Snowdonia Aerospace Airspace Change Proposal (Stage 4B), ACP-2019-58 Llanbedr Danger Area (DA)

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Document Details

Approval Level	Name	Authorisation
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1. Table of Contents

2. Introduction

Llanbedr Aerodrome (EGFD), Gwynedd (Figures 1a to 1d), is sited on a coastal promontory at the northerly end of Cardigan Bay[1] 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[2,3].

Figure 1a *- aerial view looking west*

Figure 1b *- aerial view looking east*

Figure 1c *- aerial view looking north*

Figure 1d *- aerial view looking south*

Llanbedr Aerodrome 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/tertiary operating site for RAF Valley (EGOV, approx. 58km north/north-west). An Aerodrome Traffic Zone (ATZ)[4] and the original Danger Area D202 supported these activities prior to QinetiQ/MOD vacating the site in 2004, along with extant Danger Area D201, the closest edge of which is 25km (approx.) south-west of Llanbedr[5].

[1] View on Google Maps
[2] Ref: National Statistics Wales, June 2018
[3] Ref: Annual Lower Super Output Area (LSOA) Population Estimates, 2018
[4] Aerodrome Traffic Zone (ATZ) as detailed in Article 5 of the Air Navigation Order, 2016, Ref: Air Navigation Order, 2016
[5] Ref: https://www.aurora.nats.co.uk/htmlAIP/Publications/2018-08-02/html/eAIC/EG-eAIC-2018-087-Y-en-GB.html

The aerodrome 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 (EGCK, approx. 35km north/north-west), Police helicopter and Air Ambulance. The aerodrome 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.

Snowdonia Aerospace LLP is continuing to progress and further develop a number of complementary business opportunities at Llanbedr Aerodrome relating to the above activities. 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.

3. Executive summary

The change sponsor must provide a concise summary of the activity that has led to and influenced the formal proposal and outline any changes to the proposal resulting from feedback to the consultation. The executive summary should also include, where appropriate, the data required to satisfy the Secretary of State for Transport's criteria for 'call-in'.

ACP-2019-58 relates to the creation of a permanent Danger Area (DA) that will enable Llanbedr Aerodrome to increase support to 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 Statement of Need is detailed further in Section 5 and 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.*

As Change Sponsor, Snowdonia Aerospace LLP (SAC) conducted a number of engagements through Stages 1 to 1 of the CAP1616 Airspace Change process up to, and including, a full public consultation to support the development of the ACP-2019-58 proposal.

At Stage 1, SAC undertook a number of stakeholder engagement activities to help shape the DA Design Principles. In addition to targeted stakeholder meetings, we also sent out a questionnaire to over 200 stakeholders and interested parties. The following points summarise the key outcomes from these activities:

- Positive responses were received both from the aerospace community who are seeking to make use of the permanent DA 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.
- The neutral responses raised issues / questions relating to two principal 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.

The draft Design Principles were reviewed and revised in light of the feedback received. SAC then prepared two Design Options for the DA as part of the Stage 2 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:

- Option #1 described a baseline for the permanent DA design based on the previous Temporary Danger Area (see Section 4). Option #2 was a further refinement based on feedback received as part of the two-way engagement process on the Design Principles.
- 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).
- 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 we considered would help reach a mutually acceptable position.

Finally, at Stage 3, we conducted a full public consultation on both Design Options and a "Do Nothing" option, which included a full Options Appraisal and supporting analysis. We received a total of 140 responses during the consultation and the breakdown of responses to the question, "Do you support the proposed Snowdonia Aerospace Airspace Change Proposal", is as detailed in Table 1:

Option	Total	Percent
SUPPORT – I support the proposed changes	83	59.29%
NEUTRAL – I neither support nor object	18	12.86%
OBJECT – I object to the proposed changes	36	25.71%
NO COMMENT – I have no comment to make on the proposed changes	3	2.14%

***Table 1** – Breakdown of consultation responses supporting, objecting and neutral to the proposed Snowdonia Aerospace Airspace Change Proposal*

We adopted a "we asked, you said, we did" approach to setting out the qualitative assessment of consultation responses and identified 7 responses as Category A – *i.e.* those responses which suggested changes to the airspace design that we used to shape the final ACP submission. These suggestions highlighted two key issues:

1. A need to simplify the definition of the DA sub-divisions on the eastern side of the airfield to make it easier for General Aviation to understand the boundaries of the Danger Area and also to create a wider corridor for north / south transit when the Area A, B and / or F sub-divisions of the DA are active.
2. A need to clarify airspace management and air traffic management processes for access to / from the D201 Cardigan Bay Danger Area, particularly at the western end of the corridor from Llanbedr and the potential need to deconflict military and civil aviation in this area.

A further 30 responses were received that have not had a direct impact on the final ACP submission, but which we identified as Category B responses that will form part of the holistic considerations for subsequent implementation and operation of the Danger Area. The additional issues raised in these responses were:

3. Timely notification of DA activation.
4. Weekend and out-of-hours operations.
5. Minimal overland operation, particularly over properties.
6. Minimal disruption to nearby maritime and land-based activities.

All of the above points have been adopted into the final ACP design presented in Section 6, the impacts have been assessed in Section 7, and the final Options Appraisal is summarised in Section 8. The final ACP design (Figure 2) features:

- an area of segregated airspace local to Llanbedr Aerodrome for the research, development, test and evaluation (RDT&E) of novel aerospace systems.
- an air corridor to link Llanbedr Aerodrome with the existing Danger Area D201 for extended range, altitude and endurance testing.
- multiple segments that allow the area of segregated airspace to be kept to a minimum in line with Flexible Use of Airspace principles while still meeting operational requirements.

Sections 9 to 14 detail the additional tabular information required by CAA to support the Airspace Change Proposal.

Finally, we do not believe there are any qualifying criteria that would warrant 'call-in' by the Secretary of State for Transport.

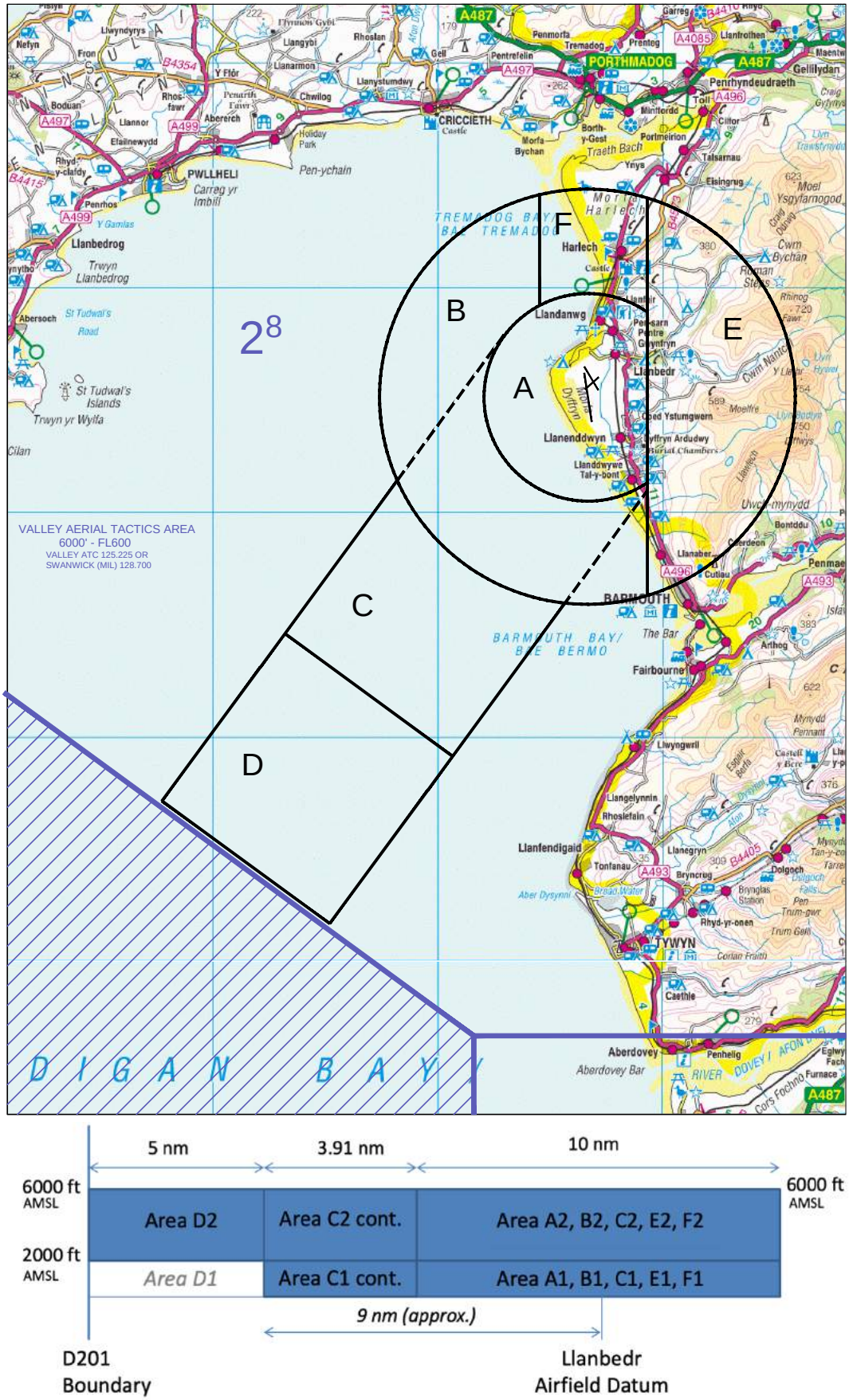

Figure 2 *- Proposed Airspace Design for ACP-2019-58, Llanbedr Danger Area*

4. Current airspace description

A free-text description of the current airspace design and operation.

4.1. Structures and routes

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). These airspace constructs lapsed when QinetiQ / MOD vacated the site in 2004.

The airspace surrounding Llanbedr Aerodrome is currently Class G. 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. Snowdonia Aerospace is an approved Air Navigation Service Provider (ANSP) and a local Flight Information Service (FIS) is provided to support day-to-day operations. A Temporary Danger Area (TDA) was previously consulted on in 2014 and has been implemented as and when required, either as a whole or in part, to support RDT&E activities and provide a safe corridor to D201 from 2015 to present (Figure 3). The previous TDA application is included as Annex 1.

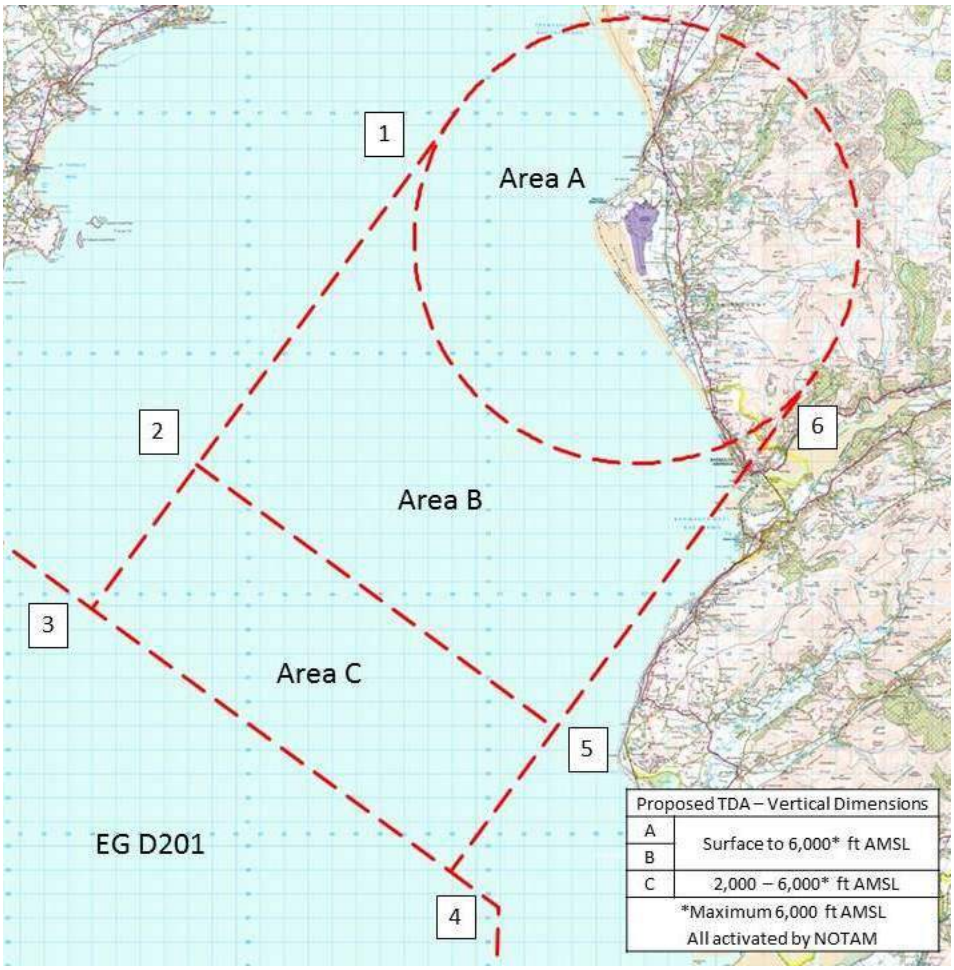

Figure 3 *– The extent of the Temporary Danger Area (TDA) that has been implemented as and when required, either as a whole or in part, to support RDT&E activities from 2015 to present*

Llanbedr is positioned approximately 30 nautical miles (58 km) south-southeast of RAF Valley, which has a number of military flight training squadrons and provides Visual / Instrument Flight Rules (VFR / IFR) services together with military ATZ (MATZ) transit services for other airspace users. Supporting operations from RAF Valley, there is a designated tactical training area in North Wales from 6,000ft to FL600 and a large area of intense aerial activity (AIAA) from surface to 6,000ft. altitude.

Llanbedr also sits approximately 20 nautical miles (35km) south-southeast of Caernarfon Airport (itself 11 nautical miles south east of RAF Valley), which operates scenic and training flights all year round and is home to the Wales Air Ambulance and the HM Coastguard helicopters operated by the Bristow Group.

Finally, Talybont and Peniarth grass strip airfields are approximately 11 nautical miles (20km) south of Llanbedr, providing support to agricultural and general aviation.

Figure 4 details the local airspace environment.

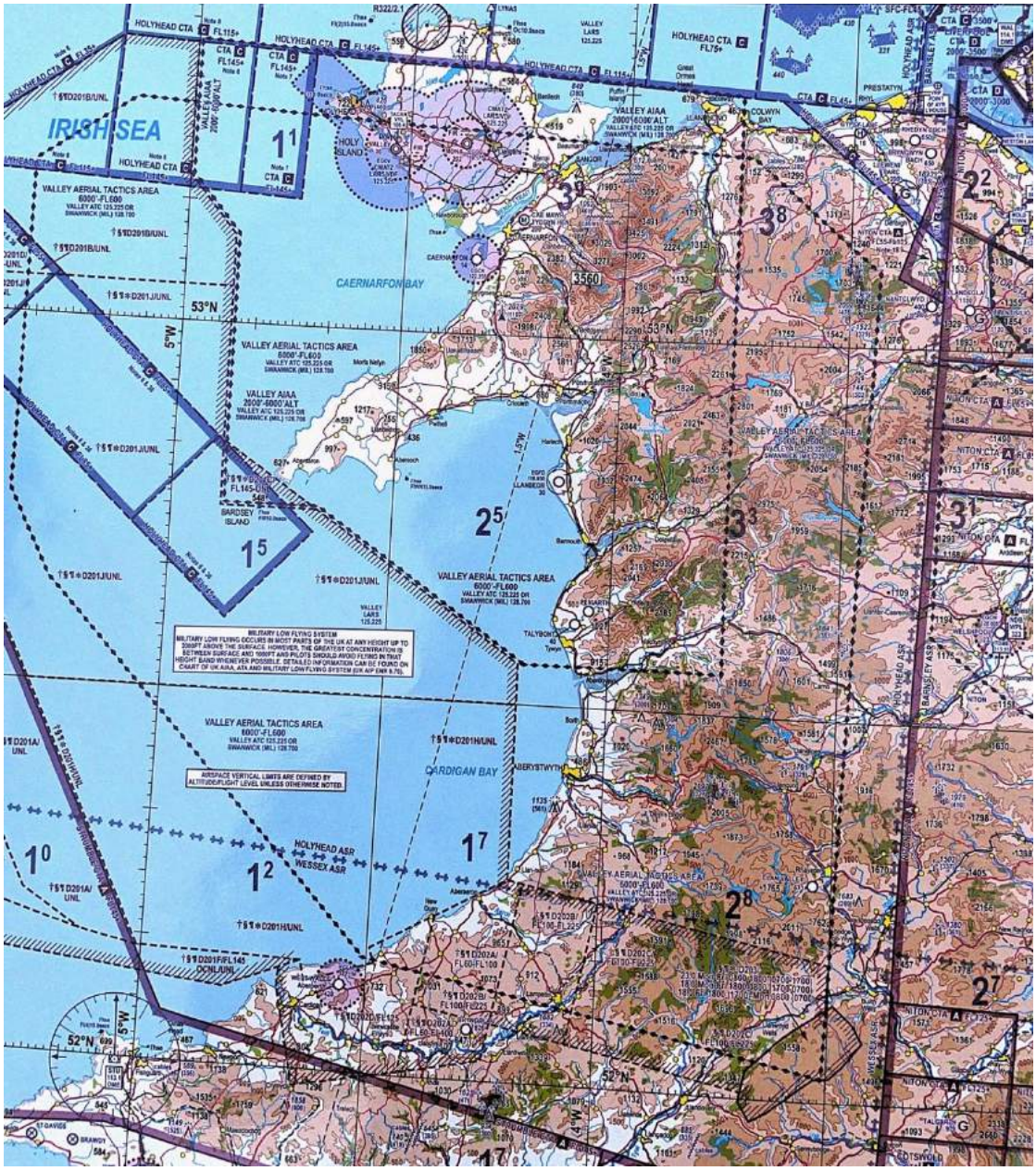

Figure 4 *– Airspace environment local to Llanbedr*

4.2. Airspace usage and proposed effect

With regard Llanbedr Aerodrome, there are GA aircraft operations most flyable days with an average of 50 movements per month during winter months rising to 100 movements per month in summer. With regard current novel aerospace RDT&E activity, we have seen on-site occupancy increase from 30 days in 2017/18 to 40 days in 2018/19 and to 80 days in 2019/20 and we are forecasting that it will double again to 160 days/annum in the period up to 2024. We estimate that the proposed effect of the airspace change will result in approximately 100 days of Danger Area activation per annum and 200 novel aerospace system flights per annum (see also Section 6.2). This needs to be set in the context of 900 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.

With further regard to the current usage and operation of the existing airspace in general around the Aerodrome by other users, the impact of the proposed DA has been considered and is set out in greater detail in Section 7.

4.3. Operational efficiency, complexity, delays and choke points

There are no current issues that impact on operational efficiency, complexity, delays or choke points at Llanbedr Aerodrome, but the primary purpose of the proposed ACP is not to change day-to-day operations *per se*, but to satisfy the longer-term needs of the novel aerospace RDT&E market. 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.

4.4. Safety issues

There is an extant Safety Management System (SMS) Manual that supports the Air Navigation Service Provision (ANSP) at Llanbedr Aerodrome, including the provision of a Flight Information Service (FIS) to support operation of the Temporary Danger Area. The SMS Manual will be updated in accordance with the Snowdonia Aerospace ANSP Change Management procedure to address any additional hazards raised as a result of ACP-2019-58. There are no additional safety issues associated with current airspace operations that impact on the ACP.

4.5. Environmental issues

The established use for the site is as an operational airfield and in accordance with 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 incorporating 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"*
- 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, particularly in the context of the sites use and its location and no particular environmental issues have been raised in the context of the planned and allocated uses against these matters.

5. Statement of Need

A free-text description of the need for change and the change sponsor's justification for the change. The change sponsor must state whether the proposal forms part of the plan for delivering the Airspace Modernisation Strategy, and, if not, confirmation that the proposal does not conflict with the plan.

As described previously in Section 2, Snowdonia Aerospace LLP is progressing and further developing a number of complementary business opportunities at Llanbedr Aerodrome relating to aerospace RDT&E and military aircraft training, while also continuing to support a mix of other aerospace uses including general aviation. To safely sustain these activities, action is required to upgrade and formalise the current airspace around the Aerodrome. Snowdonia Aerospace LLP is therefore developing two Airspace Change Proposals (ACPs) to underpin these activities:

- ACP-2019-58, Llanbedr Danger Area (DA)
- ACP-2020-02, Llanbedr Aerodrome Traffic Zone (ATZ)

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 does NOT form part of this application. This application is specific to the ACP-2019-58 and is solely in support of RDT&E opportunities with a view to creating a permanent Danger Area that will enable Llanbedr Aerodrome to increase support to 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 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 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.

With regard current novel aerospace RDT&E activity at Llanbedr Aerodrome, we have seen on-site occupancy increase from 30 days in 2017/18 to 40 days in 2018/19 and to 80 days in 2019/20. Looking ahead to the immediate future, both from existing demand together with support to the UK Research and Innovation Future Flight Challenge[6] we are forecasting, as a minimum, on site occupancy is going to double again to 160 days/annum in the period up to 2024 and that growth in the novel aerospace industry is likely to sustain this figure into the longer term.

[6] Ref: https://www.ukri.org/innovation/industrial-strategy-challenge-fund/future-flight1/

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 5a – 5f 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.

Figure 5a *– Penguin B used to explore the potential for aeromedical delivery drones*

Figure 5b *– Vertical Aerospace electric Urban Air Mobility (UAM) vehicle*

Figure 5c *– Scheibel S100 Camcopter used to explore the potential for search/rescue drones*

Figure 5d *– Astigan solar-powered high altitude, long endurance (HALE) vehicle*

Figure 5e *– C-Astral Bramor used to explore the potential for mapping and surveying drones*

Figure 5f *– The view of Cardigan Bay from the B2Space near-space testing balloon*

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.

6. Proposed airspace description

A free-text description of the proposed airspace design and operation

6.1. Objectives / requirements for proposed design

The proposed airspace design has been 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[7]. 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".

The primary technical requirements for the Llanbedr Danger Area are as follows:

a) The design will provide an area of segregated airspace local to Llanbedr Aerodrome for the research, development, test and evaluation (RDT&E) of novel aerospace systems.

b) The design will also provide an air corridor that will link Llanbedr Aerodrome with the existing Danger Area D201.

c) The design will consist of multiple segments that should, where possible, allow the area of segregated airspace to be kept to a minimum in line with Flexible Use of Airspace principles while still meeting operational requirements.

The primary operational requirements for the Llanbedr Danger Area are as follows:

d) System testing: the ability to conduct short-medium range testing (10km to 20km) of aircraft systems, particularly ground-to-air communications.

e) Extended system testing: the ability to transit to D201 to conducted extended range, altitude and/or endurance testing of aircraft systems.

f) 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*.

g) Operational testing: the ability to conduct testing in a range of operationally relevant environments – *e.g.* maritime / offshore, inshore / coastal, coastal / lowland, and upland / mountain.

6.2. Proposed new airspace / route definition and usage

6.2.1. General description

The proposed new airspace design is shown in Figure 6. In response to the requirement to identify multiple DA segments that will allow us to both minimise time and volume of airspace segregation, we have identified an Area A in the immediate vicinity of the aerodrome that has the same major dimensions as an ATZ - a standard and well understood airspace safety management feature – and an area that reflects a minimum volume for anticipated DA activities. Unlike an ATZ, Area A has been clipped to the east (by approximately 1 nautical mile) to make it easier for General Aviation (GA) aircraft to transit north-south past the DA without being pushed toward higher ground. Area A of the DA and a future ATZ (assuming successful conclusion of ACP-2020-02) will still be able 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 accommodate a range of different novel aerospace systems, examples of which are illustrated in Figure 5a to 5f.

[7] Ref: http://publicapps.caa.co.uk/docs/33/CAP722 Edition8(p).pdf

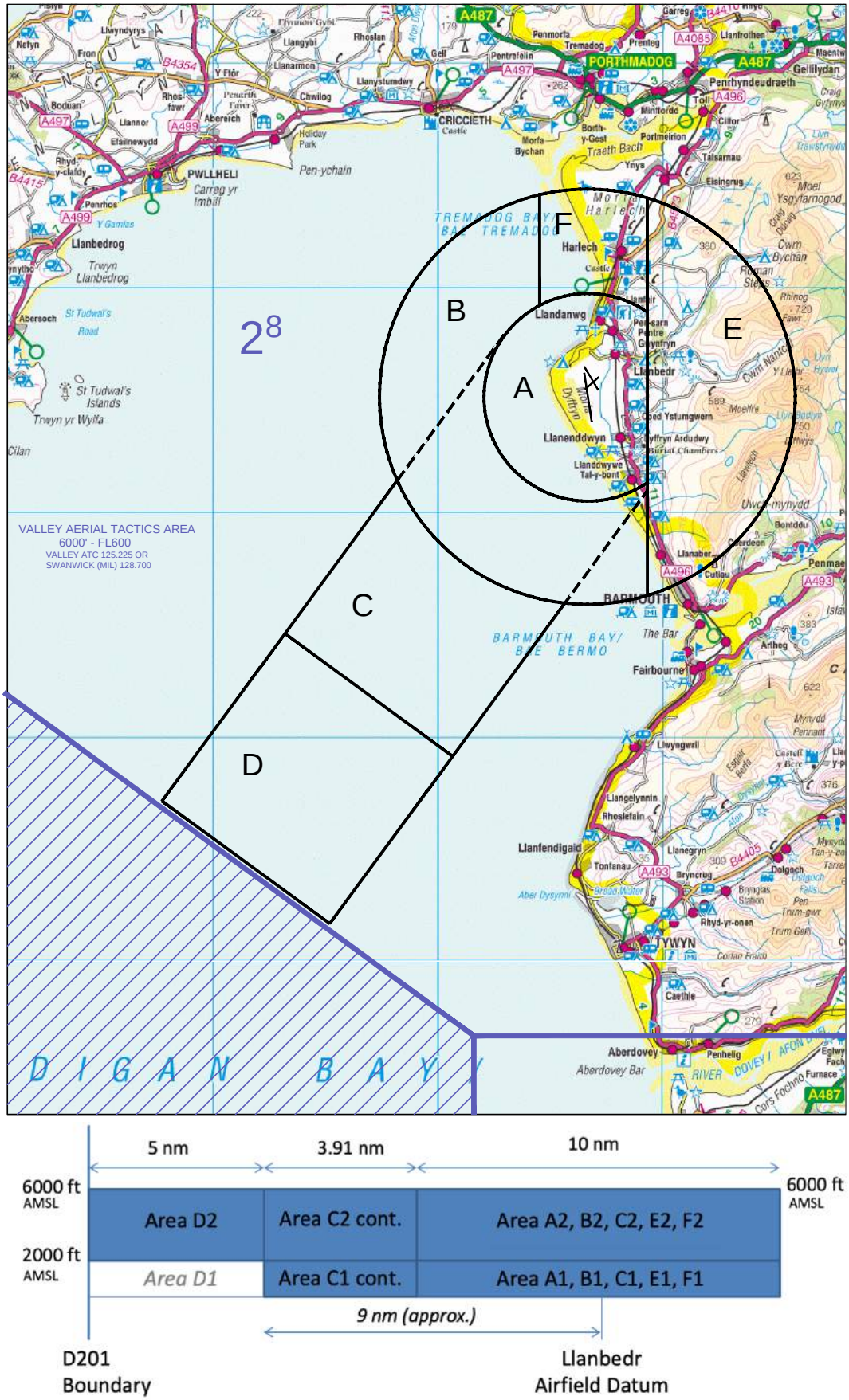

Figure 6 *- Proposed Airspace Design for ACP-2019-58, Llanbedr Danger Area*

The combination of a segregated area for RDT&E activities local to Llanbedr Aerodrome and 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.

With regard size, we received feedback from existing and potential users of the DA that it would be useful to be able to transit 10km to 20km to conduct short-medium range testing of aircraft systems (particularly ground-to-air communications), to have sufficient altitude for testing of drone stall and spin characteristics and small-scale rocketry and to have a range of different geographic features for operational testing. Equally we 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.

Overall, we believe that the proposed design represents a reasonable and proportionate balance between the potential competing requirements of different airspace users and local stakeholders. SAC wish to stress that the shape and size of the DA has been designed to be simple to interpret and implement and that, whilst specific geographic locations may nominally sit within the DA, novel aerospace flying activities will be constrained to non-sensitive areas. In addition, overland operations beyond the airfield will only constitute a small minority of DA activities and we will continue to work with local stakeholders to coordinate activities and minimise any perceived disruption or nuisance as far as is reasonably practicable.

One feature of the DA that we wish to draw attention to is the “tunnel” under Area D from surface to 2000 feet that permits low-level air traffic to transit to / from RAF Valley when the corridor to D201 is active. MOD raised a concern that, in their opinion (Annex 2), there is a potential for GA and other low-level military traffic to be funnelled through Area D when Llanbedr and other DAs in the vicinity were active, which may lead to a perceived increased risk of inadvertent penetrations of D201, or potentially force aircraft to fly towards the high ground inland from Llanbedr. We believe that the two main changes to the airspace design which we have implemented as a direct result of consultation feedback, will significantly mitigate any perceived risk by (*i*) creating a corridor through Area E for GA aircraft to stay to the east of the airfield for the vast majority of the time that the DA is active without having to fly towards high ground, and (*ii*) lengthening Area D from 4 to 5 nautical miles to increase the buffer to D201 and also reduce the potential for funnelling. Addressing (*i*) will also benefit item (*ii*) because making it easier for GA to pass to the east of the airfield will obviate the need for them to divert far out to the west and thereby leave this area clear for military aircraft to transit over / under the Llanbedr DA corridor or through the gap between the Llanbedr DA and D201.

The dimensions of Area D were previously carried over from the original definition for the TDA and had been set so as to enable an engine out (or similar emergency) recovery back into Area C (or returning to D201) without dropping through the “floor” in Area D and inadvertently entering non-segregated Class G airspace. This assumed that the recovering aircraft would have a glide ratio greater than 6:1. Increasing the length of Area D increases the required glide ratio to greater than 7.5:1, but it should be noted that a glide ratio greater than 15:1 would actually be required to recover from the far edge of Area D back to Llanbedr without ditching. Given that other mitigations will be put in place so that the risk of such an event is as low as reasonably practicable – and will be assessed as part of the CAA review of individual novel aircraft system Operating Safety Cases (OSC) – we feel that the recovery glide ratio should not be a driving factor in the definition of Area D.

6.2.2. Airspace definition

The proposed Danger Area dimensions are detailed below in terms of World Geodetic System 1984 (WGS84) co-ordinates of the boundaries, along with associated vertical levels proposed. The co-ordinates are in the format degrees, minutes and seconds. 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.

- Area A1: 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) that is consistent (in the main) with a potential Aerodrome Traffic Zone (ATZ) - which is the subject of the current second Airspace Change application ACP-2020-02 (currently paused) - but clipped to the east by approximately 1 nautical mile. The railway line and A496 main road provide useful (but not definitive) visual geographic features for delineation of the eastern boundary. Area A1 is bounded by:

  525022N 0040522W

  524617N 0040510W

  524817N 0040738W

  then clockwise by the arc of a circle radius 2.5 NM centred on

  524817N 0040738W

  to

  525022N 0040522W

- Area A2: extends Area A1 from an altitude of 2000 feet up to 6000 feet AMSL.

- 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/F division is 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 B is bounded by:

  524617N 0040510W

  524334N 0040503W

  524817N 0040738W

  then clockwise by the arc of a circle radius 5 NM centred on

  524817N 0040738W

  to

  525307N 0040947W

  525028N 0040939W

  524817N 0040738W

  then anti clockwise by the arc of a circle radius 2.5 NM centred on

  524817N 0040738W

  to

  524617N 0040510W

- Area B2: extends Area B1 from an altitude of 2000 feet up to 6000 feet AMSL.

- Area C1: a rectangle of 5 nautical mile width and 8.91 nautical mile length that extends from the centre of the airfield, coincident with Area A, tangentially out toward Danger Area D201. Areas A+C combined provide an extended area for offshore/maritime operational testing. Area C is bounded by:

  524943N 0041102W

  524223N 0041920W

  523933N 0041233W

  524605N 0040510W

  524617N 0040510W

  524817N 0040738W

  then clockwise by the arc of a circle radius 2.5 NM centred on

  524817N 0040738W

  to

  524943N 0041102W

- 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*
- Area D2: a rectangle of 5 nautical mile width and 5 nautical mile length from the edge of Area C1/C2 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 to D201 will provide an ability for extended range / endurance / altitude testing and will be managed via Letter of Agreement with QinetiQ/MOD. Area D2 is bounded by:

  524223N 0041920W

  523933N 0041233W

  523527N 0041712W

  523816N 0042358W

  524223N 0041920W

- Area E1: an arc of 5 nautical mile outer radius, centred on the main runway 17/35, that extends the Danger Area to the east of the railway line and A496 main road toward the Rhinog mountains, from surface to 2000 feet AMSL. It is intended that a minimum altitude of 500 feet above ground level (AGL) will be maintained in this area at all times, subject to further CAA review of individual Operating Safety Cases (OSC). Area E is bounded by:

  524334N 0040503W

  525307N 0040530W

  524817N 0040738W

  then clockwise by the arc of a circle radius 5 NM centred on

  524817N 0040738W

  to

  524334N 0040503W

- Area E2: extends Area E1 from an altitude of 2000 feet up to 6000 feet AMSL.

- 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 Area A1 to the north, from surface to 2000 feet altitude. Areas A+F combined provide an extended area for coastal/lowland operational testing, but it is intended that no novel aerospace activity will be conducted to the east of the railway line and A496 main road in Area F. Area F is bounded by:

  525028N 0040939W

  525307N 0040947W

  524817N 0040738W

  then anti clockwise by the arc of a circle radius 5 NM centred on

  524817N 0040738W

  to

  525307N 0040530W

  525022N 0040522W

  524817N 0040738W

  then clockwise by the arc of a circle radius 2.5 NM centred on

  524817N 0040738W

  to

  525028N 0040939W

- Area F2: extends Area F1 from an altitude of 2000 feet up to 6000 feet.

6.2.3. Airspace utilisation

As discussed previously, we have seen on-site occupancy at Llanbedr Aerodrome for novel aerospace RDT&E activities increase from 30 days in 2017/18 to 40 days in 2018/19 and to 80 days in 2019/20. Looking ahead to the immediate future, we are forecasting that on site occupancy is going to double again to 160 days/annum in the period up to 2024 and that growth in the novel aerospace industry is likely to sustain this figure into the longer term.

Translating this forecast of on-site occupancy into the demand for activation of the permanent Danger Area (DA) is not straightforward because of the wide variation in types of novel aerospace systems (examples of which are illustrated in Figure 5a to 5f) and the associated type-specific flight test and evaluation requirements, but it is useful to make an estimate of the breakdown for the probable utilisation of the sub-areas to determine any potential impact on other airspace users, the local community and the surrounding environment.

Any usage assessment is obviously going to have a degree of uncertainty, but for the purposes of the CAP1616 Design Options Appraisal, we have applied a simple multiplicative cascade estimation - *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 / E / F - and a corresponding 33.3% probability that the novel aircraft system would need to enter the Area C / D corridor.

- 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.
- If the corridor toward D201 needs to be activated, there is expected to be a 50% probability that the novel aircraft system will need to transit through Area D into D201 itself.
- If the 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.

Assuming a minimum target of 160 days occupancy per year, Table 2 gives the following predicted number of days Danger Area activation per year for each the various sub-areas:

DA sub area	No. days of activation
Area A (over the aerodrome)	107
Area B (inshore)	35
Area C (offshore corridor toward D201)	12
Area D (offshore corridor toward D201)	12
Area E (toward Rhinog mountains)	6
Area F (coastal lowland / Harlech)	6
Max. altitude <2000ft	71
Max. altitude <6000ft	36

Table 2 *- Estimate of DA annual daily usage*

Please note that these 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 substantiate this, but in terms of actual flights / aircraft movements, it would be reasonable to assume two flights on any given day as a guide.

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 totals 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. 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.

To complete the assessment of utilisation, Figures 7a to 7f show the most likely combinations of DA sub-areas that will be activated together showing the remaining areas to both east and west that will still be available for transiting aircraft – as well as over the top above 2000ft for two-thirds of the time and above 6000ft for the remainder – and the number of days of estimated utilisation per year for each combination. Note that the number of days per year for activation of Area A represents those times when it is activated in isolation and that it is estimated it will be activated on 107 days a year in total when also used in combination with other areas as per Table 2. It is also estimated that Area C will be activated for a total of 24 days a year when it is used in combination with Area D.

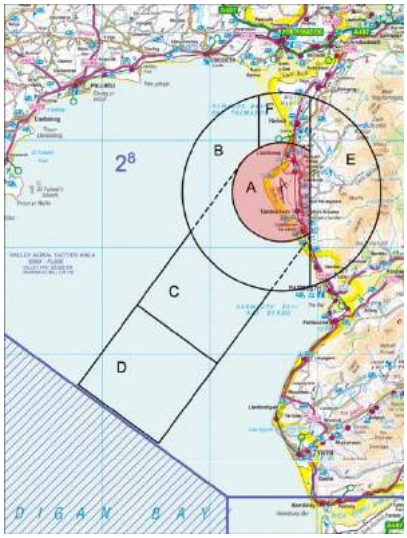

Figure 7a *- Area A, 36 days/yr with 24 days/yr below 2000ft*

Figure 7b *- Area A + B, 35 days/yr with 24 days/yr below 2000ft*

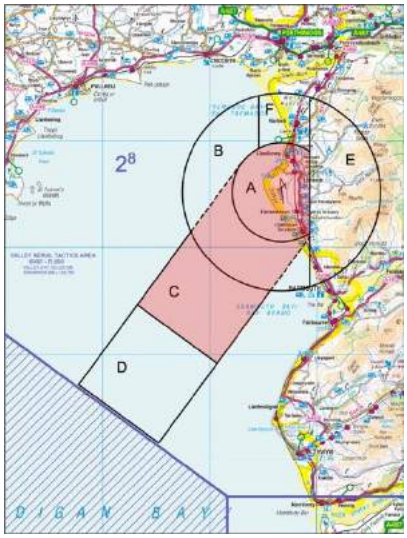

Figure 7c *- Area A + C, 12 days/yr with 8 days/yr below 2000ft*

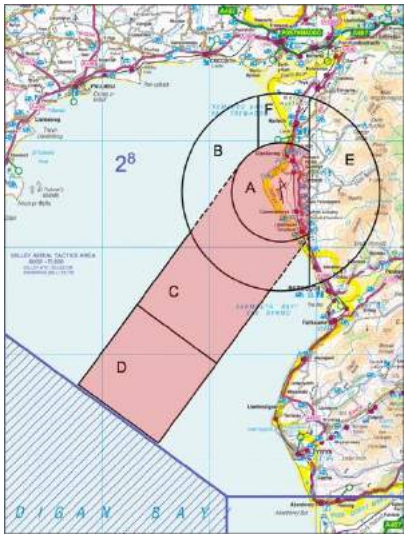

Figure 7d *- Area A+C+D, 12 days/yr, 0 days/yr below 2000ft*

Figure 7e *- Area A + E, 6 days/yr with 4 days/yr below 2000ft*

Figure 7f *- Area A + F, 6 days/yr with 4 days/yr below 2000ft*

There are also combinations of sub-areas that we do not envisage being activated together:

- Activation of Area E is unlikely to be combined with Areas B and / or C and / or F (and vice-versa) such that there will always be a transit route to the immediate east (or west) of the airfield for General Aviation when the DA is activated.
- Either Area B or Area C will be activated, but they will not normally be activated together.

6.2.4. Airspace management principles

European Commission Regulation (EC) No 2150/2005 of 23 December 2005[8] lays down common rules for the flexible use of airspace (FUA), defined as follows:

[8] Ref: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32005R2150&from=EN

- *"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".*

In the UK, CAP 740, UK Airspace Management Policy[9], 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.*

SAC intend to fully follow these stated principles within the operation of the proposed ACP-2019-58 for the Llanbedr Danger Area. Section C10 of Appendix C (Military ASM Policy) shall also be considered, where possible, when it applies to a civil DA, and Collaborative Decision Making (CDM) will be implemented via Letters of Agreement.

6.2.5. Air Traffic Management principles

The following Air Traffic Management principles will also apply within the operation of the proposed ACP-2019-58 for the Llanbedr Danger Area:

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 scheduled to take place.

Activation via NOTAM will be provided 24 hours in advance and the DA will only be active for the minimum time necessary. Airfield contact details will be included in the NOTAM.

Normal operating hours for novel aerospace activities will be 0900 to 1700, Monday to Friday, apart from rare and exceptional circumstances. Weekend and out-of-hours operations will be available for general and recreational aviation activities.

A Flight Information Service (FIS) 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 Traffic Display. Llanbedr FIS will also provide a Danger Area Activity Information Service (DAAIS) for all airspace users in the vicinity of the DA.

The appropriateness of a DAAIS (rather than a DACS or other) was confirmed with CAA Airspace Regulation during a post-consultation meeting (see Annex 2), where it was stated that:

"When determining the provision of a DACS or DAAIS, consideration should be given to the context, such as the nature of the airspace and the environment it sits in. In certain situations, a DACS or DAAIS although desirable may not be required conversely in certain situations a DACS may ultimately be a requirement due to the potential impact to other users. It is for the Sponsor to discuss and put forward in their proposals within the ACP considering that context."

The primary points of context that support the use of a DAAIS (rather than a DACS or other) for the Llanbedr Danger Area are:

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

a) The overall utilisation figures detailed in Table 1, with an estimated maximum of 107 days per year of DA activation.

b) The number of transit routes for other airspace users that remain available around and above the DA even on the estimated 71 days a year when multiple sub areas are activated (Figures 7b to 7f).

c) The limited number of days of activation above 2000 feet AMSL (estimate ≈ 36 days).

d) The Letters of Agreement (LOA) that will be put in place with other local airspace users.

With regard training operations from RAF Valley, SAC can confirm that a Letter of Agreement (LOA) will be produced detailing our commitment to take part in regular planning meetings and mutually agreed time and / or height deconfliction of airspace use, to alleviate any potential conflicts and issues and ensure that the airspace is utilised as effectively as possible whilst mitigating the impact to a key Defence task (see also Section 7.3 and Annex 8).

Likewise, SAC can also confirm that it will put in place a Letter of Agreement to be able to access D201 and utilise ATM services that are subcontracted to other partners within the D201 airspace (see also Section 7.3 and Annex 9).

QinetiQ / MOD Aberporth Air Traffic Control (ATC) will be notified of all novel aerospace operations that intend to transit through Area D to operate in D201 or further into D202.

Via the LOA, we would engage a DACS service from NATS / QinetiQ / MOD Aberporth for any aircraft seeking to enter D201 with the boundary for handover between Llanbedr FIS / DAAIS and NATS / QinetiQ / MOD Aberporth DACS being where Area D meets D201J.

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.

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 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. 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.

7. Impacts and consultation

A free-text summary of the engagement/consultation activity undertaken and the forecast impacts of the proposal.

Snowdonia Aerospace (SAC) conducted a number of engagements up to, and including, a full public consultation to support the development of the ACP-2019-58 proposal.

At Stage 1, SAC undertook a number of stakeholder engagement activities to help shape the Danger Area Design Principles. In addition to targeted stakeholder meetings, we also sent out a questionnaire 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. 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.
3. The neutral responses raised issues / questions relating to two principal 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.

The draft Design Principles were reviewed and revised in light of the feedback received. SAC then prepared two Design Options for the Danger Area (DA) as part of the Stage 2 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 was 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).
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).
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 we considered would help reach a mutually acceptable position.

Finally, at Stage 3, we conducted a full public consultation on both Design Options and a "Do Nothing" option[10], which included a full Options Appraisal and supporting analysis (see also Section 8). The consultation opened at 0000 hours Monday 7th December 2020 (midnight Sunday) and closed at 2400 hours on Friday 22nd January 2021 (midnight Friday), at which point we had received a total of 140 responses. Of these, 137 were received via the online questionnaire and a further 3 were received by post / email.

[10] 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.

The breakdown of responses to the question, "Do you support the proposed Snowdonia Aerospace Airspace Change Proposal", is as detailed in Table 3:

Option	Total	Percent
SUPPORT – I support the proposed changes	83	59.29%
NEUTRAL – I neither support nor object	18	12.86%
OBJECT – I object to the proposed changes	36	25.71%
NO COMMENT – I have no comment to make on the proposed changes	3	2.14%

***Table 3** – Breakdown of consultation responses supporting, objecting and neutral to the proposed Snowdonia Aerospace Airspace Change Proposal*

We received a steady stream of responses throughout the consultation period and as of 1800 hours on the final day of the consultation we had only received 11 objections, but a further 25 objections were received in the final six hours as the result of coordinated action by a local business.

We adopted a "we asked, you said, we did" approach to setting out the qualitative assessment of consultation responses and we brigaded the data as follows to better interpret the comments and recommendations and identify common themes:

- Local respondents within the DA (postcodes LL42 to LL47), 32 responses
- Other North Wales respondents (other LL postcodes), 35 responses
- General and Recreational Aviation respondents, 23 responses
- Commercial Aviation respondents, 13 responses
- Professional and Public Body respondents, 21 responses
- RDT&E community respondents, 30 responses

Note that some respondents were classified in more than one sub-category – *e.g.* a local resident could also be part of the General Aviation community *etc*.

As a result of the analysis conducted during the consultation review, we identified 7 responses as Category A – *i.e.* those responses which suggested changes to the airspace design that we will use to shape the final ACP submission. These suggestions highlighted two key issues:

3. A need to simplify the definition of the DA sub-divisions on the eastern side of the airfield to make it easier for General Aviation to understand the boundaries of the Danger Area and also to create a wider corridor for north / south transit when the Area A, B and / or F sub-divisions of the DA are active.
4. A need to clarify airspace management and air traffic management processes for access to / from the D201 Cardigan Bay Danger Area, particularly at the western end of the corridor from Llanbedr and the potential need to deconflict military and civil aviation in this area.

A further 30 responses were received that will not have a direct impact on the final ACP submission, but which we identified as Category B responses that will form part of the holistic considerations for subsequent implementation and operation of the Danger Area. The additional issues raised in these responses were:

7. Timely notification of DA activation.
8. Weekend and out-of-hours operations.
9. Minimal overland operation, particularly over properties.
10. Minimal disruption to nearby maritime and land-based activities.

All of the above points have been adopted into the proposed design presented in Section 6 and considered within the final Options Appraisal summarised in Section 8.

7.1. Net impacts summary for proposed route

The Options Appraisal has 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.

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 the noise and environmental impact is expected to be negligible.

The broader impact on local aviation, non-aviation, local and environmental stakeholders is discussed in more detail in the following sub-sections.

7.2. Units affected by the proposal

The proposal affects only the military units at RAF Valley and QinetiQ / MOD Aberporth, which are discussed further in Section 7.3. The consultation confirmed there were no other units – operators, aerodromes, ANSP providers *etc*. – who expressed any concern about potential impact.

7.3. Military impact and consultation

SAC engaged directly with the military units at RAF Valley and QinetiQ / MOD Aberporth during the consultation process and the minutes of these meetings, together with the MOD response, are included at Annex 2. MOD raised three key issues:

- Issues affecting RAF Valley: To ensure that the airspace is utilised as effectively as possible whilst mitigating the impact to a key Defence task, the MOD would like Snowdonia Aerospace to sign up to a Letter of Agreement detailing the requirement for taking part in regular planning meetings and mutually agreed time and/or height deconfliction of airspace use, to alleviate any potential conflicts and issues. SAC is happy to comply with this request and a letter to this effect to the MOD airspace coordinator, Defence Airspace and Air Traffic Management (DAATM), is also included as part of Annex 2.
- Usage of EG D201 Aberporth and ATS provision: The MOD would like Snowdonia Aerospace to sign up to a Letter of Agreement to be able to access D201 and utilise ATM services that are subcontracted to other partners within D201 airspace (such as QinetiQ). Again, SAC is happy to comply with this request and a letter to this effect to the MOD airspace coordinator, Defence Airspace and Air Traffic Management (DAATM), is also included as part of Annex 2.

  MOD also asked SAC to clarify airspace management and air traffic management processes for access to / from the D201 Cardigan Bay Danger Area, particularly at the western end of the corridor from Llanbedr and the potential need to deconflict military and civil aviation in this area. SAC has since taken further advice from CAA Airspace Regulation and minutes of this meeting are also included in Annex 2. As a result of this discussion, SAC confirms that a Danger Area Activity Information Service (DAAIS) will be provided for all airspace users in the vicinity of the DA when it is activated. The appropriateness of a DAAIS and the supporting context /justification is detailed further in Section 6.2.5.
- Wider MOD concerns: MOD raised a concern that, in their opinion, there is a potential for GA and other low-level military traffic to be funnelled through Area D when Llanbedr and other DAs in the vicinity are active, which may lead to a perceived increased risk of inadvertent penetrations of D201, or potentially force aircraft to fly towards the high ground inland from Llanbedr.

We believe that the two main changes to the airspace design which we have implemented as a direct result of consultation feedback, and which are included in the formal proposal in Section 6, will significantly mitigate any perceived risk by (*i*) creating a corridor through Area E for GA aircraft to stay to the east of the airfield for the vast majority of the time that the DA is active without having to fly towards high ground, and (*ii*) lengthening Area D from 4 to 5 nautical miles to increase the buffer to D201 and also reduce the potential for funnelling. Addressing (*i*) will also benefit item (*ii*) because making it easier for GA to pass to the east of the airfield will obviate the need for them to divert far out to the west and thereby leave this area clear for military aircraft to transit over / under the Llanbedr DA corridor or through the gap between the Llanbedr DA and D201.

We believe these changes and clarifications, which are as a direct result of responding to issues raised during the consultation, further reinforces our earlier assessment that the Airspace Change is anticipated to have a low to negligible impact on military aviation operations.

7.4. General Aviation airspace users impact and consultation

SAC consulted all General Aviation (GA) stakeholders associated directly with Llanbedr Aerodrome and reached out to the wider GA and recreational community through the trade press. We achieved a good level of engagement totalling 23 responses from individuals and clubs with a breakdown as follows in Table 4:

Option	Total	Percent
SUPPORT – I support the proposed changes	15	65.22%
NEUTRAL – I neither support nor object	6	26.09%
OBJECT – I object to the proposed changes	2	8.69%
NO COMMENT – I have no comment to make on the proposed changes	0	0.00%

***Table 4** – Breakdown of consultation responses supporting, objecting and neutral to the proposed Snowdonia Aerospace Airspace Change Proposal from the General Aviation and recreational aviation stakeholders*

The General Aviation and recreational aviation community is broadly supportive of the ACP, recognising the value of an active and sustainable airfield to all aviation stakeholders. Our initial assessment was that the limited number of days per year when the DA would be activated at heights greater than 2000ft and / or over land would not unduly impact the ability of General Aviation (GA) to transit over or around the DA, but a number of respondents during the consultation did express a preference for simplified sub-divisions that would make north-south transit to the east of airfield much easier when sub-division Areas A and B (and to a lesser extent F) are active. To address this, SAC has refined the original sub-divisions of Design Option #2 and modified the extent of Areas A, E and F to allow for easier GA transit north-south to the east of the airfield. This revised design is presented as the formal ACP proposal in Section 6.

We do not envisage activating Areas B and F at the same time as Area E and so GA will still be able to transit north-south to the west of the airfield on the few days a year when Area E is activated (estimated to be approximately 6 days a year) with a maximum lateral deviation of 2.5 nautical miles.

In response to other questions raised by the GA and recreational aviation communities as part of the consultation:

- Timely notification of DA activation → To address and mitigate against this SAC can confirm that activation via Notice to Airmen (NOTAM) will be provided 24 hours in advance and the DA will only be active for the minimum time necessary. Airfield contact details will be included in the NOTAM.

- Weekend and out-of-hours operations will be available for general and recreational aviation activities → To address and mitigate against this SAC can confirm that normal operating hours for novel aerospace activities within the DA will be 0900 to 1700, Monday to Friday, apart from rare and exceptional circumstances and operational parameters which would result in a requirement to access the DA outside of these.

We believe these changes and clarifications, which are as a direct result of responding to issues raised during the consultation, further reinforces our earlier assessment that the Airspace Change is anticipated to have a low to negligible impact on GA and recreational aviation.

7.5. Commercial air transport impact and consultation

There was a total of 13 responses from the commercial aviation community - airlines, airfields, air navigation service providers, airborne emergency services operators, flying schools, MOD etc. - and issues raised by these stakeholders broadly followed those of the Military and General Aviation stakeholders, as discussed in Sections 7.3 and 7.4 above.

7.6. CO_2 environmental analysis impact and consultation

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 (CO2e) 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.

However, the AEDT tool does not address drones or similar novel aerospace systems, and hence we had to construct an annual estimate by extrapolating from the known fuel burn of past trials aircraft. Assuming approximately 200 novel aerospace system flights per year in total, and recognising that up to 50% of these will be flown by zero-carbon electric aircraft, we estimate that the annual fuel burn is unlikely to exceed 1 tonne and that correspondingly the annual CO_2 emissions are unlikely to exceed 3 tonnes. To put these figures in context, the annual fuel burn and CO_2 emissions associated with flying activities at Llanbedr as a result of the ACP will be less than that generated by a single passenger car that travels 10,000 miles a year at 35 miles per gallon.

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 CO_2 emissions. In addition, CO_2 emissions was not a factor in any of the consultation responses.

7.7. Local environmental impacts and consultation

SAC reached out to the local community through social media, local press, local community councils and a series of three Open Days at the aerodrome that featured a poster presentation of the consultation material.

We also made sure that the press release, Easy Read Guide to the Consultation Document and Frequently Asked Questions were available in both English and Welsh and we had a dedicated Welsh language day as part of the series of Open Days.

We achieved a good level of engagement with a total of 32 responses from local residents within the Danger Area (postcodes LL42 to LL47) with a breakdown as follows in Table 5:

Option	Total	Percent
SUPPORT – I support the proposed changes	19	59.37%
NEUTRAL – I neither support nor object	3	9.38%
OBJECT – I object to the proposed changes	8	25.00%
NO COMMENT – I have no comment to make on the proposed changes	2	6.25%

***Table 5** – Breakdown of consultation responses supporting, objecting and neutral to the proposed Snowdonia Aerospace Airspace Change Proposal from local respondents*

A significant majority of the local responses were in support of the ACP, recognizing that aviation has long been part of the local environment - and a positive source of interest to many - and that the airfield is beneficial to the local economy. This was a view that was echoed a number of times in person at the stakeholder open days.

The number of objections increased from 3 to 8 in the last hours of the consultation as the result of coordinated action by one local business. This action also generated a further 20 objections from respondents out of the area, many from 50+ miles away. Most of the objections were completely unfounded - not least that the assertion that activities at the airfield would force other local businesses to close - but the fundamental issue of concern was continued access to the beach and inshore area for tourist and recreational activities. This issue was raised at the open days and also via the Maritime Unit of Gwynedd Council. SAC responded directly to Gwynedd Council in December and at the same time published the response as part of the "Frequently Asked Questions" on the Airspace Change Portal for all other respondents.

SAC confirmed at the time, and can further reiterate now, that there is no plan and no current requirement for an associated marine traffic exclusion zone in this area and that all marine activities will be able to continue safely when the Danger Area is active, as has been the case with the Temporary Danger Area over the past five years. In a similar manner to maritime operations, there will also be no constraints on land access around the airfield when the Danger Area is activated - *e.g.* public footpaths *etc*. If a need arose for an exclusion area beyond the airfield boundary we would seek to provide as much notice as possible and to negotiate with stakeholders to minimise any perceived impact on other activities, both in terms of minimising the geographic area and the duration of operation. However, we anticipate that any such requirement will only be in very rare and exceptional circumstances. We will also continue to work closely with Gwynedd Council and local Community Councils on matters relating to the airfield.

Local respondents did not consider any noise resulting from proposed activities using the DA as a significant issue other than to note that the activities of some powered paragliders and the military training aircraft from RAF Valley, particularly the Texan T1s, were occasionally considered a nuisance. These aircraft operations are not associated with Snowdonia Aerospace Centre nor the proposed DA and are beyond our control.

Other issues raised by local residents, which we believe have already been or will easily be mitigated, are as follows:

- Minimal overland operation, particularly over properties → To address and mitigate against this SAC can confirm that overland operations will constitute a small minority of DA activities and that we will continue to work with local stakeholders to coordinate activities and minimise any perceived disruption or nuisance as far as is reasonably practicable. We are proposing to adopt a multi-layer approach to minimise any considered impact:
    i. activation of the DA for over land operations beyond the airfield (*i.e.* Areas E and F) will only be conducted on a very small number of days, approximately 12 days a year only.
    ii. sorties in these areas will be kept as short as possible on those days, typically an hour or so maximum.

iii. the aircraft operating height in these areas will be assessed to minimise any residual noise. Typical operations at 200m above ground level will generate sound pressure levels less than 10dB greater than the daytime rural ambient level – *i.e.* commensurate with normal conversation.

iv. we will avoid all together any site that is identified as being particularly sensitive and the pre-programmed tracks and associated waypoints will be crafted to avoid overflight of buildings and property and will be appropriately geo-fenced.

- Priority access for emergency services → SAC have repeatedly confirmed that this is already guaranteed and emergency services will take priority at all times.
- No military activity → To address and mitigate against this SAC can reiterate and confirm the primary focus for and the basis of the SAC Masterplan, as discussed in Section 2, is 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*.

As part of the consultation process, we have assured local residents that we will not schedule any novel aerospace activities to overfly the town of Harlech, the local villages of Llanbedr, Llanfair or Dyffryn Ardudwy (or those further afield), the Glyn Estate, or any other permanent residence. We believe these clarifications, which are as a direct result of responding to issues raised during the consultation, further reinforces our earlier assessment that the Airspace Change is anticipated to have a low to negligible impact on the local community, noise, overflight and tranquillity.

The consultation process was a valuable exercise in community engagement, particularly the open days, and SAC has noted that an increased level of information sharing will be appreciated by the local community.

7.8. Economic impacts

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

- The economic model for Llanbedr Aerodrome does not conform to that for a conventional airport.
- The analysis of future airspace use against the six key environmental criteria (see Section 14) has shown there is negligible impact to monetise.
- 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.
- The highly variable nature of the RDT&E market makes a 10-year forecast unrealistic.
- The Business Plan for Llanbedr Aerodrome relies on a flexible mixed-use model of operations and any investment made in the infrastructure and subsequent operation and deployment costs are spread over a 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 was 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. 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 Deal[11] 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".*

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 assessment 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.

[11] Ref: https://www.gov.uk/government/publications/aerospace-sector-deal/aerospace-sector-deal

8. Analysis of options

A free text summary of the options appraisal undertaken as part of the process: the options considered, the analysis of the options and why the preferred option was selected.

8.1. Summary of the Options Appraisal process

The Phase I (Initial) Options Appraisal required an assessment of the impacts of the Design Options (see Section 8.2) against a "Do Nothing" Option (the continued use of a Temporary Danger Area).

The chosen methodology was to conduct a simple qualitative assessment of the different options, both positive and negative, against the headings identified in CAP1616, Appendix E, Table E2: "Guide to expected approach to key analysis for a typical airspace change". This approach has been applied previously in other ACPs of similar scale / proportionality and is compliant both with CAP1616 and the Government Green Book[12]. There are no commercial airline operations in the vicinity of Llanbedr, but there is a significant amount of military aircraft training and the options appraisal was therefore conducted in this context and references to "commercial airline" within CAP1616 were interpreted as "RAF/MOD".

Table 6 detail the appraisal of the Llanbedr Danger Area options and the "do nothing" options against the high-level objectives and assessment criteria laid out in CAP1616, Appendix E, Table E2.

Group	Impact	DA Option #1	DA Option #2	"Do nothing"
Communities	Noise impact on health and quality of life	• 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		• There would be little or no change from present
Communities	Air quality	• As above, there is expected to be little impact on air quality		• There would be little or no change from present
Wider society	Greenhouse gas impact	• 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		• There would be little or no change from present
Wider society	Capacity / resilience	• 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 associated with new airspace users such as drones that are identified as "unknowns" in Chapter 5 of CAP1711.		• Similar to the permanent DA, but at much reduced capacity, and makes the assumption that the TDA can be renewed indefinitely
General Aviation	Access	• 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	• 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)	• There would be little or no change on General Aviation operations in the vicinity of Llanbedr from the present position

[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

		be managed via Letters of Agreement.	depending on which sub-areas are active.	
RAF	Access	• 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.	• 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.	• 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	• There is not expected to be any economic impact on General Aviation or RAF/MOD		• There would be little or no change from present
General Aviation / RAF	Fuel burn	• General aviation and RAF/MOD fuel burn is not expected to change		• There would be little or no change from present
RAF	Training cost	• *Not applicable*		• *Not applicable*
RAF	Other costs	• *Not applicable*		• *Not applicable*
Airport / ANSP	Infrastructure costs	• 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		• As per Option #1
Airport / ANSP	Operational costs	• 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 • *See also economic impact*		• As per Option #1
Airport / ANSP	Deployment costs	• There may be a need for additional FIS and RFFS training, but this cost will be borne by Snowdonia Aerospace LLP • *See also economic impact*		• As per Option #1
Airport / ANSP	Economic impact from increased effective capacity	• A recent economic impact assessment 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		• 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

***Table 6** – Summary of the options appraisal for Llanbedr Danger Area and "do nothing" options*

Llanbedr is not a commercial aerodrome with conventional commercial air traffic and, with regard the Danger Area ACP, the changes sought are minor in comparison to those accompanying a full range of new instrument flight procedures at a large international airport, for example.

As a result, for the Phase II / III (Full / Final) Options Appraisal, the sources of quantitative data derived from modelling airport operations and aircraft movements are not available at a level sufficient to support a standard assessment that quantifies and monetises the environmental impacts of implementing the proposed change using the Department for Transport WebTAG tool. For example, quantitative noise metrics would usually be used to support the baseline case, but Noise and Track Keeping (NTK) system data is not available at Llanbedr as the level of movements is insufficient to justify the installation of the supporting infrastructure and there is no airport CHROMA data base; there is no business or regulatory basis to collect this level of data. Neither is it possible to generate overflight contours.

Instead, we agreed a scaled approach to the environmental impact assessments with CAA, that was appropriate and proportionate, while still meeting the requirements and intent of CAP 1616, using alternative sources of evidence to enable the consulted communities to understand any impact of the proposed airspace change against six key environmental factors:

- Noise
- Overflight
- CO_2 emissions
- Local air quality
- Impacts on tranquillity
- Impacts on biodiversity

Our adopted approach was to address all of these environmental factors in turn, comparing the DA Design Options against the “Do Nothing” Option, and present a mix of quantitative and qualitative evidence based on the following data sources:

- Current air traffic records.
- Estimate of future air traffic as a result of the ACP (see also Section 6.2.3).
- Comparison with referenced papers for drone noise and other known noise/pollution sources that will be familiar to non-technical stakeholders (*e.g.* military aircraft, general aviation aircraft, helicopter, road traffic *etc*.).
- Representative recent R&D drone examples (noise, flight profile ground footprint and fuel burn).

We interpolated and extrapolated from the above data to estimate any environmental impact and allow non-technical stakeholders to understand any potential impact of the proposed changes. Again, we believe this approach to be both appropriate and proportionate for the Llanbedr Danger Area ACP and compliant with CAP1616 and the Government Green Book.

The analysis was also presented as part of a poster display during the Open Days and was well received by visitors, particularly the explanation of noise and its relationship to overflight and tranquillity. The potential impacts on particular groups of stakeholders are presented in Section 7.

8.2. Options considered

The design options were developed in light of the feedback from stakeholders and interested parties in relation to the Design Principles, but also taking into account those comments relating to the technical definition of the proposed airspace change that were 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 ATZ. Reflecting these observations and comments, SAC prepared two initial design options for the DA and took both forward into the Stage 3 consultation

process. These options were 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. The only option that was discounted prior to the consultation was promulgation of the TDA in an unaltered form.

Option #1 (Figure 8a) described a baseline for the permanent Danger Area (DA) airspace change based on the Temporary Danger Area (TDA) that was originally consulted on, approved and promulgated in 2014. The TDA reflects the extant position under which SAC and others have operated to date, either in part or whole, to support the research, development, test and evaluation (RDT&E) of novel aerospace systems on an as-and-when-required basis. Option #1 took the TDA definition and identified an additional volume to reflect the proposed Aerodrome Traffic Zone (ATZ), the latter subject to a second Airspace Change application ACP-2020-02.

As a result of the two-way engagement process, Option #2 (Figure 8b) was also developed for the permanent Danger Area (DA) airspace change as a derivation of Option #1, but with a reduced width of corridor to D201 and an increased degree of internal segmentation, both in terms of horizontal plan and vertical extent.

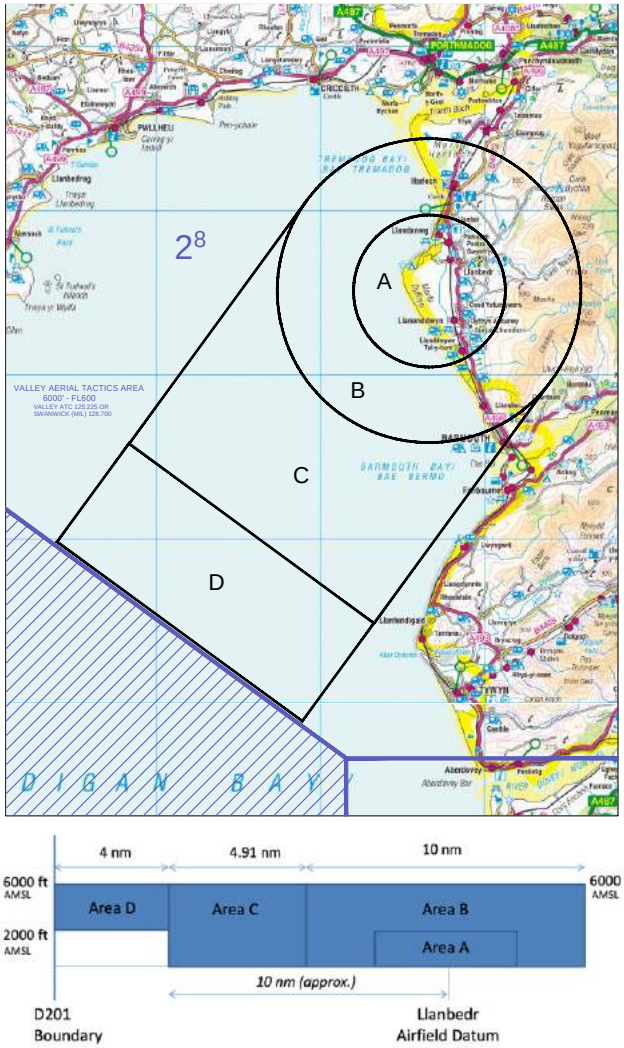

Fig. 8a *– Airspace Design Option #1 for ACP-2019-58, Llanbedr Danger Area*

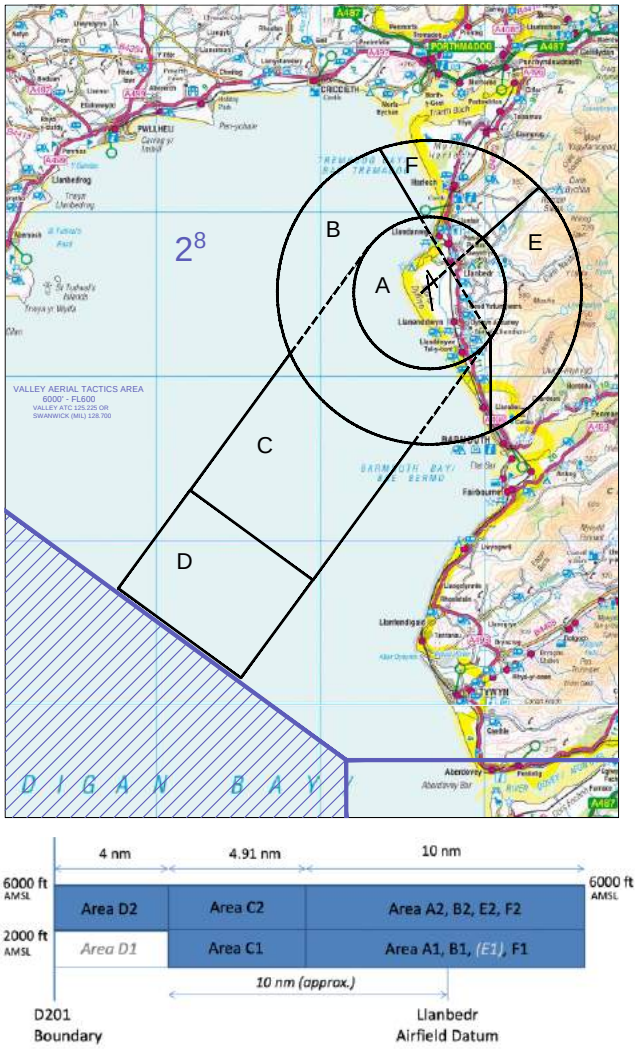

Fig. 8b *– Airspace Design Option #2 for ACP-2019-58, Llanbedr Danger Area*

8.3. Analysis of options and preferred option

The Phase I / II / III Options Appraisal didn't identify any major distinction between the two options in terms of economic impact or in terms of the six key environmental factors, but the main difference was the impact of the level of airspace segmentation on other airspace users. In early engagement, Option #1 was considered easier to interpret and provide greater flexibility for operators using the DA, whereas Option #2 was considered more complex, but offer more advantages in terms of flexible use of airspace for other aviation operators.

During the public consultation, stakeholders were asked explicitly to express a preference between the two Design Options. Design Option #2 was supported or strongly supported by 68 respondents (48.6% of total respondents) and Design Option #1 was supported or strongly supported by 58 (41.4% of total respondents). Overall SAC considers that Option #2 offers more potential and flexibility for implementing the feedback received and hence forms the basis for the formal ACP design presented in Section 6. The changes are discussed in more detail in the Stage 4A Revised Design report, but as can be seen from Fig. 8a compared to Fig. 8b, Area D has been increased in length from 4 to 5 nautical miles and Areas E and F have been simplified to improve GA transit to the east when Areas A, B and / or F are activated.

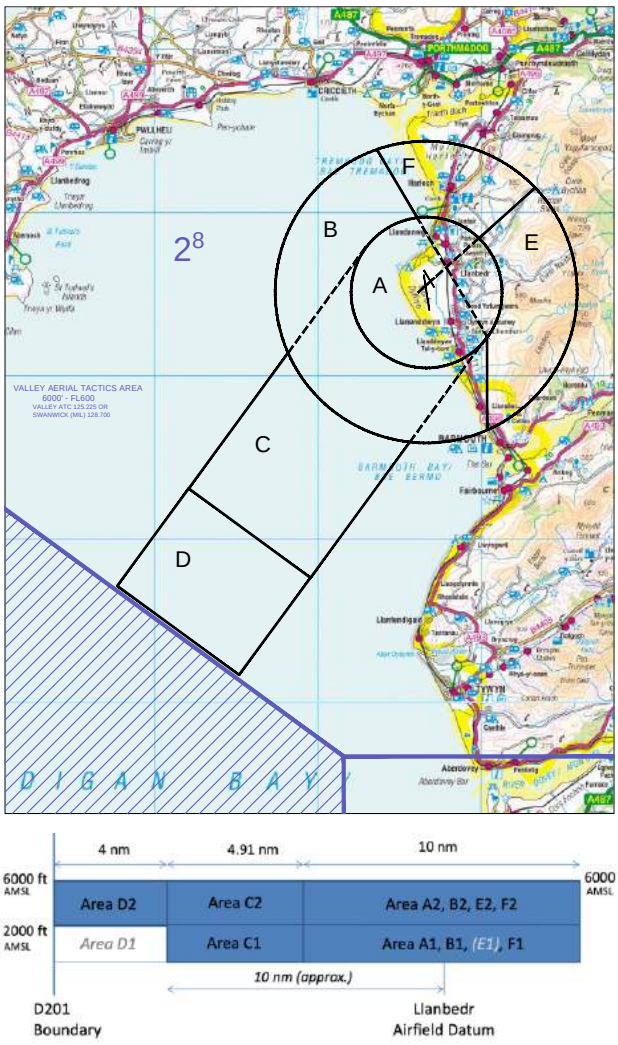

Fig. 8a *– Original Airspace Design Option #2 for ACP-2019-58, Llanbedr Danger Area*

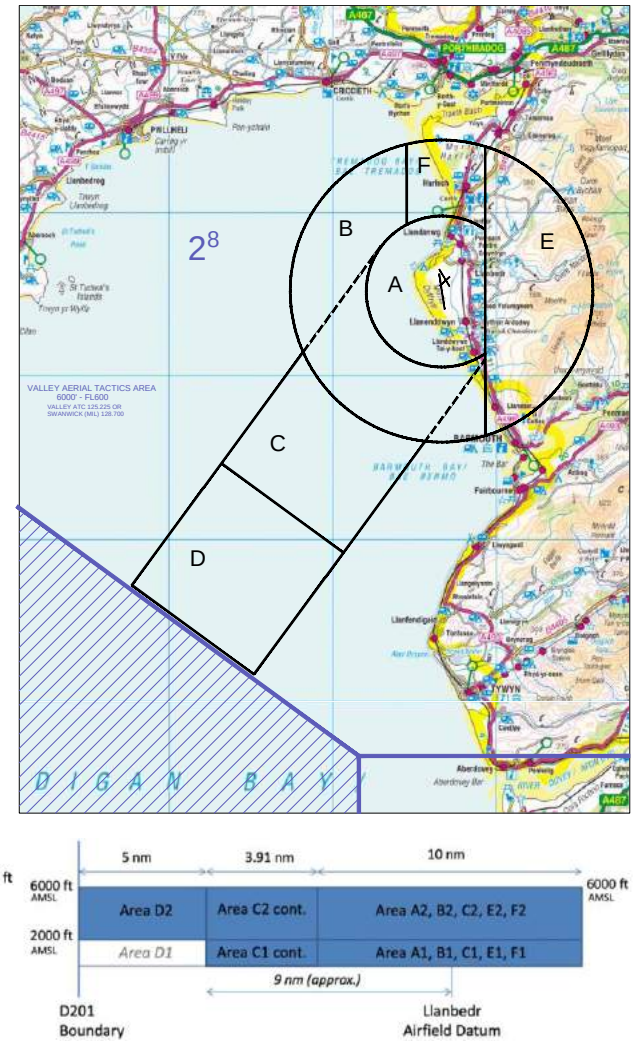

Fig. 8b *– Final Airspace Design Option #2b for ACP-2019-58, Llanbedr Danger Area incorporating revisions suggested via consultation*

9. Airspace description requirements

The change sponsor must complete those parts of the following proforma that are relevant to its proposal.

	The proposal should provide a full description of the proposed change including the following:	**Description for this proposal**
a	The type of route or structure; for example, airway, UAR, Conditional Route, Advisory Route, CTR, SIDs/STARs, holding patterns, etc	Danger Area. An area to provide for the operation of air vehicles in segregated airspace. The total volume is sub-divided in accordance with FUA principles.
b	The hours of operation of the airspace and any seasonal variations	The hours of operation will be promulgated by NOTAM. Most activity will be within the hours 9 – 5 p.m. weekdays for the anticipated period required. Due to the nature of some air vehicles operations to take advantage of lower wind conditions either early or late in the day may be necessary. Activation at a weekend may also occur due to the vagaries of the weather and or technical delays.
c	Interaction with domestic and international en-route structures, TMAs or CTAs with an explanation of how connectivity is to be achieved. Connectivity to aerodromes not connected to CAS should be covered	There is no interaction as described with controlled airspace. There is no nearby controlled airspace in the vicinity of Llanbedr. The nearest aerodromes are the grass strips at Talybont and Peniarth via the coast to the south 11nm. Caernarfon and Valley to the north west 19nm and 30nm respectively. Welshpool is 37nm to the east-south-east.
d	Airspace buffer requirements (if any). Where applicable describe how the CAA policy statement on 'Special Use Airspace – Safety Buffer Policy for Airspace Design Purposes' has been applied.	Proposed airspace subdivision Area 'D' abuts the existing D201. There is not an applicable buffer policy as Controlled airspace is not involved. However, in line with the minimum buffer criteria of 5nm set out within the Buffer Policy we have proposed that subdivision Area D immediately adjacent to D201 is 5nm span from D201 to the edge of subdivision Area C. This also is in line with responding to stakeholders responses during the consultation and will assist RAF Valley aircraft in transit low level beneath Area D. In the earlier Design Option 2 the span between was 4nm.
e	Supporting information on traffic data including statistics and forecasts for the various categories of aircraft movements (passenger, freight, test and training, aero club, other) and terminal passenger numbers	The last full and representative annual aircraft movement record for Llanbedr Aerodrome (*i.e.* for 2019) is included at Annex 3. This level of "other" aviation activity is not forecast to change as a result of the ACP. Section 6.2.3 details the forecast DA utilisation and the corresponding estimate of novel aerospace system movements.
f	Analysis of the impact of the traffic mix on complexity and workload of operations	There are no current issues that impact on operational efficiency, complexity, delays or choke points at Llanbedr Aerodrome, but the primary purpose of the proposed ACP is not to change day-to-day operations *per se*, but to satisfy the longer-term needs of the novel aerospace RDT&E market for surety of being able to operate in the UK on a reactive basis. As such, there is not

		predicted to be any significant change or impact on traffic mix, complexity or workload of operators at Llanbedr Aerodrome. The impact on other military and GA airspace users is discussed in Sections 7.3 and 7.4 and is that the Airspace Change is anticipated to have a low to negligible impact in both cases.
g	Evidence of relevant draft Letters of Agreement, including any arising out of consultation and/or airspace management requirements	See Section 7.3 and Annex 2.
h	Evidence that the airspace design is compliant with ICAO Standards and Recommended Practices (SARPs) and any other UK policy or filed differences, and UK policy on the Flexible Use of Airspace (or evidence of mitigation where it is not)	The airspace design is compliant with CAA Policy Document 20200721 – "CAA Policy for the Establishment of Permanent and Temporary Danger Areas", issued by the Safety and Airspace Regulation Group. Furthermore, Section 6.2.4 describes the adherence to European Commission Regulation (EC) No 2150/2005, Flexible Use of Airspace and CAP740, UK Airspace Management Policy.
i	The proposed airspace classification with justification for that classification	The proposed airspace design has been 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".
j	Demonstration of commitment to provide airspace users equitable access to the airspace as per the classification and where necessary indicate resources to be applied or a commitment to provide them in line with forecast traffic growth. 'Management by exclusion' would not be acceptable	Snowdonia Aerospace will provide a FIS at least at all times the DA is activated and in order to ensure this continuity SAC substantially invested resources to become an independent ANSP in its own right in September 2019 with approval following in March 2020 with the issue of CAA Competent Authority Service Provider Certificate UK/2020/00108. The resources put in to achieving this, the first approval in the U.K. under the new Regulation 2017/373 which became applicable in law on the 2nd January 2020, is evidence of SAC's commitment in this respect. The provision of the FIS enables a DAAIS to be given when the DA is active and provides the necessary manpower to ensure best FUA principles are applied in the management and utilisation of the airspace. Manpower resource will grow commensurate with the forecast traffic growth to enable the appropriate, reliable and safe support of the DA. Additionally we are researching aspects of UTM and intend to invest in Flight Information Display (FID) in order that the FISO is better informed and able to provide other users of the surrounding non activated airspace the best quality DAAIS.
k	Details of and justification for any delegation of ATS	Delegation of ATS to any other party within the DA is not envisaged. Aircraft outbound intending to access D201 will be handed over to the D201 ATS in accordance with principles to be agreed within a Letter of Agreement (see also Section 6.2.5 and Annex 2)

10. Safety assessment

Developed in accordance with CAP 760 Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers.

As noted previously in Section 4, SAC has an extant Safety Management System (SMS) Manual that supports the Air Navigation Service Provision (ANSP) at Llanbedr Aerodrome, including the provision of a Flight Information Service (FIS) to support operation of the Temporary Danger Area. The SMS Manual will be updated in accordance with the Snowdonia Aerospace ANSP Change Management procedure to address new / additional hazards raised as a result of ACP-2019-58.

The SMS describes, amongst other things, the risk assessment and hazard mitigation process, which states:

"Personnel are to undertake a safety assessment prior to the introduction and implementation of any change to the provision of air traffic services in order to demonstrate that the change meets a tolerable safety level."

This process is conducted in accordance with CAP 760 and the relevant section of the SMS Manual (SMP-01) is included in Annex 4.

SAC determined that while the ANSP provision originally included reference to the required ATS function when a Temporary Danger Area was activated, and was covered by issue of Temporary Operating Instructions, the introduction of a permanent Danger Area would trigger an airspace change management process to include the provision, when active, of a Danger Area Activity Information Service (DAAIS).

SAC has safety assessed all aspects of the proposed permanent Danger Area design throughout the ACP process in discussion with stakeholders and airspace management meetings, and we have identified the new / additional hazards and examined the risk and mitigation accordingly. The risk assessment is also included in Annex 4.

The SAC ANSP Change Management Manual requires a procedure to be followed for any change that will be applied to the update of the SMS. The Change Management Process states:

"There are a number of distinct steps in the change process; this manual is designed to enable the reader to work through the process and should be read in conjunction with the Safety Management Manual. The manual identifies the basic steps to be followed under EU 2017/373 'change management'."

The full suite of ANSP documents, including the SMS and Change Management Manual, was audited by the CAA on 20th March 2020. The CAA Competent Authority Service Provider Certificate UK/2020/00108 is also included in Annex 4.

11. Operational impact

The change sponsor must complete the following proforma to outline the operational impact.

	An analysis of the impact of the change on all airspace users, airfields and traffic levels must be provided, and include an outline concept of operations describing how operations within the new airspace will be managed. Specifically, consideration should be given to:	**Evidence of compliance / proposed mitigation**
a	Impact on IFR general air traffic and operational air traffic or on VFR General Aviation (GA) traffic flow in or through the area	It is not envisaged that the DA will be utilised other than in conditions where flights can be maintained under VFR and hence there will be no impact on IFR general air traffic. Impact on VFR General Aviation is discussed in Section 7.4 An outline ANSP concept of operations is included in Annex 5.
b	Impact on VFR operations (including VFR routes where applicable);	As (a) above.
c	Consequential effects on procedures and capacity, i.e. on SIDs, STARs, and/or holding patterns. Details of existing or planned routes and holds	N / A
d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace is discussed in Sections 7.3 to 7.5.
e	Any flight planning restrictions and/or route requirements	There are no flight planning restrictions or route requirements.

12. Supporting infrastructure/resources

The change sponsor must complete the following proforma to outline the supporting infrastructure and resources.

	General requirements	Evidence of compliance / proposed mitigation
a	Evidence to support RNAV and conventional navigation as appropriate with details of planned availability and contingency procedures	N / A
b	Evidence to support primary and secondary surveillance radar (SSR) with details of planned availability and contingency procedures	N / A
c	Evidence of communications infrastructure including R/T coverage, with availability and contingency procedures	This evidence was assessed as part of the CAA ANSP audit on 20th March 2020. ANSP CAA Competent Authority Service Provider Certificate UK/2020/00108 applies (see Annex 4) Air Traffic Services Equipment Approval Number ATS-015-2020 also applies (see Annex 6)
d	The effects of failure of equipment, procedures and/or personnel with respect to the overall management of the airspace must be considered	This evidence was assessed as part of the CAA ANSP audit on 20th March 2020. ANSP CAA Competent Authority Service Provider Certificate UK/2020/00108 applies (see Annex 4)
e	Effective responses to the failure modes that will enable the functions associated with airspace to be carried out including details of navigation aid coverage, unit personnel levels, separation standards and the design of the airspace in respect of existing international standards or guidance material	This evidence was assessed as part of the CAA ANSP audit on 20th March 2020. ANSP CAA Competent Authority Service Provider Certificate UK/2020/00108 applies (see Annex 4)
f	A clear statement on SSR code assignment requirements	N/A
g	Evidence of sufficient numbers of suitably qualified staff required to provide air traffic services following the implementation of a change	This evidence was assessed as part of the CAA ANSP audit on 20th March 2020. ANSP CAA Competent Authority Service Provider Certificate UK/2020/00108 applies (see Annex 4) Because a DAAIS will be provided whenever the DA is promulgated, additional staff will be trained and organised to cover the activity. The present senior FISO is employed full time and part time FISOs are currently in training.

13. Airspace and infrastructure

The change sponsor must complete the following proforma to demonstrate that the airspace change complies with the airspace and infrastructure requirements set out in UK/European law and policy, ICAO standards and recommended practices, and Eurocontrol standards.

	General requirements	Evidence of compliance / proposed mitigation
a	The airspace structure must be of sufficient dimensions with regard to expected aircraft navigation performance and manoeuvrability to fully contain horizontal and vertical flight activity in both radar and non-radar environments	The size, shape and structure of the DA is discussed in detail in Section 6.2.1.
b	Where an additional airspace structure is required for radar control purposes, the dimensions shall be such that radar control manoeuvres can be contained within the structure, allowing a safety buffer. This safety buffer shall be in accordance with agreed parameters as set down in CAA policy statement 'Safety Buffer Policy for Airspace Design Purposes Segregated Airspace'. Describe how the safety buffer is applied, show how the safety buffer is portrayed to the relevant parties, and provide the required agreements between the relevant ANSPs/ airspace users detailing procedures on how the airspace will be used. This may be in the form of Letters of Agreement with the appropriate level of diagrammatic explanatory detail.	N/A
c	The Air Traffic Management system must be adequate to ensure that prescribed separation can be maintained between aircraft within the airspace structure and safe management of interfaces with other airspace structures	The Air Traffic Management principles for the DA are discussed in detail in Section 6.2.5.
d	Air traffic control procedures are to ensure required separation between traffic inside a new airspace structure and traffic within existing adjacent or other new airspace structures	N/A

e	Within the constraints of safety and efficiency, the airspace classification should permit access to as many classes of user as practicable	Normal operating hours for novel aerospace activities will be 0900 to 1700, Monday to Friday, apart from rare and exceptional circumstances. None of the areas of the proposed DA will be permanently active, they will only be activated by Notice to Airmen (NOTAM) when novel aerospace flying activities are scheduled to take place and will only be active for the minimum time necessary. The airspace will be Class G at all other times
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation	The airspace description will be included in the Aeronautical Information and Control (AIRAC) publications and activation via NOTAM will be provided 24 hours in advance. Airfield contact details will be included in both AIRAC and NOTAM. SAC will also participate in regular planning meetings with RAF Valley to mutually agree time and/or height deconfliction of airspace use, to alleviate any potential conflicts and issues.
g	Pilots shall be notified of any failure of navigational facilities and of any suitable alternative facilities available and the method of identifying failure and notification should be specified	N/A
h	The notification of the implementation of new airspace structures or withdrawal of redundant airspace structures shall be adequate to allow interested parties sufficient time to comply with user requirements. This is normally done through the AIRAC cycle	An indicative timeline has been agreed with CAA that will see the notification of implementation for the Llanbedr DA published in AIRAC 09/2021.
i	There must be sufficient R/T coverage to support the Air Traffic Management system within the totality of proposed controlled airspace	See Section 12(c)
j	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered	See Section 7.3
k	Should there be any other aviation activity (low flying, gliding, parachuting, microlight site, etc) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests	Paragliding and hang gliding takes place near Harlech on a limited number of days per year and the change sponsor is in communication with the principal stakeholders involved.

	ATS route requirements	**Evidence of compliance / proposed mitigation**

a	There must be sufficient accurate navigational guidance based on in-line VOR/DME or NDB or by approved RNAV derived sources, to contain the aircraft within the route to the published RNP value in accordance with ICAO/Eurocontrol standards	N/A
b	Where ATS routes adjoin terminal airspace there shall be suitable link routes as necessary for the ATM task	N/A
c	All new routes should be designed to accommodate P-RNAV navigational requirements	N/A

	Terminal airspace requirements	**Evidence of compliance / proposed mitigation**
a	The airspace structure shall be of sufficient dimensions to contain appropriate procedures, holding patterns and their associated protected areas	N/A
b	There shall be effective integration of departure and arrival routes associated with the airspace structure and linking to designated runways and published instrument approach procedures (IAPs)	N/A
c	Where possible, there shall be suitable linking routes between the proposed terminal airspace and existing en-route airspace structure	N/A
d	The airspace structure shall be designed to ensure that adequate and appropriate terrain clearance can be readily applied within and adjacent to the proposed airspace	N/A
e	Suitable arrangements for the control of all classes of aircraft (including transits) operating within or adjacent to the airspace in question, in all meteorological conditions and under all flight rules, shall be in place or will be put into effect by the change sponsor upon implementation of the change in question (if these do not already exist)	N/A

f	The change sponsor shall ensure that sufficient visual reference points are established within or adjacent to the subject airspace to facilitate the effective integration of VFR arrivals, departures and transits of the airspace with IFR traffic	N/A
g	There shall be suitable availability of radar control facilities	N/A
h	The change sponsor shall, upon implementation of any airspace change, devise the means of gathering (if these do not already exist) and of maintaining statistics on the number of aircraft transiting the airspace in question. Similarly, the change sponsor shall maintain records on the numbers of aircraft refused permission to transit the airspace in question, and the reasons why. The change sponsor should note that such records would enable ATS managers to plan staffing requirements necessary to effectively manage the airspace under their control	All Llanbedr Aerodrome movements are currently recorded manually by the FISO on a daily basis. SAC is exploring options to augment the manual FISO record with an ADS-B Traffic Display System that will allow us to automatically record all novel aerospace system movements (and flight profiles) within the DA and the movements of other ADS-B Out equipped aircraft in the vicinity.
i	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure	N/A

	Off-route airspace requirements	**Evidence of compliance / proposed mitigation**
a	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered	See Section 7.3 and Annex 2.
b	Should there be any other aviation activity (military low flying, gliding, parachuting, microlight site etc) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests	Paragliding and hang gliding takes place near Harlech on a limited number of days per year and the change sponsor is in communication with the principal stakeholders involved. The potential impact on military operations is discussed in Section 7.3.

14. Environmental Assessment

The change sponsor must complete an environmental assessment including the following details:

- *all environmental assessment requirements must be consistent with the information presented throughout the engagement and consultation process; there should be no new assessment outputs presented in the final proposal that have not already been presented to stakeholders*
- *where impacts have been modified since consultation, a rationale for the revision must be presented by the change sponsor; the change sponsor should be aware that changes to environmental impacts after consultation has closed may mean that the CAA advises on the need for re-consultation*
- *for all proposals submitted to the CAA, the underlying data and assumptions for assessment outputs must be made available to the CAA; if this is in the form of separate assessment reports, these must be provided*
- *more information on the metrics and methodology for an environmental assessment is set out in Appendix B and the environmental requirements technical annex.*

	Theme	Content	Evidence of compliance / proposed mitigation
a	WebTAG analysis	Output and conclusions of the analysis (if not already provided elsewhere in the proposal)	WebTAG analysis was not considered appropriate given the unique nature of the proposed Llanbedr DA and hence a proportionate, scaled approach to the environmental impact assessment was agreed with CAA and is reported in Section 8.
b	Assessment of noise impacts (Level 1/M1 proposals only)	Consideration of noise impacts, and where appropriate the related qualitative and/or quantitative analysis, including whether the anticipated noise impact meets the criteria for a proposal to be called-in by the Secretary of State (paragraph 5(c) of Direction 6 of the Air Navigation Directions 2017) If the change sponsor expects that there will be no noise impacts, the rationale must be explained	Standard aircraft noise measurement and modelling tools are not available and / or applicable to drones and hence we agreed with CAA that comparison could be made with the limited referenced papers for drone noise and interpolated / extrapolated using data for other known noise / pollution sources that will be familiar to non-technical stakeholders (*e.g.* military aircraft, general aviation aircraft, helicopter, road traffic *etc*.). The noise analysis was well received by stakeholders who attended the Open Days and respondents did not consider any noise resulting from proposed DA activities as a significant issue other than to note that the activities of some powered paragliders and the military training aircraft from RAF Valley, particularly the Texan T1s, were occasionally considered a nuisance. These aircraft operations are not associated with SAC nor the proposed DA and are beyond our control. It should also be noted that SAC and Gwynedd Council have not received a

			single noise complaint since the TDA was first activated in 2015. The ACP is therefore anticipated to have a low to negligible impact on the local community, noise, overflight and tranquillity.
c	Assessment of *CO_2 emissions*	Consideration of the impacts on CO2 emissions, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on CO2 emissions impacts, the rationale must be explained	The standard AEDT tool used for assessment of CO_2 emissions does not address drones or similar novel aerospace systems, and hence we had to construct an annual estimate by extrapolating from the known fuel burn of past trials aircraft. Assuming approximately 200 novel aerospace system flights per year in total and recognising that up to 50% of these will be flown by zero-carbon electric aircraft, we estimate that the annual fuel burn is unlikely to exceed 1 tonne and that correspondingly the annual CO_2 emissions are unlikely to exceed 3 tonnes. To put these figures in context, the annual fuel burn and CO_2 emissions associated with flying activities at Llanbedr as a result of the ACP will be less than that generated by a single passenger car that travels 10,000 miles a year at 35 miles per gallon. We also know that there will a negligible impact resulting from displacement of other aviation The ACP is therefore anticipated to have a negligible overall impact on CO_2 emissions.
d	Assessment of local air quality (Level 1/M1 proposals only)	Consideration of the impacts on local air quality, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on local air quality, the rationale must be explained	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 website and monthly data can also be accessed via the Welsh Air Quality Forum website. The ACP is therefore anticipated to have a negligible impact on local air quality.

e	Assessment of impacts upon tranquillity (Level 1/M1 proposals only)	Consideration of any impact upon tranquillity, notably on Areas of Outstanding Natural Beauty (AONB) or National Parks, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no tranquillity impacts, the rationale must be explained	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 AONB and National Parks. 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 ACP is an important consideration. We're confident that the evidence presented with regard to noise and overflight, together with the estimates for limited over-land operation (Section 6.2.3), will ensure the continued tranquillity of the local environment, but we will continue to engage with stakeholders on a regular basis. We are proposing to adopt a multi-layer approach to minimise any considered impact: *i.* activation of the DA for over land operations beyond the airfield (*i.e.* Areas E and F) will only be conducted on a very small number of days, approximately 12 days a year only. *ii.* sorties in these areas will be kept as short as possible on those days, typically an hour or so maximum. *iii.* the aircraft operating height in these areas will be assessed to minimise any residual noise. Typical operations at 200m above ground level will generate sound pressure levels less than 10dB greater than the daytime rural ambient level – *i.e.* commensurate with normal conversation. *iv.* we will avoid all together any site that is identified as being particularly sensitive and the pre-programmed tracks and associated waypoints will be crafted to avoid overflight of buildings and property and will be appropriately geo-fenced. The ACP is therefore anticipated to have a very low / negligible impact on tranquillity.

f	Operational diagrams	Any operational diagrams that have been used in the consultation to illustrate and aid understanding of environmental impacts must be provided	See Annex 7.
g	Traffic forecasts	10-year traffic forecasts, from the anticipated date of implementation, must be provided (if not already provided elsewhere in the proposal)	The highly variable nature of the RDT&E market makes a 10-year traffic forecast unrealistic, but an estimate of airspace utilisation that will be representative for the next 3 to 5 years is provided in Section 6.2.3.
h	Summary of environmental impacts and conclusions	A summary of all of the environmental impacts detailed above plus the change sponsor's conclusions on those impacts	The number of novel aerospace system movements is expected to double, but numbers are relatively small (~100 DA activation days per year, <200 flights per year). The vast majority of operations (~90%) will also be over the aerodrome or out to sea and vehicle size (majority <150kg) and propulsion type (50%+ electric) means the environmental impact in terms of noise, overflight, CO2, air quality and tranquillity is likely to be very low / negligible. SA has also identified a multi-layer approach to minimise any considered impact and we will continue to work with local stakeholders to coordinate activities and minimise any perceived disruption or nuisance as far as is reasonably practicable.

15. List of Annexes

Annex 1 - Previous Temporary Danger Area Application
Annex 2 - Record of correspondence detailing potential impact on military aviation
Annex 3 - Llanbedr Aerodrome Aircraft Movement Record 2019
Annex 4 – Safety Assessment
Annex 5 - Draft ANSP Concept of Operations
Annex 6 - Air Traffic Services Equipment Approval
Annex 7 - Operational diagrams used in the consultation to illustrate and aid understanding of environmental impacts
Annex 8 - Draft Letter of Agreement (LOA) with RAF Valley
Annex 9 - Draft Letter of Agreement (LOA) with EG D201 / D202 Aberporth Range Air Control

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