



**Snowdonia Aerospace Airspace Change Proposal  
Design Options Development (Stage 2A), ACP-2019-58  
Llanbedr Danger Area (DA) – Version 2**

## Document Details

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| Author                                    |      | Consultant       |
| First reviewer                            |      | Airfield Manager |
| Second reviewer and release authorisation |      | Chief Executive  |

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|       |   |                             |

## Executive Summary

**This report documents the “Stage 2A Options Development” element of the Snowdonia Aerospace LLP submission for an Airspace Change Proposal, Reference: ACP-2019-58, Llanbedr Danger Area (DA), under the Civil Aviation Authority (CAA) CAP1616 Airspace Change Process.**

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

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

This document relates to the former application, ACP-2019-58, with a view to creating a permanent Danger Area that will enable Llanbedr Aerodrome to increase support to the RDT&E for next-generation UK aerospace - e.g. drones (particularly non-military “drones for good”), electric aircraft, urban/regional air mobility vehicles, balloons, airships, near-space testing *etc.*

The CAA Civil Aviation Publication CAP1616 defines a six-stage process through to implementation of a permanent airspace change, some of which have more than one step. This document addresses the requirements for Stage 2A: Options Development. The objectives for Stage 2A are as follows:

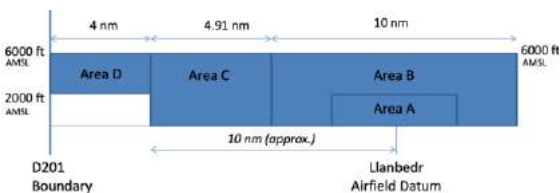
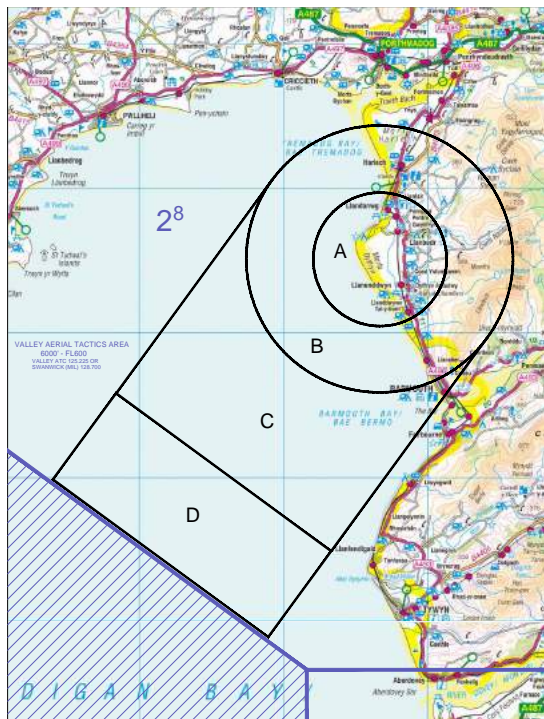
- identify all the possible airspace design options;
- evaluate the design options against the design principles from Stage 1B;
- evaluate that the design options are compliant with the required technical criteria.

The following conclusions have been drawn from the Stage 2A: Options Development process:

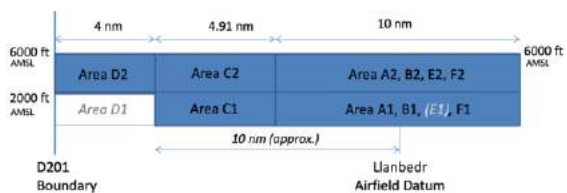
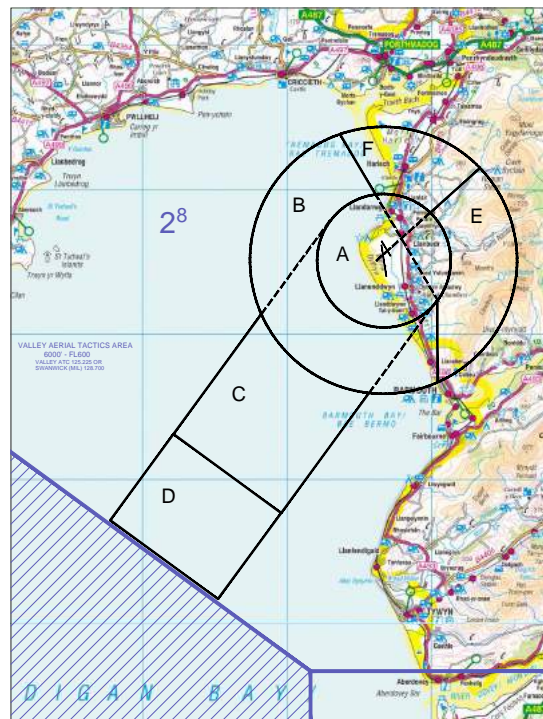
1. SAC has prepared two design options for the Danger Area (DA) and requested further feedback and comment from the stakeholders and interested parties previously engaged on the Design Principles. A side-by-side comparison of the design options is shown in Figure 1a and 1b;
2. In both cases, the design provides an area of segregated airspace local to Llanbedr Aerodrome for the RDT&E of novel aerospace systems and an air corridor that will link Llanbedr Aerodrome with the existing Danger Area D201;
3. Option #1 describes a baseline for the DA airspace change based on the Temporary Danger Area (TDA) that was originally consulted on, approved and promulgated in 2014. Option #2 is a further refinement based on feedback received as part of the two-way engagement process on the Design Principles;
4. As far as possible, the shape of both DA options 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. Outline Air Traffic Management principles have also been identified for both options;
5. 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;

6. Other local airspace users, both military and general aviation, and a local landowner identified possible potential conflicts, but SAC is sympathetic to the needs of other stakeholders and we believe a mutually satisfactory compromise is very easily achievable. An action was identified for continued engagement to further refine the details and operating procedures that will inform the Letters of Agreement with these other stakeholders;
7. For both design options, the number of days of DA sub-area activation per year is likely to provide further mitigation of airspace access issues. Utilisation, and other safety, operational, environmental and economic considerations, will be addressed in more detail as part of the analysis supporting the Stage 2B Options Appraisal;
8. Some stakeholders (mostly non-aviation) felt unable to comment pending further clarification. We must also consider how future engagement/consultation materials are developed to suit a range of audiences, such as how technical information will be communicated in an accessible way to non-aviation stakeholders.
9. On the basis of the feedback received, but also recognising the ongoing engagement actions identified in (6) and (8) above, we believe the Design Principles and Design Options that have been developed to date are fundamentally sound and suitable for taking forward into the next stages of the airspace change process.

The design options stated here together with the previous design principles from Stage 1B will be used to inform the Design Options Appraisal (Stage 2B). More generally, the conclusions will also be used to help inform the Consultation Preparation (Stage 3A). As an immediate follow-on activity, SAC will also write back to all respondents with a thank you letter and seek to identify opportunities for further engagement/consultation that will address the action items described in (6) and (8) above.



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



**Fig. 1b** – Airspace Design Option #2 for ACP-2019-58, Llanbedr Danger Area

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# 1. Introduction

## 1.1. Background

Llanbedr Aerodrome (EGFD), Gwynedd (Figures 2a-2d), is sited on a coastal promontory at the northerly end of Cardigan Bay<sup>1</sup> 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<sup>2,3</sup>.



**Fig. 2a** - aerial view looking west



**Fig. 2b** - aerial view looking east



**Fig. 2c** - aerial view looking north



**Fig. 2d** - aerial view looking south

Llanbedr Airfield has a long history and established use for the research, development, test and evaluation (RDT&E) flying activities, particularly associated with the use of target drones, and also as a secondary/tertiary operating site for RAF Valley (EGOV, approx. 58km north/north-west). An Aerodrome Traffic Zone (ATZ)<sup>4</sup> 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<sup>5</sup>.

<sup>1</sup> [View on Google Maps](#)

<sup>2</sup> Ref: [National Statistics Wales, June 2018](#)

<sup>3</sup> Ref: [Annual Lower Super Output Area \(LSOA\) Population Estimates, 2018](#)

<sup>4</sup> Aerodrome Traffic Zone (ATZ) as detailed in Article 5 of the Air Navigation Order, 2016, Ref: [Air Navigation Order, 2016](#)

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

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The airfield currently supports an increasing mix of small (<20kg) and light (<150kg) drone RDT&E and General Aviation (GA) operations together with visiting military aircraft (fixed wing and rotary) and others including the search and rescue (SAR) helicopter from Caernarfon (EGCK, approx. 35km north/north-west), Police helicopter and Air Ambulance. The airspace is currently Class G. A local Flight Information Service (FIS) has been provided to support day-to-day operations and a Temporary Danger Area (TDA)<sup>6</sup> has previously been consulted on and implemented as and when required, either as a whole or in part, to support RDT&E activities and provide a safe corridor to D201. There are GA aircraft operations most flyable days with an average of 100 to 200 movements per month. The airfield has also been designated as one of the candidate sites for a UK Spaceport by the Department for Transport (DFT) and Snowdonia Aerospace LLP has recently received a grant award from the UK Space Agency to generate a Horizontal Spaceport Development Plan.

### 1.2. Opportunity to be addressed and Statement of Need

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

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This document relates to the former application, ACP-2019-58, with a view to creating a permanent Danger Area that will enable Llanbedr Aerodrome to increase support to the RDT&E for next-generation UK aerospace - e.g. drones (particularly non-military drones for good), electric aircraft, urban/regional air mobility vehicles, balloons, airships, near-space testing etc. The Statement of Need for the application is declared as follows:

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

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

### 1.3. The cause of the opportunity and associated factors or requirements

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

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

Llanbedr has long been a UK national asset for aerospace RDT&E and there has been increased demand in recent years given its ideal location for Beyond Visual Line-of-Sight (BVLOS) drone testing.

<sup>6</sup> Ref: “Request for TDA “Approval in Principle” For UAS operations at Llanbedr Aerodrome”, QINETIQ/MS/AD/LET1404197, Sept 2014



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These activities have been satisfied to date by use of a Temporary Danger Area, but both customer demand and the need for confidence and reliance are now such that an application for a Permanent Airspace Change is warranted. The combination of safety, operational, technical and environmental factors already pertaining to low volume RDT&E activities is not expected to change. Moving to a permanent Danger Area will allow an increase in throughput to satisfy the market need and provide UK businesses in these sectors with a surety of being able to operate in the UK on a reactive basis. Many UK businesses have chosen to undertake their testing abroad due to the uncertainties around availability of adequate and appropriate commercial trials environments. Figures 3a – 3f 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.



**Fig. 3a** – Penguin B used to explore the potential for aeromedical delivery drones



**Fig. 3b** – Vertical Aerospace electric Urban Air Mobility (UAM) vehicle



**Fig. 3c** – Scheibel S100 Camcopter used to explore the potential for search/rescue drones



**Fig. 3d** – Astigan solar-powered high altitude, long endurance (HALE) vehicle



**Fig. 3e** – C-Astral Bramor used to explore the potential for mapping and surveying drones



**Fig. 3f** – The view of Cardigan Bay from the B2Space near-space testing balloon



## 2. Design Options and Design Principle Evaluation

### 2.1. CAP1616 requirements and document scope

The CAA Civil Aviation Publication CAP1616<sup>7</sup> provides guidance on the regulatory process for changing the notified airspace design and planned and permanent redistribution of air traffic, and on providing airspace information.

CAP1616 defines a six-stage process through to implementation of a permanent airspace change, some of which have more than one step. However, it is recognised that requested airspace changes can vary hugely in size, scale and complexity and this variation has led the CAA to scale the process accordingly (CAP1616, Para. 50). Furthermore, the CAA will consider requests from the Change Sponsor for additional scaling of the process when there is a good reason and it is proportionate to do so.

On the 23<sup>rd</sup> January 2020 the CAA Airspace Regulation team met with Snowdonia Aerospace LLP to discuss an appropriately scaled submission for ACP-2019-58, Llanbedr Danger Area. Subsequent to this meeting, the CAA agreed to a scaled CAP1616 submission with a combined Define, Develop and Assess Gateway in July 2020. To meet this combined Gateway, Snowdonia Aerospace as the Change Sponsor is required to submit the following documents:

- Stage 1A: Assess Requirements - Statement of Need (previously submitted)
- Stage 1B: Design Principles;
- Stage 2A Options Development;
- Stage 2B Options Appraisal.

This document addresses the requirements for Stage 2A: Options Development, which has the following objectives:

- to identify all the possible airspace design options;
- to evaluate the design options against the design principles from Stage 1B in a fair and consistent manner;
- to evaluate that the design options are compliant with the required technical criteria.

The remainder of this section describes the design option(s) for ACP-2019-58, Llanbedr Danger Area, as put forward by the Change Sponsor and evaluates the option(s) against the design principles from Stage 1B.

### 2.2. Design principles

The purpose of CAP1616 is to avoid “solutionising” and to impose a structured process that delivers a considered and balanced airspace design and implementation. In this regard the design principles precede the development of design options.

Snowdonia Aerospace (SAC) has undertaken a number of stakeholder engagement activities to help shape the Danger Area (DA) design principles. In addition to a number of targeted stakeholder meetings, a questionnaire was also sent out to over 200 stakeholders and interested parties.

The initial draft design principles were reviewed and revised to take account of feedback and reflect the observations and comments made as part of the two-way engagement process. The final statement of DA design principles is presented below in Table 1:

<sup>7</sup> Ref: [https://publicapps.caa.co.uk/docs/33/CAP1616\\_Airspace%20Change\\_Ed\\_3\\_Jan2020\\_interactive.pdf](https://publicapps.caa.co.uk/docs/33/CAP1616_Airspace%20Change_Ed_3_Jan2020_interactive.pdf)

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| <b>ID</b> | <b>Category</b>             | <b>Design Principle</b>  |
|-----------|-----------------------------|--|
| 1         | Technical                   | 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   |
| 2         | Technical                   | The design will also provide an air corridor that will link Llanbedr Aerodrome with the existing Danger Area D201  |
| 3         | Technical / Operational     | 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  |
| 4         | Technical / Operational     | The Danger Area (DA) design will be consistent with the operation of the Aerodrome Traffic Zone (ATZ) (assuming successful conclusion of ACP-2020-02)  |
| 5         | Safety                      | The design will not adversely affect the safety of operations at other nearby aerodromes   |
| 6         | Safety / Operational        | Operating hours of the Flight Information Service (FIS) and DA will be linked to ensure consistent traffic procedures and radio calls, and demand for changes in operating hours of the FIS will require a corresponding change in the operating hours of the DA and vice-versa              |
| 7         | Environmental / Operational | Any impact on the environment and associated leisure activities should, where possible, be minimised via operating procedures and should, where possible, take account of any local development projects or noise sensitive areas that are highlighted as a result of stakeholder engagement |
| 8         | Environmental               | The design should, where possible, take account of local planning policy including that of the Snowdonia National Park Authority and the aerodrome registered Safeguarding Map   |
| 9         | Operational                 | Impact on military aircraft training should, where possible, be minimised via operating procedures in line with Flexible Use of Airspace principles  |
| 10        | Operational                 | Impact on General Aviation (GA), gliding, microlight flying, hang gliding, paragliding or model flying should, where possible, be minimised via operating procedures in line with Flexible Use of Airspace principles  |

**Table 1** - Final technical, safety, environmental and operational design principles for ACP-2019-58, Llanbedr Danger Area (DA)

**2.3. Design options**

The design options have been promulgated as Danger Areas (DA), rather than as Radio or Transponder Mandatory Zones (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”.

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The design options have been developed in light of the feedback received from stakeholders and interested parties in relation to the Stage 1B 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 Temporary Danger Area (TDA) and the second of our airspace change proposals that relates to provision of an Air Traffic Zone (ATZ). There were also a few neutral responses to the design principles that raised issues/questions relating to two principle factors: (i) the impact of segregation on the flexible use of airspace (FUA) for other aviation operators, and (ii) the potential noise/general nuisance impact on non-aviation leisure activities in Snowdonia National Park. We have also sought to address these issues in the design options.

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.*

This is reflected explicitly in Design Principle #3 and drove the requirement to identify multiple DA airspace segments that will allow us to both minimise time and volume of segregation. In response to this requirement we have identified an Area A in the immediate vicinity of the aerodrome that is common to all design options. Area A has the same dimension as an ATZ - a standard and well understood airspace safety management feature – and an area that reflects a minimum volume for anticipated DA activities. This will also allow the DA and ATZ (assuming successful conclusion of ACP-2020-02) to be managed in a consistent fashion.

As far as possible, beyond Area A, the shape of the DA has been designed to be easy to interpret and implement and the size has been designed to accommodate a range of different novel aerospace systems, examples of which are illustrated in Figure 3.

The combination of a segregated area for RDT&E activities local to Llanbedr Aerodrome (Design Principle #1) and a corridor connecting that area to the existing D201 Cardigan Bay Danger Area (Design Principle #2) means that the Llanbedr DA will always have a natural “T” or “keyhole” shape, both 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 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.

Reflecting the observations and comments captured above, SAC prepared two initial design options for the DA upon which we then requested further feedback and comment from the stakeholders and interested parties previously engaged on the Design Principles. These options are intended to reflect (1) a maximum extent for the DA, and (2) a maximum segregation/minimum extent for the DA, and that additional design options could be generated by combining elements of both options. The only option that has been discounted is promulgation of the TDA in an unaltered form. Details of the two options are set out in Sections 2.3.1 and 2.3.2 below and further assessment of these options against the design principles and additional stakeholder feedback is discussed in Section 2.4.

### 2.3.1. Airspace Design Option #1

Option #1 (Figure 4) describes 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<sup>6</sup>. The TDA reflects the extant position under which SAC and others presently operate, 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 takes the TDA definition and identifies an additional volume to reflect the proposed Aerodrome Traffic Zone (ATZ), the latter subject to the current second Airspace Change application ACP-2020-02. Four separate volumes of airspace are referenced under the same DA identity, but each take a separate suffix - e.g. Areas A to D:

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

### 2.3.2. Airspace Design Option #2

As a result of the two-way engagement process and in line with the resulting design principles (Table 1), the following Option #2 (Figure 5) is also put forward for the permanent Danger Area (DA) airspace change:

- Area A1: a cylinder of 2.5 nautical mile radius, centred on the main runway 17/35, from surface to 2000 feet altitude - *i.e.* coincident with the proposed Aerodrome Traffic Zone (ATZ), the subject of the current second Airspace Change application ACP-2020-02.
- Area A2: extends Area A1 from an altitude of 2000 feet up to 6000 feet.
- Area B1: a partial annulus of 2.5 nautical mile inner radius, 5 nautical mile outer radius, centred on the main runway 17/35, extending to the west and angled west/south-west, from surface to 2000 feet altitude. Areas A+B combined provide an extended area for inshore/coastal operational testing. The Area B/E division cuts north/south from the Area A/C intersect to maximise the coastal coverage of Area B whilst minimising the overland area. The Area B/F division is nominally aligned with the coastline, but offset from the coast by approximately 1 nautical mile to minimise the impact on any paragliding and hang-gliding activities in the vicinity of Harlech.
- Area B2: extends Area B1 from an altitude of 2000 feet up to 6000 feet.



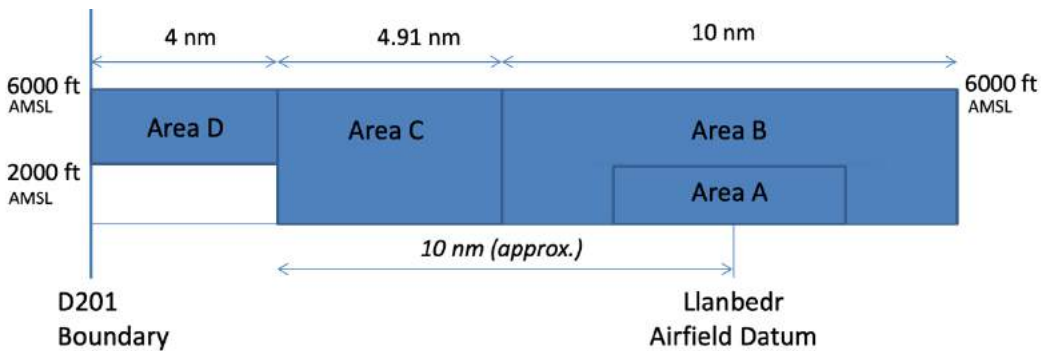
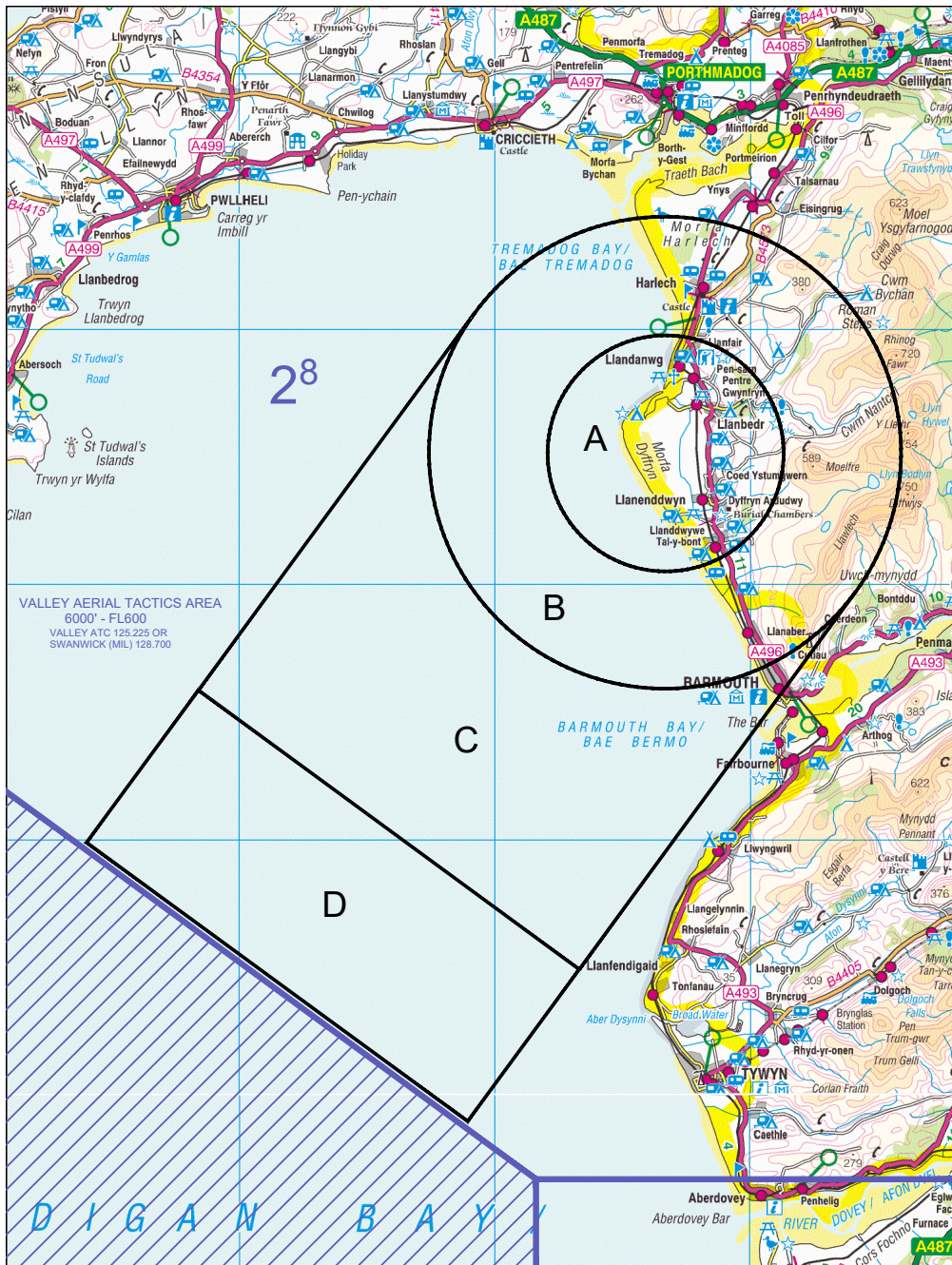


Figure 4 – Draft airspace design Option #1 for ACP-2019-58, Llanbedr Danger Area (DA)



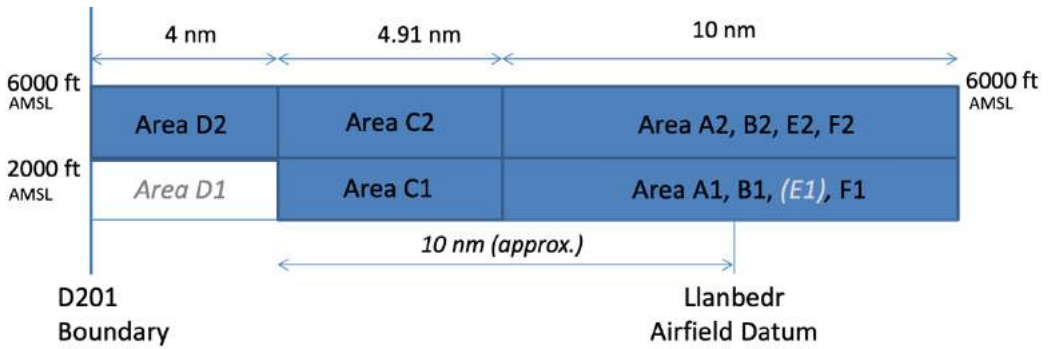
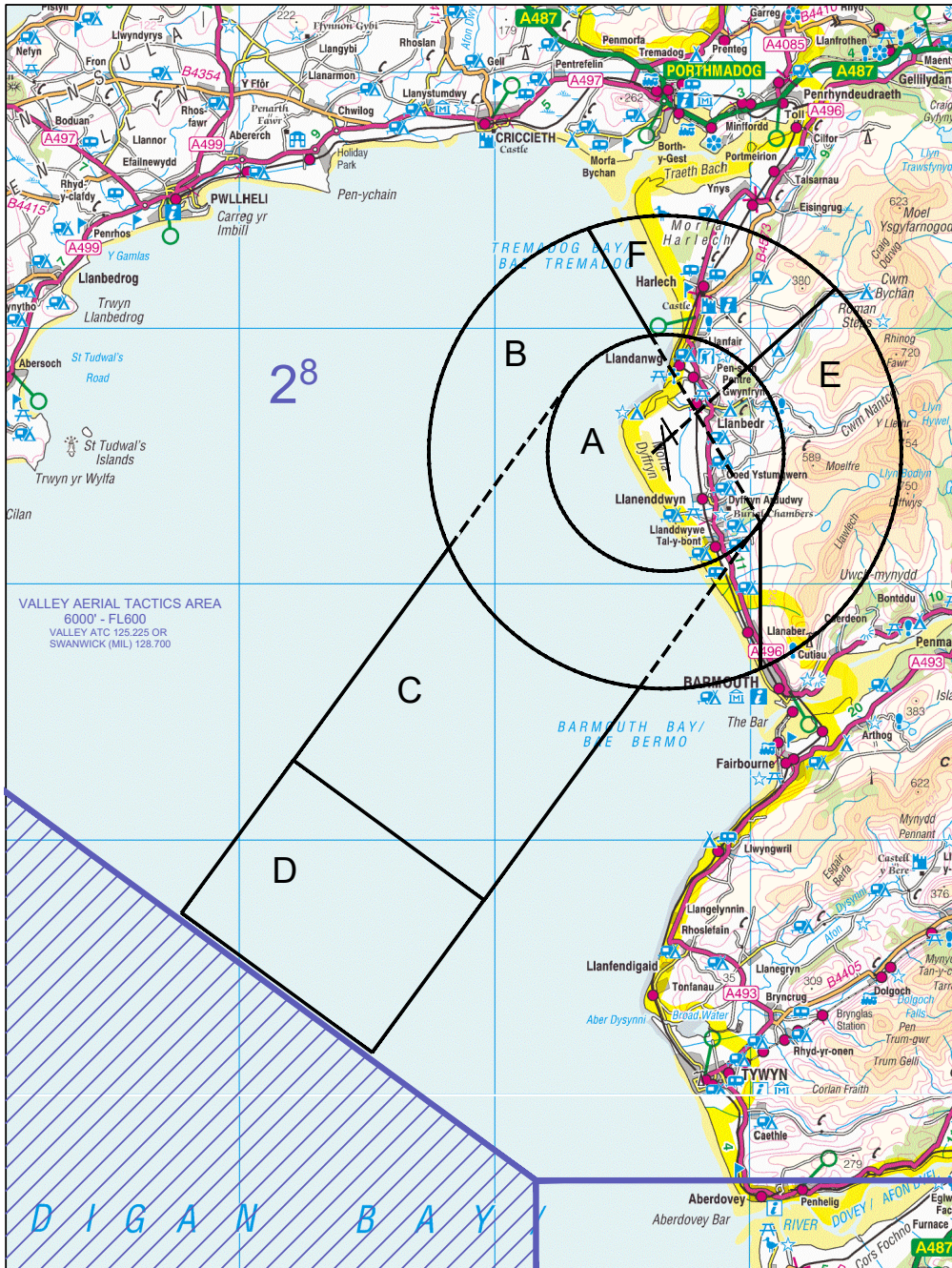


Figure 5 – Draft airspace design Option #2 for ACP-2019-58, Llanbedr Danger Area (DA)

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- Area C1: a rectangle of 5 nautical mile width and 4.91 nautical mile length that extends from Area A tangentially out toward Danger Area D201. Area A and C1 collectively extend to approximately 10 nautical mile in length (measured from the centre of the main runway 17/35), from surface to 2000 feet altitude. Areas A+C combined provide an extended area for offshore/maritime operational testing.
- Area C2: extends Area C1 from an altitude of 2000 feet up to 6000 feet.
- Area D1: *it is proposed that this area remains outside the DA to maintain a “tunnel” from surface to 2000 feet for low-level air traffic transiting to / from RAF Valley as per current operations with the TDA.*
- Area D2: a rectangle of 5 nautical mile width and 4 nautical mile length that further extends Areas A+C to create either an extended straight-line testing route and / or a “bridge” into the existing Danger Area D201, from an altitude of 2000 feet up to 6000 feet. Access when required to D201 will provide an ability for extended range/endurance/altitude testing, which will be managed via Letter of Agreement with QinetiQ/MOD. The 6000 feet upper altitude limit is defined so as to enable an engine out recovery without leaving segregated airspace in Area D for glide profiles <1000 feet per nautical mile.
- Area E1: *it is proposed that this area remains outside of the DA to keep experimental aircraft clear of the Rhinog mountains.*
- Area E2: a partial annulus of 2.5 nautical mile inner radius, 5 nautical mile outer radius, centred on the main runway 17/35, extending to the east, from an altitude of 2000 feet up to 6000 feet. Areas A+E combined provide an extended area for upland/mountain operational testing. The Area E/F division is nominally aligned with the extended centreline from Runway 05/23 and represents a natural division between upland/mountain and coastal lowland environments, again seeking to minimise the impact on any paragliding and hang-gliding activities in the vicinity of Harlech.
- Area F1: a partial annulus of 2.5 nautical mile inner radius, 5 nautical mile outer radius, centred on the main runway 17/35, extending to the north, from surface to 2000 feet altitude. Areas A+F combined provide an extended area for coastal/lowland operational testing
- Area F2: extends Area F1 from an altitude of 2000 feet up to 6000 feet.

### 2.3.3. Air Traffic Management principles for Design Options #1 and #2

The following outline Air Traffic Management principles are expected to apply for both Design Options #1 and #2:

- None of the areas of the proposed DA will be permanently active and will only be activated by NOTAM when novel aerospace flying activities are due to take place;
- A FISO service will be provided by Snowdonia Aerospace from take-off to landing for all novel aerospace operations within the proposed DA. The core FIS will be augmented with an Unmanned Traffic Management (UTM) system with a minimum ADS-B Out monitoring capability. Llanbedr FIS will also provide a Danger Area Activity Information Service (DAAIS) for all airspace users in the vicinity of the DA;
- It is anticipated that the novel aerospace system will be equipped with an ADS-B Out transponder as a minimum electronic conspicuity capability when operating outside of Area A for both Options #1 and #2;
- QinetiQ/MOD Aberporth Air Traffic Control (ATC) will be notified of all novel aerospace operations and their services will be engaged via Letter of Agreement (LOA) for operations that intend to transit through Area D for both Options #1 and #2 to operate in D201 or further into D202;



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- The novel aerospace system crew is responsible for monitoring flight systems and communicating directly with Llanbedr FIS or 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.

### 2.4. Design principle evaluation

#### 2.4.1. Design option correlation with design principles

Commensurate with Design Principles #1 and #2, the horizontal dimensions of each Design Option have been set to satisfy the following requirements for a range of different novel aerospace systems:

- i. System testing: the ability to conduct short-medium range testing (10km to 20km) of aircraft systems, particularly ground-to-air communications;
- ii. Extended system testing: the ability to transit to D201 to conducted extended range, altitude and/or endurance testing of aircraft systems;
- iii. System-of-systems testing: the ability to conduct systems-of-systems testing supporting wider airspace integration – e.g. Unmanned Traffic Management (UTM), detect-and-avoid *etc.*
- iv. Operational testing: the ability to conduct testing in a range of operationally relevant environments – e.g. maritime/offshore, inshore/coastal, coastal/lowland, and upland/mountain.

However, in both cases the DA has been broken into a number of sub-areas as per Design Principle #3. With regard Design Option #1, the DA can be promulgated either as Area A, A+B, A+B+C or A+B+C+D. For Design Option #2 there are multiple possible combinations, the most likely being: A, A+B, A+C, A+C+D, A+E, A+F, A+B+E+F. In-line with Flexible Use of Airspace principles, none of the areas of the proposed DA will be permanently active and will only be activated by NOTAM when RDT&E flying activities are due to take place.

With regard the vertical dimensions, RAF Valley aircraft operate on the Regional Pressure Setting (RPS) when they are conducting their medium level activity and OC STANAT has confirmed that expressing the upper height as XXXX ft as opposed to Flight Level (FL) XX will make it easier for RAF Valley to safely deconflict. The 6000 feet upper altitude limit in Area D was defined previously so as to enable an engine out recovery without leaving segregated airspace for glide profiles <1000 feet per nautical mile. A similar 6000 feet upper altitude limit in the vicinity of Llanbedr Aerodrome – *i.e.* for Areas A and B – has also been identified by potential DA users as being valuable for testing of drone stall and spin characteristics and small-scale rocketry. Design Option #2 also contains an explicit split in altitude – e.g. A1 from surface to 2000ft, A2 from 2000ft to 6000ft *etc.* – to again adhere to Flexible Use of Airspace principles as much as possible. With Option #1 the upper altitude would be determined on a case-by-case basis (up to a maximum of 6000ft) and implemented as part of the activation NOTAM.

Making Area A coincident with the proposed Aerodrome Traffic Zone (ATZ) helps satisfy Design Principle #4, as does ensuring consistent operation of the Flight Information Service (FIS) in line with Design Principle #6.

Furthermore, the combination of the ATZ (assuming successful conclusion of ACP-2020-02), the FIS service, the ATM principles outlined in Section 2.3.3 and the explicit horizontal and vertical segmentation of the Danger Area in Option #2, will allow other air traffic to safely transit over the DA (above 2000ft) and past the DA to the west or east depending on which areas have been activated. This will minimise the impact on military and other general aviation and satisfies Design Principles #9 and #10. The same capability to transit over the DA will also exist with Option #1 as the full 6000ft altitude will only be activated if required.



The horizontal and vertical segmentation of the Danger Area will also allow us to minimise the impact on the environment, Snowdonia National Park and associated leisure activities in line with Design Principles #7 and #8.

Design Principle #5 is inherent in all operations at Llanbedr Aerodrome.

#### 2.4.2. Stakeholder feedback on the design options

We received 32 responses to the request for stakeholder feedback on the design options (detailed in Appendix 1). 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).

The main voices of opposition came from a local Harlech landowner and also the Harlech hang-gliding club who felt that both Danger Area options would “put an end to hang-gliding and paragliding at Harlech”. SAC is sympathetic to the needs of local residents and airspace users and we believe a mutually satisfactory compromise is very easily achievable. As noted earlier, the shape of the DA has been designed to be simple to interpret and implement and hence, whilst specific geographic locations may nominally sit within the DA, operating procedures can be put in place to ensure any novel aerospace flying activities are constrained to non-sensitive areas or managed via Letters of Agreement (LOA).

It should also be noted that the Temporary Danger Area (effectively Design Option #1) has been activated on a number of occasions over the past 5 years without incident, concern or impact on the hang-gliding and paragliding or any other local aviation or non-aviation activities.

Regardless of the design option, the number of days of DA sub-area activation per year is likely to provide further mitigation of the issues raised and to Design Principles #7 to #10 in general (environment and flexible use of airspace). Utilisation, and other safety, operational, environmental and economic considerations, will be addressed in more detail as part of the analysis supporting the Stage 2B Options Appraisal, which will also pick up the potential noise/nuisance issues raised in the “unable to comment” responses.

With regard Option #1 versus Option #2, 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. One response also highlighted the potential for combining elements of both options – e.g. Areas A and B from Option #1 and Areas C and D from Option #2. Multiple such combinations could be identified, but SAC considers the two current options to best represent the distinct alternatives.

A number of further issues were raised by MOD who operate Hawk T2 and Texan T1 aircraft from RAF Valley throughout the North-West Military Training Area (NWMTA). The Texans will routinely operate to a base level of 4000ft and MOD would require a LOA to ensure any activation above 4000ft is deconflicted with Valley operations. Again, SAC is sympathetic to the needs of other airspace users and we believe a mutually satisfactory compromise is very easily achievable via LOA and that the number of days of DA activation per year requiring operations at altitudes greater than 3000ft is likely to provide further mitigation.

A further LOA will be needed with MOD/QinetiQ in order to manage any transition from the Llanbedr DA into the D201 Cardigan Bay Range via Area D, but we believe the outline Air Traffic Management principles described in Section 2.3.3 provide the basis for discussions that will allow this to be concluded in a timely fashion.

As a result of the additional stakeholder feedback around the design options, there is obviously a need for continued engagement to further refine the details and operating procedures that will inform the LOAs. We will actively follow up with the individual stakeholders in due course. We must also consider how engagement/consultation materials are developed to suit a range of audiences, such as how technical information will be communicated in an accessible way to non-aviation stakeholders.

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On the basis of the feedback received, but also recognising the ongoing engagement actions identified above, we believe the design principles and design options that have been developed to date are fundamentally sound and suitable for taking forward into the next stages of the airspace change process.

### 3. Conclusions and Next Steps

#### 3.1. Conclusions

The following conclusions have been drawn from the “Stage 2A Options Development” element of the Snowdonia Aerospace LLP submission for an Airspace Change Proposal, Reference: ACP-2019-58, Llanbedr Danger Area, under the Civil Aviation Authority (CAA) CAP1616 Airspace Change Process:

1. SAC has prepared two design options for the Danger Area (DA) and requested further feedback and comment from the stakeholders and interested parties previously engaged on the Design Principles. A side-by-side comparison of the design options is shown in Figure 1a and 1b;
2. In both cases, the design provides an area of segregated airspace local to Llanbedr Aerodrome for the research, development, test and evaluation (RDT&E) of novel aerospace systems and an air corridor that will link Llanbedr Aerodrome with the existing Danger Area D201;
3. Option #1 describes a baseline for the DA airspace change based on the Temporary Danger Area (TDA) that was originally consulted on, approved and promulgated in 2014. Option #2 is further refinement based on feedback received as part of the two-way engagement process on the Design Principles;
4. As far as possible, the shape of both DA options 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. Outline Air Traffic Management principles have also been identified for both options;
5. 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;
6. Other local airspace users, both military and general aviation, and a local landowner identified possible potential conflicts, but SAC is sympathetic to the needs of other stakeholders and we believe a mutually satisfactory compromise is very easily achievable. An action was identified for continued engagement to further refine the details and operating procedures that will inform the Letters of Agreement with these other stakeholders;
7. For both design options, the number of days of DA sub-area activation per year is likely to provide further mitigation of airspace access issues. Utilisation, and other safety, operational, environmental and economic considerations, will be addressed in more detail as part of the analysis supporting the Stage 2B Options Appraisal;
8. Some stakeholders (mostly non-aviation) felt unable to comment pending further clarification. We must also consider how future engagement/consultation materials are developed to suit a range of audiences, such as how technical information will be communicated in an accessible way to non-aviation stakeholders.
9. On the basis of the feedback received, but also recognising the ongoing engagement actions identified in (6) and (8) above, we believe the Design Principles and Design Options that have been developed to date are fundamentally sound and suitable for taking forward into the next stages of the airspace change process.

#### 3.2. Next steps

The design options stated here together with the previous design principles from Stage 1B will be used to inform the Design Options Appraisal (Stage 2B). More generally, the conclusions will also be used to help inform the Consultation Preparation (Stage 3A).

As an immediate follow-on activity, SAC will also write back to all respondents with a thank you letter and seek to identify opportunities for further engagement/consultation that will address the action items described in (6) and (8) above.

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