approximately 200 novel aerospace system flights per year in total (based on the future utilisation estimates in Section 4), and recognising that up to 50% of these will be flown by zero-carbon electric aircraft, it is obvious that the annual fuel burn is unlikely to exceed 1 tonne and that correspondingly the annual CO₂ emissions are unlikely to exceed 3 tonnes.

To put these figures in context, the annual fuel burn and CO₂ emissions associated with flying activities at Llanbedr as a result of the airspace change will be less than that generated by a single passenger car that travels 10,000 miles a year at 35 miles per gallon.

From Section 4.4 we also know that there will a negligible impact resulting from displacement of other aviation and hence the Airspace Change is therefore anticipated to have a negligible overall impact on CO₂ emissions.

5.4. Local air quality

CAP1616 requires changes to local air quality impacts to be included in the options appraisal process and that these effects must be conveyed in the consultation materials and quantified and monetised using WebTAG outputs. However, this is normally only required when the proposal affects an area in the vicinity of a location that has been designated as an air quality management area, which is not the case for Llanbedr. Details on the local approach to air quality can be found on the Gwynedd Council website²⁴ and monthly data can also be accessed via the Welsh Air Quality Forum website²⁵.

The Airspace Change is anticipated to have a negligible impact on local air quality.

²⁴ Ref: <https://www.gwynedd.llyw.cymru/en/Council/Strategies-and-policies/Environment-and-planning/Air-Quality-Management---Updating-and-Screening-Assessment.aspx>

²⁵ Ref: <https://airquality.gov.wales/about-air-quality>

5.5. Impacts on tranquillity

Tranquillity refers to the remoteness and sense of isolation within the landscape. This is affected and often determined by noise levels and the views and backdrop resulting from an absence of buildings and traffic.

Normally, impacts on tranquillity need only be considered with specific reference to Area of Outstanding Natural Beauty (AONB) and National Parks. However, engagement with stakeholders may identify other local sensitive areas for consideration such as heritage sites and popular visitor locations.

The Snowdonia Aerospace Centre sits inside the western coastal boundary of the Snowdonia National Park and borders a Site of Special Scientific Interest, hence the impact on tranquillity of the proposed airspace change is an important consideration. Local stakeholders and agencies such as Snowdonia National Park Authority, Natural Resources Wales, Cadw, and other similar groups, have already been engaged in the earlier stages of the ACP process and will be contacted directly as part of the Stage 3C consultation.

We're confident that the evidence presented with regard to noise (Section 5.1) and overflight (Section 5.2), together with the estimates for limited over-land operation (Section 4.1), will ensure the continued tranquillity of the local environment, but we will continue to engage with stakeholders on a regular basis.

The Airspace Change is anticipated to have a very low / negligible impact on tranquillity.

5.6. Impacts on biodiversity

The majority of airspace change proposals are unlikely to have an impact on biodiversity because they do not involve ground-based infrastructure, but biodiversity factors should still be considered proportionately.

Snowdonia Aerospace already has a Wildlife Hazard Management Plan in place and Natural Resource Wales has already been engaged in the earlier stages of the ACP process and will be contacted directly as part of the Stage 3C consultation. In addition, we have commissioned an Ecological Impact Assessment for the site. This survey is intended to provide a baseline assessment of the ecological value and constraints of the site, as well as evaluate the potential impacts of future developments on protected and/or notable species and sites.

The Airspace Change is anticipated to have a negligible impact on biodiversity.

6. Assessment of economic impact and summary of options appraisal

6.1. Cost Benefit Analysis

CAP1616 requires that we complete a cost benefit analysis for all related economic impact, however:

1. The economic model for Llanbedr Aerodrome does not conform to that for a conventional airport;
2. The analysis of future airspace use against the six key environmental criteria has shown there is negligible impact to monetise;
3. The sites established planning use, its recognised heritage and its key focus over the past 5 years are all fully accepted by all stakeholders and the local community. In many respects the community and airspace users feel the proposed implementation of a permanent DA will merely revert the airfield to its position previously and this will constitute more of the same and consequently negligible impact.
4. The highly variable nature of the RDT&E market makes a 10-year forecast unrealistic.
5. The Business Plan for Llanbedr Aerodrome relies on a flexible mixed-use model of operations and any investment made in the airfield infrastructure and subsequent operation and deployment costs are spread over the range of mixed uses rather than specific to those only requiring use of the DA.

In light of the specific circumstances associated with Llanbedr Aerodrome it is therefore felt inappropriate to include a specific cost -benefit model along the lines of Table E3 in CAP1616. In particular, DA airspace users do not explicitly derive income from flight operations at Llanbedr, but rather use the test and evaluation capabilities on offer to develop their products and services. It is therefore considered to be more useful to look at the value provided to the wider UK aerospace industry and the derived value back into the local economy.

The primary difference between the “do nothing” option of continuing with a Temporary Danger Area or implementing a permanent Danger Area is that a permanent DA will take away the schedule limitation on RDT&E operations at Llanbedr and provide UK aerospace businesses with a surety of being able to conduct developmental testing in the UK on a reactive basis. There is a growing demand for such a capability, as witnessed by the doubling of activity at Llanbedr over the past two years and the forecast for it to double again in the next two years, particularly to support the upcoming UK Future Flight Challenge. UK Research & Innovation has already highlighted a paucity of aviation innovation or development environments in the UK that will allow real-life demonstration and evaluation of next-generation system-of-system issues as part of its Future Flight Challenge problem statements.

A permanent DA will significantly enhance the UK RDT&E capability in environmentally-friendly aircraft and electric technologies and allow UK Government to move closer to the goal stated in the Aerospace Industrial Strategy, 2018 for “the UK to be at the cutting edge of these exciting developments”. The related Aerospace Sector Deal²⁶ describes the value of the UK aerospace industry as follows:

- *“It provides over 120,000 highly skilled jobs, most of these outside London and the south east. The sector has an annual turnover of £35 billion, the majority of which comes from exports to the rest of the world. This is a world-leading industry, driving growth and prosperity across the UK, supporting jobs that pay 40% above the national average”.*

²⁶ Ref: <https://www.gov.uk/government/publications/aerospace-sector-deal/aerospace-sector-deal>

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A permanent DA also supports the CAA Airspace Modernisation Strategy (CAP1711) by creating a test zone in which to explore the airspace integration issues associated with new airspace users such as drones that are currently identified as “unknowns” in Chapter 5 of CAP1711.

A commercially-run, civil-focused permanent DA will enable UK business to retain their future flight test programmes within the UK rather than operating abroad, thereby retaining economic activity, jobs and spend in the UK economy.

As well as supporting the development of environmentally-friendly aerospace and aviation in the UK and supporting regeneration of a greener UK economy following Covid-19, there is also a strong local economic benefit to a permanent DA. A recent economic impact assessment²⁷ suggested a multi-use aerospace site at Llanbedr (with aerodrome licencing, ATZ and DA implementation as fundamental building blocks), if developed in full, could contribute 515 jobs and £19.5m/annum of GVA at the local level and 765 jobs and £34m/annum of additional GVA in Wales over the next 10 years.

6.2. Summary of options appraisal

The analysis in Sections 4 to 6 is summarised in Table 3 against the high-level objectives and assessment criteria laid out in CAP1616, Appendix E, Table E2. Taken together, there is an exceptionally strong argument that implementation of a permanent Danger Area at Llanbedr provides a solution that not only satisfies safety and operational requirements, but also minimises the broader environmental impact, whilst meeting a need that is in the strategic economic interest of both the UK and Welsh governments in terms of accelerating novel aerospace development in the UK and creating jobs in south Gwynedd, respectively.

Given the environmental, safety, operational, and economic considerations presented above, the Change Sponsor strongly commends the Llanbedr Danger Area airspace change proposal to the CAA and all related stakeholders.

Group	Impact	DA Option #1	DA Option #2	“Do nothing”
Communities	Noise impact on health and quality of life	<ul style="list-style-type: none"> The number of novel aerospace system movements is expected to double, but numbers are relatively small (~100 DA days/annum, <200 flights/annum), and vehicle size (majority <150kg) and propulsion type (50%+ electric) means the noise impact is likely to be negligible. The vast majority of operations (~90%) will also be over the aerodrome or out to sea. Systems that deviate notably from the norm can be managed by Letter of Agreement with the local communities 		<ul style="list-style-type: none"> There would be little or no change from present
Communities	Air quality	<ul style="list-style-type: none"> As above, there is expected to be little impact on air quality 		<ul style="list-style-type: none"> There would be little or no change from present
Wider society	Greenhouse gas impact	<ul style="list-style-type: none"> As above, there is expected to be little direct impact and a strong element of the RDT&E activities will be focussed on reducing greenhouse gases in aviation 		<ul style="list-style-type: none"> There would be little or no change from present
Wider society	Capacity / resilience	<ul style="list-style-type: none"> A permanent DA will significantly enhance the UK RDT&E capability in environmentally friendly aircraft and electric technologies and allow UK Govt. to move closer to the goal stated in the Aerospace Industrial Strategy, 2018 for “the UK to be at the cutting edge of these exciting developments”. A permanent DA also supports the Airspace Modernisation Strategy by creating a test zone in which to explore the airspace integration issues 		<ul style="list-style-type: none"> Similar to the permanent DA, but at much reduced capacity, and makes the assumption that the TDA can be renewed indefinitely

²⁷ Wavehill Ltd, “Economic Impact Assessment for the Masterplan Development Proposals for the Snowdonia Aerospace Centre incorporating Spaceport Snowdonia at Llanbedr Airfield”, 12th March 2020

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		associated with new airspace users such as drones that are identified as “unknowns” in Chapter 5 of CAP1711.		
General Aviation	Access	<ul style="list-style-type: none"> The current level of GA traffic (789 movements in 2019)9 is unlikely to be unduly impacted by the DA, which is estimated will be active 2 days / week on average. Related operational issues could be managed via Letters of Agreement. 	<ul style="list-style-type: none"> As per Option #1, but with the potential for increased flexible use of airspace via greater DA segmentation and with mechanisms in place for safe transit to west, east or above the DA (above 2000ft) depending on which sub-areas are active. 	<ul style="list-style-type: none"> There would be little or no change on General Aviation operations in the vicinity of Llanbedr from the present position
RAF	Access	<ul style="list-style-type: none"> Despite a predicted increase in both RDT&E flying and RAF/MOD training, there is still considered to be sufficient capacity to accommodate all activities safely with appropriate mechanisms identified for spatial and temporal deconfliction. It is estimated the DA will be active 2 days / week on average and with operations above 2000ft likely only 33% of the time. Related operational issues could be managed via Letters of Agreement. 	<ul style="list-style-type: none"> As per Option #1, but with the potential for increased flexible use of airspace via greater DA segmentation and with mechanisms in place for safe transit to west, east or above the DA (above 2000ft) depending on which sub-areas are active. 	<ul style="list-style-type: none"> There would be little or no change on RAF/MOD operations in the vicinity of Llanbedr from the present position
General Aviation / RAF	Economic impact from increased effective capacity	<ul style="list-style-type: none"> There is not expected to be any economic impact on General Aviation or RAF/MOD 		<ul style="list-style-type: none"> There would be little or no change from present
General Aviation / RAF	Fuel burn	<ul style="list-style-type: none"> General aviation and RAF/MOD fuel burn is not expected to change 		<ul style="list-style-type: none"> There would be little or no change from present
RAF	Training cost	<ul style="list-style-type: none"> <i>Not applicable</i> 		<ul style="list-style-type: none"> <i>Not applicable</i>
RAF	Other costs	<ul style="list-style-type: none"> <i>Not applicable</i> 		<ul style="list-style-type: none"> <i>Not applicable</i>
Airport / ANSP	Infrastructure costs	<ul style="list-style-type: none"> There will be a need for further investment into the Aerodrome facilities to implement a UTM system. These costs are being borne by Snowdonia Aerospace LLP as part of its ongoing investment programme at the Aerodrome 		<ul style="list-style-type: none"> As per Option #1
Airport / ANSP	Operational costs	<ul style="list-style-type: none"> There may be a need for increased Flight Information Service (FIS) and Rescue & Fire-Fighting Services (RFFS), but this cost will be borne by Snowdonia Aerospace LLP <i>See also economic impact</i> 		<ul style="list-style-type: none"> As per Option #1
Airport / ANSP	Deployment costs	<ul style="list-style-type: none"> There may be a need for additional FIS and RFFS training, but this cost will be borne by Snowdonia Aerospace LLP <i>See also economic impact</i> 		<ul style="list-style-type: none"> As per Option #1

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Airport / ANSP	Economic impact from increased effective capacity	<ul style="list-style-type: none"> A recent economic impact assessment²⁶ suggested a multi-use aerospace site at Llanbedr (with aerodrome licencing, ATZ and DA implementation as fundamental building blocks) could contribute 515 jobs and £19.5m/annum of GVA at the local level and 765 jobs and £34m/annum of additional GVA in Wales over the next 10 years 	<ul style="list-style-type: none"> Not having a permanent DA will remove one of the fundamental building blocks associated with development of Llanbedr as a multi-use aerospace site and jeopardise the predicted economic benefit to the local community
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Table 3 – Summary of the options appraisal for Llanbedr Danger Area and “do nothing” options against the high-level objectives and assessment criteria laid out in CAP1616, Appendix E, Table E2

7. How to participate

7.1. What is Being Asked?

We are asking you to consider any impact this proposal could have on you as an individual, your community as a whole or your organisation's activities. This is your opportunity to review the proposed procedures and influence the final designs that SAC will submit to the CAA. We would welcome any feedback and suggestions that you may have.

7.2. Consultation Period

This consultation begins on Monday 7th December 2020 and runs for 7 weeks. All comments must be received via the media listed below by 12 noon on Friday 22nd January 2021.

7.3. How to respond?

7.3.1. Responding via the Airspace Portal

This consultation is being conducted by SAC using the CAA's online consultation portal. The page dedicated to this change can be accessed here:

<https://airspacechange.caa.co.uk/PublicProposalArea?pID=193>

The CAA Airspace Regulation Department will oversee the consultation and ensure that it adheres to the CAP1616 process and government guidelines. All comments will appear in the public domain and the CAA will also act as moderator for the comments.

This Consultation Document and all supporting documents are available on the CAA portal. There is a link to our consultation questionnaire hosted by Citizen Space where you can submit your answers to our specific questions. There is a free-text comments field for you to submit anything you feel is not covered by our questions. Please submit your response directly to us via the CAA portal at the link above.

7.3.2. Responding in Person – or Finding Out More

We invite you to come along to one of our public drop-in sessions to find out more, ask questions or submit a response in person. SAC will also assist attendees to make an online response during their visit if requested. Note that Session 2 will be prioritised as a Welsh language event. The sessions are being held at the following times and locations:

- Session 1: Main Hangar, Snowdonia Aerospace Centre, Llanbedr LL45 2PX, on Thursday 10th December 2020 between 10am and 4pm
- Session 2: Main Hangar, Snowdonia Aerospace Centre, Llanbedr LL45 2PX, on Friday 11th December 2020 between 10am and 4pm – Welsh language event
- Session 3: Main Hangar, Snowdonia Aerospace Centre, Llanbedr LL45 2PX, on Saturday 12th December 2020 between 10am and 2pm

There will be free parking immediately outside the Main Hangar and a one-way pedestrian system in place inside and outside to ensure adequate social distancing in line with the latest Covid-19 best practice for public events. Refreshments and toilet facilities will be available and all the facilities are accessible to disabled visitors. In the event that changes in the Covid-19 restrictions for Llanbedr prevent a public event on the dates stated, we will first look to rearrange within the consultation period, but with the fallback that we will hold a similar series of events via video conference.

All in-person responses to our questionnaire or hand-written comments will be uploaded to the CAA Portal for moderation and must be legible and include your full name and contact details to be considered.

7.3.3. Responding by Post

Respondents can submit a postal response to the consultation and a paper copy of the online questionnaire (Appendix A) will be available on request. We cannot commit to respond to all postal responses directly, but respondents are welcome to include a stamped addressed envelope if they do require a reply. Postal responses can be sent to the following address:

Airspace Change
Snowdonia Aerospace Centre
Llanbedr Aerodrome
Llanbedr, LL45 2PX

7.4. What information will you need to provide?

Please note that when submitting feedback whether online, in person or by post you will be asked to provide the following information in order for your response to be counted:

- Your full name
- Your role if you are responding on behalf of a stakeholder group or organisation
- Your contact details
- A feedback category: SUPPORT, NO COMMENT, NEUTRAL, OBJECT
- Your feedback on each of the proposed options
- Your general feedback comments, with an opportunity to provide more detail

We would like to know your views, including whether or not you have a preference for either option, or whether you have any positive or negative comments to make for either of them. All feedback will be moderated by the CAA and any anonymous, unaddressed or offensive feedback will not be counted.

7.5. Response acknowledgement and processing

We will acknowledge consultation responses by sending a message to the user, using the email address provided. Responses will be categorised in accordance with CAP 1616 Appendix C and posted on the CAA portal. If responses contain any commercially sensitive data, this will be redacted. SAC will post responses to any Frequently Asked Questions (FAQs) on the portal where common themes emerge. In the unlikely event that an unexpected, challenging response is received, the sponsor will commit additional resources to resolve the challenge where possible.

7.6. What happens at the end of the Consultation?

All responses will be published. Responses will be moderated, managed and uploaded to the consultation portal as appropriate. If any responses contain commercially sensitive data then we would expect the CAA to redact that information as part of its moderating practice. Guidance on the moderation of consultation responses can be found on the CAA website:

<http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8131>

On completion of the consultation, we will analyse the responses received and produce a feedback report, summarising themes arising from the feedback, alongside our response to any issues raised. The feedback report will be uploaded onto the portal. Any new requirements identified will be considered in the on-going design process. If fundamental changes are required to our design options as a result of feedback received during this consultation, then we may need to carry out a second consultation. When all consultation and review activities are complete, we will submit a formal Airspace Change Proposal to the CAA, referring to any changes that have been made to take account of consultation feedback.

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Our intent is to make our formal Stage 4 submission on 8th February 2021, to receive a positive response from CAA at Stage 5 by 7th June 2021 and to complete Stage 6 implementation with publication of the Aeronautical Information Regulation and Control (AIRAC) update AIRAC 09/2021 on 9th September 2021.

7.7. Consultation timetable

Table 3 below summarises the key dates and activities for the consultation process:

Activity	Location	Date
Stage 3C Consultation launch	CAA Airspace Change Portal	Monday 7 th December 2020
Public drop-in sessions	Snowdonia Aerospace Centre <i>(alternatively video conference in event of Covid-19 restrictions)</i>	Thurs 10 th December 2020 Fri 11 th December 2020 (Welsh) Sat 12 th December 2020
Stakeholder reminders	Email, social media	Mon 21 st December 2020
Stakeholder reminders	Email, social media	Mon 4 th January 2021
Consultation finishes		Fri 22 nd January 2021
Stage 4B ACP Submission		Monday 8 th February 2021

Table 3 - Key dates and activities for the ACP-2019-58, Llanbedr Danger Area Consultation Process

7.8. Thank You

Thank you for taking the time to consider the information in this document. A reminder that if you, or anyone you know, requires this information in an alternative format, please ask at one of our events or write to us at the following address:

Airspace Change
Snowdonia Aerospace Centre
Llanbedr Aerodrome
Llanbedr
LL45 2PX

Appendix A – Consultation Questionnaire

The following is the print copy of the online Consultation Questionnaire that will be distributed to stakeholders on request.

Snowdonia Aerospace Centre Danger Area Airspace Change Proposal

Overview

The aim of this consultation is to seek stakeholders views on the introduction of a change in designation of airspace at and around the Snowdonia Aerospace Centre at Llanbedr Aerodrome.

Snowdonia Aerospace LLP is continuing to progress and further develop a number of complementary business opportunities at Llanbedr Aerodrome relating to research, development, test and evaluation (RDT&E) of next-generation UK aerospace - e.g. drones (particularly non-military “drones for good”), electric aircraft, urban/regional air mobility vehicles, balloons, airships, near-space testing *etc.* To support these operations, action is required to upgrade and formalise the current airspace around the Aerodrome as the present provision is insufficient to meet the identified future need and risks restricting opportunities that are in the strategic economic interest of the UK and Welsh governments and required to sustain long term employment in the region.

Snowdonia Aerospace has to date operated under a Temporary Danger Area when undertaking activities of the nature described above. Due to the restrictions associated with a Temporary Danger Area, we are now proposing to introduce a Permanent Danger Area at Llanbedr Aerodrome. This will not increase the present volume of segregated airspace around Llanbedr Aerodrome associated with the current Temporary Danger Area approach, but changing to a Permanent Danger Area will allow us to increase throughput to satisfy the market need and provide UK businesses in the aerospace sector with a surety of being able to operate in the UK on a reactive basis. Note that “Permanent” merely means the designation is permanent and does not have to be applied for on a repeated basis. None of the areas of the proposed Danger Area will be permanently active.

The purpose of this consultation is for you, our stakeholders, to respond effectively to the information we have provided.

Why we are consulting

This consultation allows Snowdonia Aerospace, who is the Change Sponsor, to gather and consider views and information from relevant stakeholders about any potential impacts of this Airspace Change Proposal (ACP). Stakeholders have a crucial role to play in providing relevant and timely feedback to Snowdonia Aerospace with their views and opinions on any impact of this ACP.

The Consultation Document can be read in conjunction with the Consultation Strategy, which outlines the consultation approach, and Full Options Appraisal, which assesses the costs, benefits, and potential environmental impacts of introducing the new procedures.

You have the opportunity to provide relevant feedback, which may conflict with that of other stakeholders. After the consultation has ended, we will consider all your feedback and then produce the final design proposal, which may differ from that described in this document.

The consultation begins on 7th December 2020 and ends on 22nd January 2021.

Introduction

1 What is your name?

Full name

2 What is your email address?

If you enter your email address then you will automatically receive an acknowledgement email when you submit your response.

Email address

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3 Please enter your postcode (most relevant to your response e.g. home / work / organisation etc).

Postcode *(Required)*

4 Are you responding as an individual or do you represent an organisation?

Please select only one item

- Individual
- Organisation

5 If you are responding on behalf of an organisation, what is the organisation name?

6 If you are responding on behalf of an organisation, what is your position/title?

7 In accordance with the UK Civil Aviation Authority's CAP 1616 airspace change process, consultation responses will be published on Citizen Space via the Airspace Change Portal. Responses will be subject to moderation by the Civil Aviation Authority (CAA). If you wish your response to be published anonymously your personal details (Name, Address & Position) will be redacted and only be seen by the CAA.

Please select only one item

- Yes
- No

Snowdonia Aerospace Centre Danger Area Airspace Change Proposal

8 Do you support the proposed Snowdonia Aerospace Airspace Change Proposal?

Please select only one item

- SUPPORT – I support the proposed changes
- NEUTRAL – I neither support nor object
- OBJECT – I object to the proposed changes
- NO COMMENT – I have no comment to make on the proposed changes

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9 Please rank your response to each of the Airspace Design Options as presented in the Consultation Document.

	Option 1	Option 2
Strongly Support <i>Please select only one item</i>	<input type="radio"/>	<input type="radio"/>
Support <i>Please select only one item</i>	<input type="radio"/>	<input type="radio"/>
Neutral <i>Please select only one item</i>	<input type="radio"/>	<input type="radio"/>
Object <i>Please select only one item</i>	<input type="radio"/>	<input type="radio"/>
Strongly Object <i>Please select only one item</i>	<input type="radio"/>	<input type="radio"/>

10 If you support this proposal, are there any alterations that would further improve it for you?

11 If you oppose this proposal, why? Can you suggest any mitigation or alterations that would resolve your opposition?

Why do you oppose?

Mitigation or Alterations

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