Ministry of Defence

ACP-2021-006 - ENABLING BVLOS UAS OPERATIONS FROM KEEVIL AIRFIELD

STAGE 2A DESIGN PRINCIPLE EVALUATION

This document forms part of the overall submission of Stage 2A of ACP-2021-006 in accordance with the requirements laid out in CAP 1616.

The document aims to demonstrate to the CAA how the design options presented have responded to the design principles agreed at Stage 1B. This was achieved through the use of the feedback received from stakeholders as well as an internal review of each design option against the standardised format laid out in Appendix E of CAP 1616.

Furthermore, some analysis utilised experience obtained from the previous Temporary Danger Area activity that was conducted in Spring 2021.

The three design options evaluated in this document are:

1. Do nothing
2. Use existing airspace structures
3. Danger Area

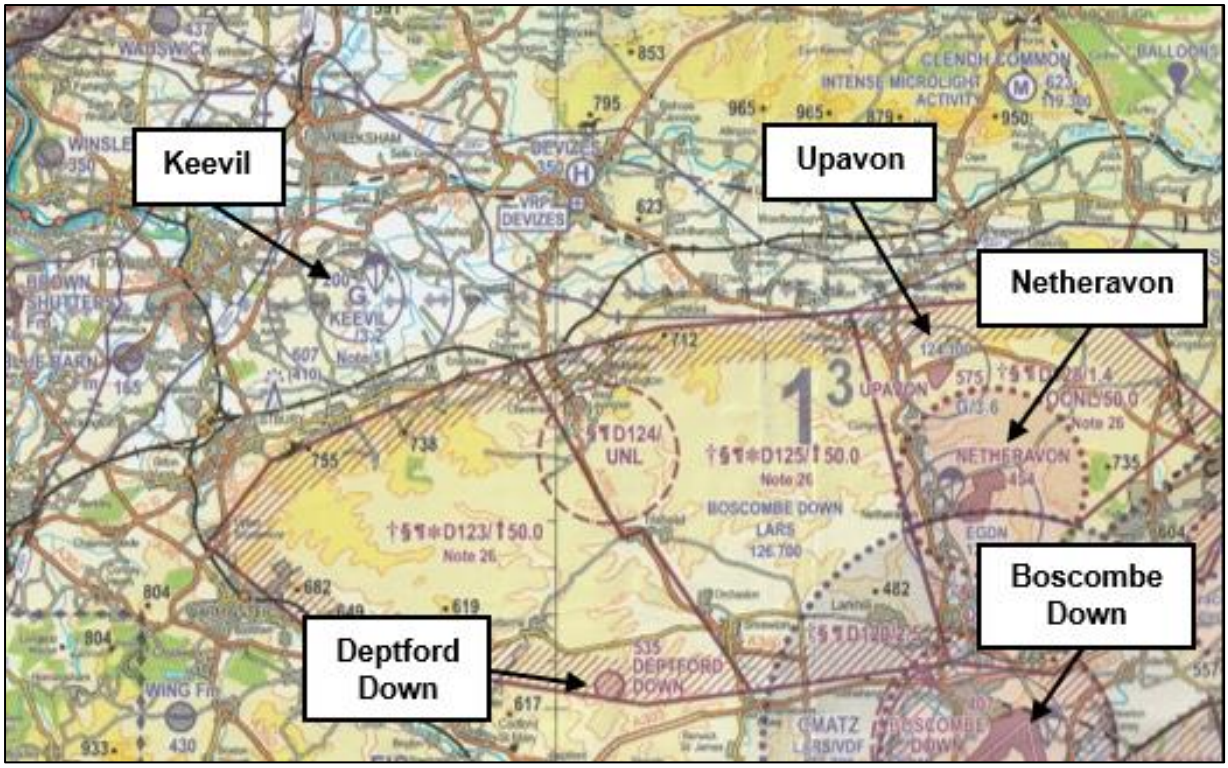
Additional options were discounted by the sponsor at Stage 2A which will be justified in greater detail during Stage 2B Initial Options Appraisal.

The Design Principles agreed at Stage 1 are as follows:

DP	Design Principle	Priority
A	Provide a safe environment for all airspace users	**1**
B	Provide sufficient airspace to meet all reasonable technical requirements for the Watchkeeper RPAS platform that are required to facilitate safe access to and from SPTA and usage of Keevil Airfield.	**2**
C	Minimise the impact to other airspace users, both in terms of activation and volume of airspace required.	**3**
D	Make the airspace as accessible as possible to all types of air user.	**4**
E	Use standard airspace structure where possible (conformity, simplicity and safety).	**5**
F	Minimise the impact of operating noise to local residents	**6**

Design Principle Evaluation			OPTION NO: 1	
Do Nothing			~~ACCEPT~~ / REJECT	
The Sponsor is currently unable to achieve the level of operation that is required as per the Statement of Need as Keevil sits within Class G airspace and does not afford direct segregated airspace into D123. Should the Sponsor not be able to operate RPAS within SPTA it will detrimentally affect military training. This option is considered to NOT meet the SoN but does allow a baseline to measure the effectiveness of subsequent proposals.				
Design Principle A	Provide a safe environment for all airspace users	**NOT MET**	~~**PARTIAL**~~	~~**MET**~~
This design option would not facilitate a safe environment for BVLOS operations in accordance with current regulation, which currently demands segregated airspace. It would also not provide a safe environment for other air users.				
Design Principle B	Provide sufficient airspace to meet all reasonable technical requirements for the Watchkeeper RPAS platform that are required to facilitate safe access to and from SPTA and usage of Keevil Airfield.	**NOT MET**	~~**PARTIAL**~~	~~**MET**~~
No viable options exist within the region that provides both an appropriate dedicated take-off and landing site meeting operational requirements and segregated airspace. Whilst MOD Boscombe Down is a viable RPAS flying location from a *technical* perspective it does not meet the SoN as it is unable to facilitate 'essential aircrew and groundcrew training'. Further evidence maybe provided to the CAA at their request.				
Design Principle C	Minimise the impact to other airspace users, both in terms of activation and volume of airspace required.	~~**NOT MET**~~	~~**PARTIAL**~~	**MET**
This option would produce zero impact on other air users however would not provide the airspace that is required for BVLOS operations from Keevil into D123 and therefore fail to achieve the SoN.				
Design Principle D	Make the airspace as accessible as possible to all types of air user.	**NOT MET**	~~**PARTIAL**~~	~~**MET**~~
This DP would not be met as this option would not provide access to RPAS operating BVLOS from Keevil but would provide all other air users the access that they are currently afforded.				
Design Principle E	Use standard airspace structure where possible	**NOT MET**	~~**PARTIAL**~~	~~**MET**~~

	(conformity, simplicity and safety).			
This option does not seek to utilise any airspace structure (existing or proposed) and would see the airspace remain in its current form, thus not adhering to the design principle.				
Design Principle F	Minimise the impact of operating noise to local residents	~~**NOT MET**~~	~~**PARTIAL**~~	**MET**
The 'Do nothing' option would not facilitate BVLOS operations therefore there would be no additional noise impacting local residents.				



Option 1 Summary

Option 1 aimed to examine whether alternatives existed which would still facilitate the operations of RPAS BVLOS in accordance with the SoN. It was assessed internally at the MOD that Keevil is the only option that satisfies the SoN by providing a dedicated airfield to conduct Force Generation of aircrew and groundcrew and conduct critical training with the British Army that cannot be achieved elsewhere.

The 'do nothing' option does not adhere to any DP that would allow military BVLOS operations to occur at Keevil and therefore this option will be discounted during Stage 2B however the options taken forward will continue to be assessed against the 'do nothing' position in line with the requirements in CAP 1616[1].

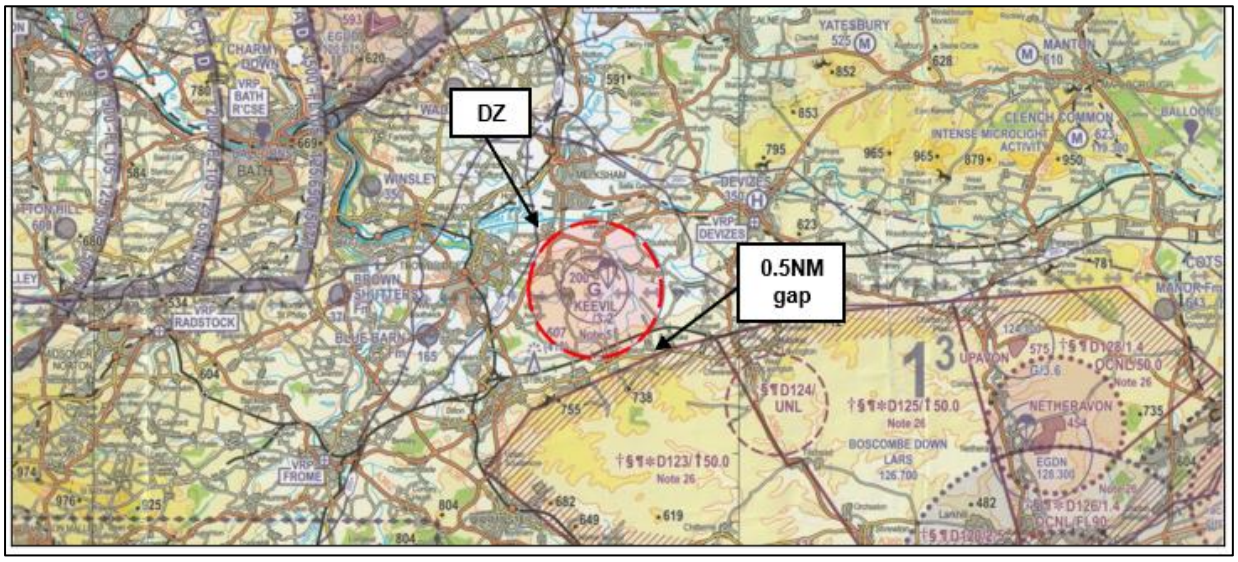
[1] p.41 para. 133

<table>
<tr><th colspan="4">Design Principle Evaluation</th><th>OPTION NO: 2</th></tr>
<tr><td colspan="4">Use Existing Airspace Structures</td><td>ACCEPT / ~~REJECT~~</td></tr>
<tr><td colspan="5">Although there is currently no precedence for using a DZ to afford segregation to RPAS operating BVLOS, the Sponsor would like to consider its effectiveness against the Design Principles in this specific location. The DZ could be activated to allow RPAS to transit between Keevil and Salisbury Plain.

To bridge the 0.5NM gap between the DZ and D123, the Sponsor would like to propose either an ‘RPAS Crossing Corridor’, activated by NOTAM when required or a small extension to the North of D123 to shift the DA 0.5NM closer to Keevil could be considered.</td></tr>
<tr><td>Design Principle A</td><td>Provide a safe environment for all airspace users</td><td>~~NOT MET~~</td><td>PARTIAL</td><td>~~MET~~</td></tr>
<tr><td colspan="5">Keevil is currently a Glider Site and a DZ, with a note on aeronautical charts advising air users to avoid the area by 2NM/2000ft at all times. Therefore it could be argued that, particularly when activated by NOTAM, a safe environment for air users can be achieved. However, this only partly meets DP A as there is no precedence for using this airspace structure to create a safe environment for all air users and meet the regulatory segregation requirements.</td></tr>
<tr><td>Design Principle B</td><td>Provide sufficient airspace to meet all reasonable technical requirements for the Watchkeeper RPAS platform that are required to facilitate safe access to and from SPTA and usage of Keevil Airfield.</td><td>~~NOT MET~~</td><td>PARTIAL</td><td>~~MET~~</td></tr>
<tr><td colspan="5">If a DZ option was to be utilised and was deemed to meet DP A the dimensions of the DZ would only provide airspace to facilitate circuits as the DZ does not intercept D123. As a result, the DZ alone would not allow RPAS to operate between Keevil and Salisbury Plain, without either amendment to D123 or the addition of a corridor.</td></tr>
<tr><td>Design Principle C</td><td>Minimise the impact to other airspace users, both in terms of activation and volume of airspace required.</td><td>~~NOT MET~~</td><td>PARTIAL</td><td>~~MET~~</td></tr>
<tr><td colspan="5">A DZ partially meets this DP. As the shape of the DZ is a circle it unnecessarily stretches North of Keevil which is not minimising the amount of airspace used. This has the potential to unnecessarily increase the funnelling effect of aircraft between Salisbury Plain and Bristol CTR.

In terms of minimising activation, this meets DP C in the same way as a Danger Area activated by NOTAM.</td></tr>
<tr><td>Design Principle D</td><td>Make the airspace as accessible as possible to all types of air user.</td><td>~~NOT MET~~</td><td>PARTIAL</td><td>~~MET~~</td></tr>
</table>

The airspace would be safely accessible for some air users. It could be argued that with an air traffic service an aircraft can safely transit the DZ even whilst active if it can be confirmed whether or not live activity is currently being conducted. However, aircraft operating in Class G without a radio will potentially be unable to transit through the active DZ if they cannot determine whether or not it is safe to do so.				
Design Principle E	Use standard airspace structure where possible (conformity, simplicity and safety).	~~NOT MET~~	PARTIAL	~~MET~~
This DP is partially met as the DZ is conforming to an extant structure and simple in design. However, as discussed, the use of a DZ to provide a safe operating area for RPAS is only partly met as there is no precedent.				
Design Principle F	Minimise the impact of operating noise to local residents	~~NOT MET~~	PARTIAL	~~MET~~
A DZ solution would be able to minimise the impact of operating noise on the local area provided that noise abatement procedures are contained within the extant DZ dimensions. As this is an extant structure, operating noise of other aircraft would not adversely differ from the 'do nothing' option.				



Option 2 Summary

This design option was deemed to have partially met all design principles. This is primarily due to the fact that there is currently no precedence of using this airspace structure to segregate RPAS operating BVLOS. The sponsor believes that the principles behind both a Drop Zone and a Danger Area with the intent to segregate RPAS are very similar.

This option will be further assessed at the Initial Options Appraisal at Stage 2B as it has the potential to fully meet some DPs should a DZ be deemed to satisfy the requirement for segregated airspace.

<table>
<tr><th colspan="4">Design Principle Evaluation</th><th>OPTION NO: 3</th></tr>
<tr><td colspan="4">Danger Area</td><td>ACCEPT / ~~REJECT~~</td></tr>
<tr><td colspan="5">Danger Areas are currently the primary method of achieving segregated airspace outside of controlled airspace to facilitate BVLOS RPAS operations in the UK.

A Danger Area for Keevil could be activated by NOTAM only when required in order to best meet Design Principles C and D. Additionally, services such as a Danger Area Crossing Service (DACS) or Danger Area Activity Information Service (DAAIS) would be employed to ensure access to GA traffic would not be unnecessarily impeded.</td></tr>
<tr><td>Design Principle A</td><td>Provide a safe environment for all airspace users</td><td>~~NOT MET~~</td><td>~~PARTIAL~~</td><td>MET</td></tr>
<tr><td colspan="5">Danger Areas have long been the primary method for segregating RPAS operations from other air users. A Danger Area would provide a safe operating environment for RPAS operating BVLOS without approved detect and avoid technology. It is able to segregate RPAS from all airspace users- including aircraft without a radio and/or transponder operating within Class G.</td></tr>
<tr><td>Design Principle B</td><td>Provide sufficient airspace to meet all reasonable technical requirements for the Watchkeeper RPAS platform that are required to facilitate safe access to and from SPTA and usage of Keevil Airfield.</td><td>~~NOT MET~~</td><td>~~PARTIAL~~</td><td>MET</td></tr>
<tr><td colspan="5">A Danger Area could be designed to ensure that RPAS remain segregated at all times for:

1. Take off, landing and circuits
2. Transit to and from Salisbury Plain Danger Areas
3. Emergency situations such as engine failure or returning to land at Keevil in a lost-link scenario

A DA could be designed as efficiently as possible to ensure reasonable technical requirements of the RPAS are met to ensure the design option facilitates the SoN.</td></tr>
<tr><td>Design Principle C</td><td>Minimise the impact to other airspace users, both in terms of activation and volume of airspace required.</td><td>~~NOT MET~~</td><td>~~PARTIAL~~</td><td>MET</td></tr>
</table>

We believe this DP can been met in the following ways:

1. The LoA with the Wiltshire Air Ambulance during the TDA in Summer 2021 proved to be effective. Additionally, the LoA with the local model flying club was also deemed effective in minimising the impact of the TDA on the club. These procedures would be refined in line with Stage 3 during the Full Options Appraisal.
2. The use of a DACS/DAAIS could be employed by Boscombe ATC as in Summer 2021 in order to facilitate transit of other aircraft whilst the DA is active.
3. A Danger Area design that satisfied DP B would ensure that only the volume of airspace required for all reasonable technical requirements is presented.
4. Pursue a Danger Area design option that is activated by NOTAM only when required.

Design Principle D	Make the airspace as accessible as possible to all types of air user.	~~**NOT MET**~~	~~**PARTIAL**~~	**MET**

A Danger Area, activated by NOTAM and with a DACS/DAAIS provided will make the airspace as accessible as possible to air users, provided that they are in possession of a radio and able to communicate with the relevant ATSU. As the DA would primarily be utilised for take off and landing of RPAS the airspace, even if still activated, will be available to transiting aircraft in receipt of a DACS as the majority of RPAS activity will still be contained within D123.

This option does not provide access to non-radio equipped aircraft during the hours of activation. However, to mitigate this as much as possible the following could be employed:

1. Create local deconfliction procedures/ LoAs with air users such as paragliders at Westbury White Horse, Gliders and local air users who may not carry an airband radio.
2. Local operational procedures to cancel the airspace activation should the DA no longer be required for that day.

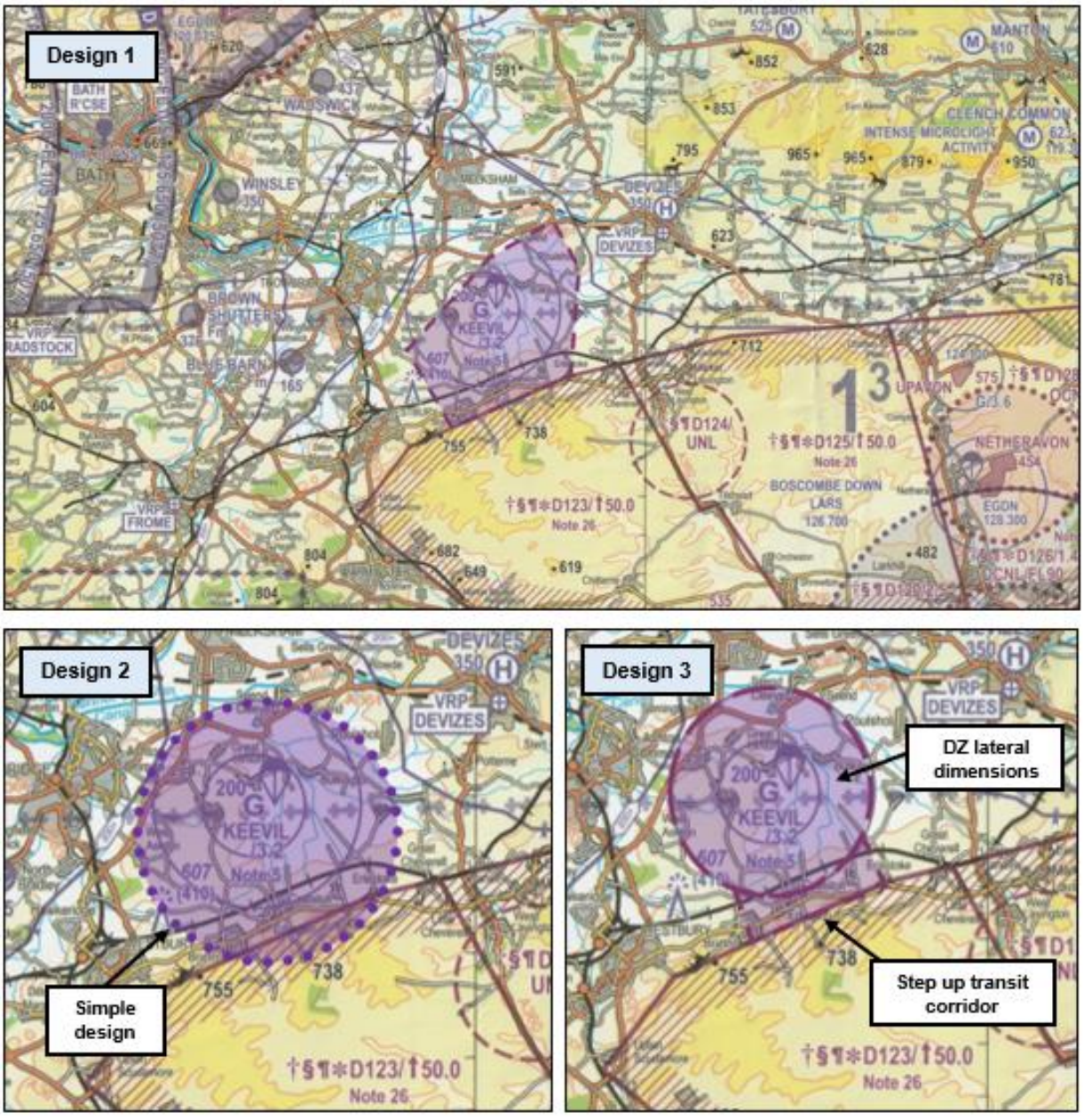
Design Principle E	Use standard airspace structure where possible (conformity, simplicity and safety).	~~**NOT MET**~~	~~**PARTIAL**~~	**MET**

A Danger Area is a recognised method for providing segregated airspace for RPAS operations in the UK.

Several designs are possible which adhere better to either DP E (by creating a simple design such as a circle or square such as Design 2) or DP C (by creating a design that ensures only the volume of airspace required is used such as design 1 or 3).

A DA could meet DP E in varying degrees by ensuring that the design is as simple as possible whilst ensuring that the airspace facilitates safe technical operation of the aircraft and minimises airspace use.

Design Principle F	Minimise the impact of operating noise to local residents	~~NOT MET~~	~~PARTIAL~~	MET
A Danger Area would be able to minimise the impact of operating noise on the local area provided that it is large enough (laterally or vertically) to facilitate noise abatement procedures.				



Option 3 Summary

A Danger Area solution meets all Design Principles. It is an option that provides the level of segregated airspace that would facilitate BVLOS RPAS operations. The merits and drawbacks of different DA designs will be explored at Stage 2B.