Ministry of Defence

Gateway documentation:
Stage 2 DEVELOP & ASSESS

Step 2B Options Appraisal (phase I) initial

ACP – 2023 - 022

Roles

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Produce	Airspace Change Team UAS CDC	9 Apr 2024
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Contents

Introduction

The main operating base (MOB) for the large Remotely Piloted Air System (RPAS), Protector RG Mk1 is RAF Waddington, where permanent segregated airspace in the form of a danger area has already been established. The danger area is EG D324A/B, which was implemented at the end of November 2023. Under current timescales routine Protector operations is likely to commence from RAF Waddington in Summer 2024 when the MOD will conduct test and evaluation activities prior to Protector formally entering into service. During this, and for future activity in the UK, Protector will require a nominated permanent diversion airfield to be made available in the event that, for any unforeseen reason, RAF Waddington becomes unavailable. Following investigation into several military airfields, RAF Marham has been identified as the most suitable and preferred diversion airfield. Whilst Protector's MOB remains RAF Waddington there may be occasions when access to RAF Marham is required for operational reasons.

This airspace change proposal (ACP) seeks to establish suitable airspace to enable Protector RG Mk1 safe and efficient access to RAF Marham as a nominated diversion airfield. The Ministry of Defence (MOD), and specifically Air Capability, is the Change Sponsor for this proposal (identification number ACP-2023-022).

The purpose of this document is to demonstrate that the Change Sponsor has followed the airspace change process as laid down in the Civil Aviation Publication (CAP)1616. It forms part of the overall requirements for the Stage 2 Develop and Assess Gateway, Step 2B - Options Appraisal (Initial).

Executive Summary

The proposal seeks to establish suitable airspace to enable Protector RG Mk1 safe and efficient access to a nominated permanent diversion airfield, RAF Marham in Norfolk.

A design principle evaluation was completed in Step 2A testing the two airspace design options developed by the Change Sponsor. As a result of the evaluation, the Change Sponsor decided to discount Option 1 and take only Option 2 through to the Options Appraisal. This document details the appraisal of Option 2 and the baseline scenario against the high-level objectives and assessment criteria laid out in CAP1616f (see Table 3).

The baseline scenario does not meet the Statement of Need or Design Principle 2 (*The airspace provides access to a sufficient area to meet operational and training objectives*) and therefore would severely limit Protector's UK training and operational activity. Since the only design option which meets the Statement of Need and all of the Design Principles is Airspace Design Option 2, this is the Change Sponsor's preferred design option.

For the next phase of the Options Appraisal (Stage,3, Consult) the Change Sponsor will endeavour to obtain a more definitive indication of Protector's forecast flying tempo, in particular an estimate of projected live flying hours, which will inform the likely frequency of segregated airspace activation associated with RAF Marham. Moreover, to ensure all airspace user requirements are considered, the internal division of the airspace construct will be subject to further engagement.

1 Section 1

1.1 Regulatory Requirement

1.1.1 UK military aviation is regulated by the Military Aviation Authority (MAA). Accordingly, the Protector programme is subject to the MAA Regulatory Publications (MRP). Of particular relevance to the operation of Protector in UK airspace is MAA Regulatory Article (RA) 2320 – MAA regulation for operation of military RPAS. The RA states the criteria for beyond visual line of sight (BVLOS[1]) RPAS operation such that within UK airspace, BVLOS operations should only be conducted if:

- An appropriately approved Detect and Avoid (DAA) capability enables compliance with Rules of the Air appropriate to the class of airspace, or;

- They are flown using a Layered Safety Approach that specifically requires flight in Segregated Airspace, or in Controlled Airspace (Classes A-D) with the informed consent of the Air Navigation Services Provider (ANSP).

1.1.2 When Protector initially comes into service, it will be fitted with a limited DAA capability only and, since RAF Marham is located entirely within Class G airspace, flight in segregated or controlled airspace is required. This will permit Protector to access RAF Marham in a safe environment, maintain regulatory compliance, and provide protection of other airspace users of any associated and identified hazardous activities.

1.2 Statement of Need

1.2.1 Version 2.0 of the SON can be viewed via the CAA ACP Portal[2] and states the objective of the proposed change is to establish suitable airspace enabling safe and efficient access to a nominated diversion airfield for the BVLOS RPAS, Protector.

1.3 Design Principles

1.3.1 Design Principles (DPs) were developed with stakeholders through Stage 1 of the ACP process to provide a shortlist of principles, which will be used to inform the development of the proposed airspace design options. The adopted DPs are at Table 1:

Table 1: ACP-2023-022 Design Principles		
Priority	Ref	Design Principle
1	DP1	The airspace change proposal must maintain a high standard of safety and should seek to enhance levels of safety, wherever possible.
2	DP2	The airspace provides access to a sufficient area to meet operational and training objectives.
3	DP5	The airspace change proposal should not be inconsistent with relevant legislation, the CAA's airspace modernisation strategy or Secretary of State and CAA's policy and guidance.
4	DP3	The airspace design should endeavour to maximise accessibility for other airspace users.
	DP4	The airspace change proposal should consider the impacts on all airspace users.

[1] The MAA Master Glossary defines BVLOS as the operation of a Remotely Piloted Aircraft beyond a distance where the Remote Pilot is able to respond to or avoid other airspace users by visual means.

[2]The SON can be found on the CAA ACP Portal here:
https://airspacechange.caa.co.uk/documents/download/6230

1.4 Design Options Summary

1.4.1 The Change Sponsor presented two airspace design options upon which it invited feedback and comment from a range of stakeholders. baseline scenarios were also developed as required in CAP1616; feedback on the suitability of these scenarios was also invited.

1.4.2 During the design principle evaluation in Step 2A, Option 1 was evaluated as only partially meeting DP3, which is "*The airspace design should endeavour to maximise accessibility for other airspace users*". Since Option 2 meets DP3 (via the addition of a vertical division in the airspace design) and all other DPs, the Change Sponsor has decided to discount Option 1 and take only Option 2 through to the Options Appraisal at Stage 2B of the process.

1.4.3 The options appraisal will, therefore consist of an appraisal of Option 2 and the baseline scenarios as described below.

1.5 Baseline Scenarios

1.5.1 CAP1616 requires the Change Sponsor to identify baseline scenarios; future scenarios without the airspace change that are developed for the following timescales:

- Year of implementation without the airspace change proposal (year 1); and
- 10 years after implementation without the airspace change proposal (year 10).

1.5.2 The baseline scenarios were presented to stakeholders for feedback at Stage 2A of the ACP process. Following suggestions received, the baseline scenarios document was amended to V2.0, provided at Appendix A.

1.6 Airspace Design Option 2.

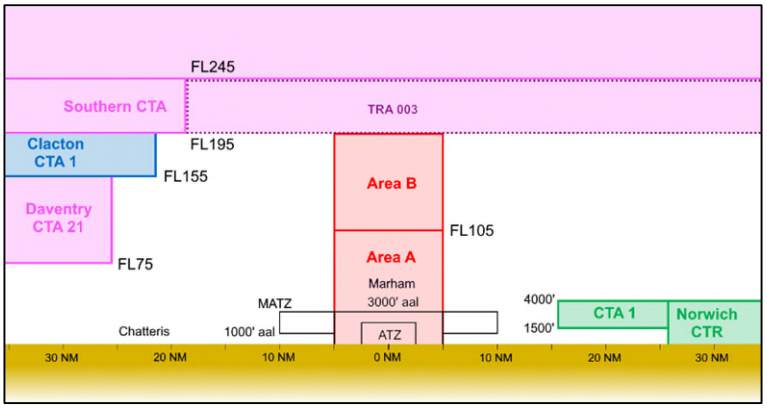
1.6.1 As shown in Figure 1 Airspace Design Option 2 comprises two volumes of airspace, both of 5 nm radius centred on RAF Marham's aerodrome reference point (ARP)[3]. Area A is from surface to FL105[4]; Area B is FL105 – FL195.

[3] RAF Marham airfield reference point is the midpoint of RW05/23 (52 38 54.26N 000 33 02.42E)

[4] A Flight Level (FL) is used to ensure that all aircraft are flying to a common datum to ensure height separation is maintained (1 Flight Level = approximately 100ft, e.g. FL 195 = approximately 19,500ft).

Option 2

Source data: CAA VFR Aeronautical Chart 1:500K



SW/NE Cross-section with internal vertical division

Lateral Dimension: 5 nm radius circle centred on RAF Marham's ARP	**Vertical Dimension**: Area A: Surface to FL105 Area B: FL105 - FL195

Figure 1 - Airspace Design Option 2

1.7 Type of Airspace

1.7.1 RAF Marham sits entirely within Class G airspace, which does not provide adequate segregation for Protector without a full DAA capability. Consideration has been given to the most appropriate type of airspace to accommodate the Protector activity; a precis follows and is then further summarised in Table 2 below.

1.7.2 In broad terms civil and military regulations specify that without an appropriately approved DAA capability, Protector must be flown using a Layered Safety Approach that specifically requires flight in segregated airspace. Protector is fitted with TCAS II, which may be approved to provide a DAA capability in airspace where all traffic can be expected to be operating a transponder (i.e. transponder-mandatory airspace).

1.7.3 The MOD is producing an Airspace Integration Safety Argument (AISA) for the introduction of Protector into UK airspace. This work aims to develop an evidenced argument for the safe operation of Protector under Instrument Flight Rules (IFR) and under an air traffic service within transponder-mandatory airspace, as well as in suitable segregated airspace.

Table 2 - Proposed Airspace Types for Consideration with MOD Comment		
Type of segregated airspace	Suitability for Protector	MOD Comment
Classes A & C Class D above FL100 or if below FL100 is also a TMZ[5]	Yes	These classes of airspace are not justifiable by the Change Sponsor in terms of: o Restrictions placed on other airspace users; o Air traffic management resourcing; o Flexible use of airspace (notified hours of activation in UK Aeronautical Information Publication (AIP).
Class E	Unknown	Pending AISA for Protector, but thought unlikely to be suitable.
Class G Danger Area	Yes	Less impact on other airspace users since it can be tactically managed (does not have notified hours of activation in UK AIP)
TMZ/RMZ	Possibly	Not being considered for same reasons as noted above for Classes A, C and D,

1.7.4 It is envisaged, therefore, that the most economical type of airspace to be implemented (in terms of hours of activation, access to airspace and staffing resource) would be segregated airspace in the form of a danger area.

1.8 Measures to Minimise the Impact on other Airspace Users

1.8.1 The type of airspace implemented will drive the overall hours of airspace activation. As suggested above, the implementation of segregated airspace in the form of a danger area will provide the most efficient and tactical use of airspace, since the MOD will be able to activate the airspace structures only as and when necessary.

1.8.2 The proposed airspace will not be permanently active; it will only be activated when Protector flying is due to take place (either from RAF Waddington or on departure from RAF Marham). Procedures will be adopted to ensure that the airspace is activated and notified only as and when required. This will involve appropriate Notice To Aviation (NOTAM) action being taken at D-1[6]. To ensure minimum disruption to other airspace users a Special Use Airspace Crossing Service (SUACS) will be offered within all implemented airspace. This means that, even if the airspace has been notified as being active, it may be possible for both civil and military aircraft to transit through it under a clearance from either RAF Marham or Swanwick Military ATC.

1.8.3 Information on the current status of the airspace will be available, including a Special Use Airspace Activity Information Service (SUAAIS) via appropriate military ATC units.

1.8.4 The design of Airspace Design Option 2, enables the proposed airspace to be managed to minimise the impact on other airspace users. Each area is able to be managed independently. For instance, when Area A is occupied by Protector, other traffic may be permitted to access Area B, but as soon as Protector has been given clearance to enter Area B, civil airspace users will not be allowed access to Area A until Protector has cleared the area (e.g. landed). This is a restriction which has

[5] TMZ = Transponder Mandatory Zone.

[6] D-1 means that the NOTAM must be requested the day before the airspace is to be activated.

been imposed by the CAA. MOD may be able to make other arrangements for military traffic. The addition of the split aims to reduce holding times for aircraft wishing to cross the proposed airspace and those which operate to/from airfields situated within the airspace and thus promotes Flexible Use of Airspace (FUA). The proposed level of the division has been selected as FL105[7]; however, to ensure all airspace user requirements are considered, the internal division of the airspace construct will be subject to further engagement at the next phase of the ACP (Stage 3, Consult).

1.9 Utilisation of Airspace

1.9.1 The Change Sponsor anticipates that during the first 6 months of Protector's service in the RAF, the flying tempo will be restricted to one air vehicle at a time during core flying hours Monday – Friday. This is likely to occur up to 3 times per week. It is difficult to predict when the flying tempo will significantly increase, but potentially within the first 24 months of service, there may be up to 2 air vehicles in the air simultaneously. Some night-flying is expected.

[7] FL105 was selected as the same level at which division is made in EGD 324 at RAF Waddington.

2 Section 2

2.1 Methodology

2.1.1 Stage 2B requires an initial appraisal of the impacts of the design options presented in Section 1 against the baseline scenarios.

2.1.2 The chosen methodology is to conduct a simple qualitative assessment of the different options, both positive and negative, against the headings identified in CAP1616f.

2.2 Options Appraisal

2.2.1 Table 3 details the appraisal of Option 2 and the baseline scenarios against the high-level objectives and assessment criteria laid out in CAP1616f. Over and above the requirement in CAP161f, an additional row has been added to the table outlining initial safety considerations in brief. The list is not exhaustive.

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
Communities	Noise	**Civil aircraft:** The mechanism for crossing the airspace associated with this option (SUACS) would be very similar to that of crossing the MATZ. Option 2 has the same lateral footprint as the extant MATZ at RAF Marham. Vertically, Option 2 provides flexibility in facilitating transit within 5 nm of RAF Marham through the split of the proposed airspace into 2 areas, thus reducing changes to noise levels as a result of re-routing/holding outside the proposed airspace. Therefore, noise levels are expected to remain unchanged and it is considered that any consequential impact on noise from this option is very low over and above the impact of baseline scenarios.	**Civil aircraft:** The mechanism for crossing the airspace associated with this option (SUACS) would be very similar to that of crossing the MATZ. Option 2 has the same lateral footprint as the extant MATZ at RAF Marham. Vertically, Option 2 provides flexibility in facilitating transit within 5 nm of RAF Marham through the split of the proposed airspace into 2 areas, thus reducing changes to noise levels as a result of re-routing/holding outside the proposed airspace. Therefore, noise levels are expected to remain unchanged and it is considered that any consequential impact on noise from this option is very low over and above the impact of baseline scenarios. There is intention for Protector to be equipped with a fully certified DAA within this timeframe.	No impact on noise within communities since: • Protector would be unable to operate without Option 2. Therefore, airspace and associated activity would remain unchanged. • Most civil and military pilots would carry on as they do now – ATZ and MATZ would still be in existence. • There is the likelihood that some rerouting already occurs below 3000ft AAL, which is unlikely to change under this scenario. • There is no anticipated change in the number of civil aircraft operating in the local area, nor will the aircraft types be altered.	No impact on noise within communities since: • Protector would be unable to operate without Option 2. Therefore, airspace and associated activity would remain unchanged. • Most civil and military pilots would carry on as they do now. Whilst there may be a change to airspace in the vicinity of military aerodromes in the future it is best to assume that ATZ and MATZ would still be in existence. • There is the likelihood that some rerouting already occurs below 3000ft AAL, which is unlikely to change under this scenario. • There is no anticipated change in the number of civil aircraft operating in the local area, nor will the aircraft types be altered.

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
			Therefore, it is likely that there will be a reduction to volume of proposed airspace. Whilst it is difficult to offer any precise metrics, this could result in reducing the impact on other airspace users and therefore reducing any noise impact.		
Communities	Local Air Quality	The Change Sponsor has assessed that other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. Minimal reduction in overall air quality thought to be possible as establishment of segregated airspace should lead to minimal reroute of General Aviation (GA) aircraft.	The Change Sponsor has assessed that, other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. Minimal reduction in overall air quality thought to be possible as establishment of segregated airspace should lead to minimal reroute of GA aircraft There is intention for Protector to be equipped with a fully certified DAA within this timeframe. Therefore, it is likely that there will be a reduction to volume of proposed airspace. Whilst it is difficult to offer any precise metrics, this could result in reducing the impact on	Protector would be unable to operate without Option 2. Therefore, airspace and associated activity would remain unchanged No reduction in air quality from existing aviation, since civil and military pilots would carry on as they do now – ATZ and MATZ would still be in existence. There is the likelihood that some rerouting already occurs below 3000ft AAL under this scenario which would already impact air quality. As there is no anticipated increase in the number of civil aircraft operating in the local area, nor will the aircraft types be altered,	Protector would be unable to operate without Option 2. Therefore, airspace and associated activity would remain unchanged No reduction in air quality from existing aviation, since civil and military pilots would carry on as they do now. Whilst there may be a change to airspace in the vicinity of military aerodromes in the future, it is best to assume that ATZ and MATZ would still be in existence. There is the likelihood that some rerouting already occurs below 3000ft AAL under this

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
			other airspace users and therefore reducing any impact on local air quality.	the local air quality is likely to remain unchanged.	scenario which would already impact air quality. As there is no anticipated increase in the number of civil aircraft operating in the local area, nor will the aircraft types be altered, the local air quality is likely to remain unchanged.
Wider society	Greenhouse gas emissions	The Change Sponsor has assessed that, other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. There may be a very small increase in greenhouse gas if GA do not / cannot take advantage of a crossing service (e.g. SUACS) to achieve a direct routing	The Change Sponsor has assessed that, other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. There may be a very small increase in greenhouse gas if GA do not / cannot take advantage of a crossing service (e.g. SUACS) to achieve a direct routing. There is intention for Protector to be equipped with a fully certified DAA within this timeframe. Therefore, it is likely that there will be a reduction to volume of proposed airspace. Whilst it is difficult to offer any precise metrics, this could result in	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the greenhouse gas emissions are likely to remain unchanged.	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the greenhouse gas emissions are likely to remain unchanged.

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
			reducing the impact on other airspace users and therefore reducing any greenhouse gas emissions impact.		
Wider society	Tranquillity	The Change Sponsor has assessed that, other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. Due to Infrequent utilisation of the airspace by Protector, the local tranquillity is likely to be unaffected.	The Change Sponsor has assessed that, other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. Due to Infrequent utilisation of the airspace by Protector, the local tranquillity is likely to be unaffected.	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the tranquillity is likely to be unaffected.	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the tranquillity is likely to be unaffected.
Wider society	Biodiversity	The Change Sponsor has assessed that, other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. Due to Infrequent utilisation of the airspace by Protector, the local biodiversity is likely to be unaffected.	The Change Sponsor has assessed that, other than Protector, Option 2 will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. Due to Infrequent utilisation of the airspace by Protector, the local biodiversity is likely to be unaffected.	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the biodiversity is likely to be unaffected.	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the biodiversity is likely to be unaffected.

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
Wider society	Capacity/ resilience	N/A	N/A	Protector would be unable to operate without Option 2. Therefore, no change to the current situation.	Protector would be unable to operate without Option 2. Therefore, no change to the current situation.
General Aviation	Access	There may be a very small impact on ease of access to the airspace proposed by Option 2 by GA. Estimated initial Protector flying tempo will require activation of segregated airspace up to 3 times per week. However, it is expected that Protector will need to access airspace infrequently and for a total of approximately 20 minutes during each departure or recovery phase. Access by GA will be maximised when the airspace is not occupied by Protector by provision of a crossing service (e.g. SUACS). Option 2 provides flexibility in facilitating transit within 5 nm of RAF Marham through the split of the proposed airspace into 2 areas, thus reducing the requirement for GA to re-route or to hold outside the proposed airspace.	There may be a very small impact on ease of access to the Option 2 airspace design options by GA. Estimated initial Protector flying tempo will require activation of segregated airspace up to 3 times per week. However, it is expected that Protector will need to access airspace infrequently and for a total of approximately 20 minutes during each departure or recovery phase. Access by GA will be maximised when the airspace is not occupied by Protector by provision of a crossing service (e.g. SUACS). Option 2 provides flexibility in facilitating transit within 5 nm of RAF Marham through the split of the proposed airspace into 2 areas, thus reducing the requirement for GA to re-	Protector would be unable to operate without Option 2. Therefore, no change to the current situation.	Protector would be unable to operate without Option 2. Therefore, no change to the current situation.

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
		Gliders without communication equipment are likely to be unable to enter the DA, as they would not be able to receive a SUACS.	route or to hold outside the proposed airspace. Gliders without communication equipment are likely to be unable to enter the DA, as they would not be able to receive a SUACS. There is intention for Protector to be equipped with a fully certified DAA within this timeframe. Therefore, it is likely that there will be a reduction to volume of proposed airspace. Whilst it is difficult to offer any precise metrics, this could result in reducing the impact on other airspace users..		
General Aviation / commercial airlines	Economic impact from increased effective capacity	N/A	N/A	N/A	N/A
General Aviation / commercial airlines	Fuel burn	There may be a small increase in fuel burn if GA do not / cannot take advantage of a crossing service (e.g. SUACS) to achieve a direct routing.	There may be a small increase in fuel burn if GA do not / cannot take advantage of a crossing service (e.g. SUACS) to achieve a direct routing	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the fuel	Protector would be unable to operate without Option 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, the fuel

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
				burn is likely to remain unchanged	burn is likely to remain unchanged
Commercial airlines	Training costs	No perceived training costs.	No perceived training costs.	Not applicable	Not applicable
Commercial airlines	Other costs	No other costs anticipated.	No other costs anticipated.	Not applicable	Not applicable
Airport /ANSP	Infrastructure costs	No infrastructure costs will be imposed.	No infrastructure costs will be imposed.	Not applicable	Not applicable
Airport /ANSP	Operational costs	No operational costs anticipated.	No operational costs anticipated.	Not applicable	Not applicable
Airport /ANSP	Deployment costs	No costs anticipated for deployment.	No costs anticipated for deployment.	Not applicable	Not applicable

Table 3 – Summary of options appraisal: Option 2 (at years 1 and 10) and baseline scenarios					
Group	Impact	Option 2: Year 1	Option 2: Year 10	Baseline + 1 Year	Baseline + 10 years
Airport /ANSP	Other costs	No other costs foreseen.	No other costs foreseen.	Not applicable	Not applicable
Safety Considerations (not an exhaustive list)		Pilots being unaware of new airspace Re-route through unfamiliar areas Funnelling as a result of need to re-route Increased controller workload due to funnelling/SUACS requests	Pilots being unaware of new airspace Re-route through unfamiliar areas Funnelling as a result of need to re-route Increased controller workload due to funnelling/SUACS requests	Protector would be unable to operate without Option 1 or 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, there are no safety considerations.	Protector would be unable to operate without Option 1 or 2. Therefore, as the Change Sponsor has assessed that there is no anticipated increase in the number of aircraft operating in the local area, nor will the aircraft types be altered, there are no safety considerations.

2.3 Summary of preferred options

2.3.1 The baseline scenario does not meet the SON or DP2 (*The airspace provides access to a sufficient area to meet operational and training objectives*) and therefore would severely limit Protector's UK training and operational activity. Since the only design option which meets the SON and all of the DPs is Airspace Design Option 2, this is the Change Sponsor's preferred design option.

2.4 Evidence to be collected for Options Appraisal (Phase II) Full

2.4.1 The Change Sponsor will endeavour to firm up the following information to inform the next stage of the Options Appraisal:

- Obtain a more definitive indication of Protector's forecast flying tempo from the Programme Delivery Team, in particular an estimate of projected live flying hours which will inform the likely frequency of segregated airspace activation associated with RAF Marham.

3 Section 3

3.1 Assessment of noise impact and high level assessment of other costs and benefits

3.1.1 CAP1616 requires the Change Sponsor to provide an indication of the likely noise impact for each design and a high level assessment of other costs and benefits. An initial summary is offered in Table 4 below:

Table 4 - Summary of likely noise impact and high level assessment of other costs and benefits

Airspace Design Option	Likely Noise Impact	Other Costs and Benefits
1 Year Baseline	Civil: No additional noise impact as current airspace situation is anticipated to remain unchanged. Protector: No additional noise impact as it would be unable to operate without implementation of Option 2.	The air quality, greenhouse gas emissions, access to airspace and fuel burn will all remain unchanged.
10 Year Baseline	Civil: No additional noise impact as current airspace situation is anticipated to remain unchanged. Protector: No additional noise impact as it would be unable to operate without implementation of Option 2.	The air quality, greenhouse gas emissions, access to airspace and fuel burn will all remain unchanged.
Option 2	**Civil aircraft:** The mechanism for crossing the airspace associated with this option (SUACS) would be very similar to that of crossing the MATZ. Option 2 has the same lateral footprint as the extant MATZ at RAF Marham. The majority of civil pilots already call to cross the MATZ and they are required to avoid the ATZ. Marham ATC reports few civil aircraft transit within 5 nm from Marham without calling on the radio. It is thought, therefore, that the majority of aircraft will continue to call to cross any segregated airspace implemented. The majority of aircraft will opt for a crossing service (SUACS), which will be granted when possible. Occasional re-routing is envisaged if activity within the segregated airspace precludes a clearance. Option 2 provides flexibility in facilitating transit within 5 nm of RAF Marham through the split of the proposed airspace into Areas A & B. This should result in minimising the need to re-route or to hold outside the proposed airspace and thus minimise the impact on noise.	Air quality: Owing to the infrequent utilisation of the airspace by Protector, the local air quality is likely to remain unchanged. Greenhouse gas: There may be a very small increase in greenhouse gas if GA do not / cannot take advantage of a crossing service (e.g. SUACS) to achieve a direct routing. Access: There may be a very small impact on ease of access by GA. Estimated initial Protector flying tempo will require activation of segregated airspace up to 3 times per week. However, it is expected that Protector will need to access airspace infrequently and for a total of approximately 20 minutes during each departure or recovery phase. Access by GA will be maximised when the airspace is not occupied by Protector by provision of a crossing service (e.g. SUACS). Option 2 provides flexibility in facilitating transit within 5 nm of RAF Marham through the split of the proposed airspace into 2 areas, thus reducing the requirement for GA to re-route or to hold outside the proposed airspace.

Table 4 - Summary of likely noise impact and high level assessment of other costs and benefits		
Airspace Design Option	Likely Noise Impact	Other Costs and Benefits
	Therefore, it is considered that any consequential impact on noise from this option is very low.	Fuel burn: There may be a small increase in fuel burn if GA do not / cannot take advantage of a crossing service (e.g. SUACS) to achieve a direct routing.

3.2 Safety Assessment

3.2.1 UK military aviation is regulated by the Military Aviation Authority (MAA). Accordingly, the Protector programme is subject to the MAA Regulatory Publications (MRP). Of particular relevance to the operation of Protector in UK airspace is MAA Regulatory Article (RA) 2320 – MAA regulation for operation of military RPAS. The RA states the criteria for beyond visual line of sight (BVLOS[8]) RPAS operation such that within UK airspace, BVLOS operations should only be conducted if:

- An appropriately approved Detect and Avoid (DAA) capability enables compliance with Rules of the Air appropriate to the class of airspace, or;

- They are flown using a Layered Safety Approach that specifically requires flight in Segregated Airspace, or in Controlled Airspace (Classes A-D) with the informed consent of the Air Navigation Services Provider (ANSP).

3.2.2 When Protector initially comes into service it will be fitted with a limited DAA capability only and, since RAF Marham is located entirely within Class G airspace, flight in segregated or controlled airspace is required and will permit Protector, in the event of an actual or planned (practise) diversion, to access RAF Marham in a safe environment, maintain regulatory compliance, and provide protection of other airspace users of any associated and identified hazardous activities.

3.2.3 The MOD is producing an Airspace Integration Safety Argument (AISA) for the introduction of Protector into UK airspace. This work aims to develop an evidenced argument for the safe operation of Protector under Instrument Flight Rules (IFR) and under an air traffic service within transponder-mandatory airspace, as well as in suitable segregated airspace.

3.2.4 The following operating principles and means of managing the airspace are anticipated to be implemented for the airspace:

- Operating authority. The Operating Authority for the DA is as follows, together with details for the provision of a SUACS and a SUAAIS:

  - Operating Authority - Marham ATC;

    - A SUACS will be available during hours of activation from Marham ATC;
    - A SUAAIS will be available via appropriate military ATC agencies. London Information[9] will also provide a SUAAIS on 124.6MHz.

- Type of airspace. The Change Sponsor intends to implement the required segregation in the form of a danger area, which will provide the most efficient and tactical use of airspace.

[8] The MAA Master Glossary defines BVLOS as the operation of a Remotely Piloted Aircraft beyond a distance where the Remote Pilot is able to respond to or avoid other airspace users by visual means.

[9] See NATS record of Engagement Summary V1.0 Appendix C in ACP-2019-18 on the CAA ACP Portal here for email on agreement to provide service

The MOD will activate the airspace structures only as and when necessary. In other words, only when activity by Protector is planned from either RAF Waddington or RAF Marham itself.

- Notification. The DA will be activated via NOTAM at the latest by D-1. Activation and de-activation of the DA will be requested by RAF Waddington.

- Activation periods. The proposed airspace will not be permanently active; it will only be activated when Protector flying is due to take place. Procedures will be adopted to ensure that the airspace is activated and notified as and when required. This will involve appropriate NOTAM action being taken by D-1 at the latest. The DA airspace would be kept active for the duration of Protector sorties and is likely to mirror the activation periods of the airspace implemented at RAF Waddington (EG D324); this is required in order to facilitate an early recovery to Waddington and to cater for any unplanned emergency situations. It is important to stress that whilst this airspace is required to be active for the entirety of any Protector flying (whether or not Protector makes use of the DA), the DA may not be used as a mechanism by which MOD may exclude other airspace users, other than when Protector is within the airspace or for reasons of routine air traffic safety and co-ordination.

3.2.5 Assessment of potential funnelling. Reference to open-source flight data and to Marham ATC indicates that some very minor funnelling takes place between the RAF Marham MATZ and EG D208 (Stanford) at levels up to FL100. Since the proposed airspace has the same lateral footprint as the MATZ, it is appropriate to conclude that some pilots might still choose to avoid the DA rather than call for a SUACS which could add to the existing funnelling. Taking into account the low numbers of MATZ and overhead crossers even on the busiest flying days[10], the Change Sponsor assesses that even if a small percentage of pilots chose to avoid the DA, there would be a negligible increase to the funnelling of traffic. The Change Sponsor considered whether there was any means of gathering further data to support this assessment during the trial, but after discussion with Marham ATC it was concluded that verifiable data would be difficult to evidence and the workload to obtain it would be disproportionate to achieving a meaningful outcome.

3.3 Application of the CAA Safety Buffer Policy

3.3.1 The Change Sponsor has considered the proposed airspace's status with regard to the safety buffer criteria laid down in Ref A and proposes that it complies with the policy. The airspace is vertically adjacent to Class C airspace but a buffer is not required. For EG D324 (RAF Waddington) and for the airspace trial scheduled for summer 2024 (RAF Marham), the MOD has agreed procedures in place with National Air Traffic Services (NATS), which the CAA has approved. The Change Sponsor will manage a similar process with NATS for this airspace change and present an agreement between MOD and NATS to confirm that no additional buffer is required. This will be presented to the CAA for approval with the formal submission at Stage 4 of the ACP.

3.4 Noise-modelling requirement

3.4.1 CAP1616 also requires Change Sponsors to confirm the minimum noise-modelling category that is required to be applied to the airspace change. In considering what level of noise modelling is required, the MOD has obtained a qualitative assessment of the potential consequential[11] effect of the low level airspace design options on civil traffic from ATC at RAF Marham ATC regarding the number of requests from civil airspace users to cross overhead RAF Marham (both inside and outside the Military Aerodrome Traffic Zone [MATZ]). On an average day, Marham ATC estimate that they will receive around 20 requests for MATZ and overhead crossings from general aviation (GA) (both leisure and sporting) passing within 5 nm overhead and operating below 7000ft above aerodrome level (AAL). Of that 20, up to 10 are estimated to cross above the MATZ. The total number of overhead crossings (inside and outside the MATZ) may peak to the high 20s on the busiest flying days, but is

[10] See para 3.4 – for example, number of civil aircraft crossing above the MATZ is estimated at up to 10 on the busiest days of the year

[11] as this is a MOD ACP, only consequential impacts on civil traffic need to be considered

estimated to be less than 30 on any given day.

3.4.2 Supporting quantitative evidence has also been obtained from Marham ATC in the form of a monthly breakdown of MATZ crossing requests for the 12 months Oct 2022 – Sep 2023 (inclusive). Since Marham ATC does not routinely operate at weekends the figures apply to requests for Monday to Friday only and no further granularity is available. The figures provided are included in the baseline scenarios at Appendix A. The figures support the qualitative estimate above. During the busiest month of Jun 2023 the total number of MATZ crossing requests was 83 under the current airspace construct. This equates to a weekly total of just over 19 requests. Assuming there were 2 or 3 busy flying days in any given week, the figures suggest an average of 6 – 10 MATZ crossing requests per day. Add to this the estimate of up to 10 crossing requests above the MATZ and below 7000ft AAL, this would align with the qualitative estimate of around 20 crossings of the Marham MATZ and overhead.

3.4.3 A point worth noting is that even though the DA may be activated (initially up to 3 occasions per week), it will only be accessed by Protector on an infrequent basis, including in the event of an actual diversion as a result of the main runway at RAF Waddington being declared BLACK. Waddington ATC has provided the number of occasions when the runway at RAF Waddington has been unavailable to aircraft operations due to the runway status being declared BLACK over the last 5 years. The figures are shown in Table 5 below.

Table 5 – Occurrences of RW BLACK at RAF Waddington 2019-23	
Year	Number of Occurrence
2019	3
2020	2
2021	9
2022	3
2023	5

3.4.4 Over the 5-year period 2019 – 2023 the runway at RAF Waddington was not available due to runway BLACK on 22 occasions, an average of 4.4 occasions per year. Whilst the actual figures have not been made available for this submission, a proportion of these occurrences would be due to snow/snow clearing operations, during which Protector would not have been likely to have flown. DACS requests will be denied whilst Protector is actually operating within either Option 2 Area A or Area B, the impact of which is estimated to be a delay of approximately 10 minutes per event. 10 minutes represents 1.67% of a 10 hr flying window. Therefore, based on up to 20 civil airspace users requesting crossings within 5 nm of RAF Marham spread throughout that window, a live diversion inbound or outbound could result in less than 1 aircraft being impacted (20 x 1.67% = 0.2 aircraft) on an average of 4.4 times per year. It is clear that the impact would be minimal overall.

3.4.5 Since the surrounding airspace is Class G, where the majority of the civil air traffic is GA and engaged predominantly in leisure or sporting activity, it would be difficult to predict any definite traffic patterns created or altered by new airspace and hence the production of operational diagrams would be difficult and of no benefit. The Change Sponsor has also assessed that the proposed change will not result in an increase in the number of aircraft operating in the local area, nor will the aircraft types be altered. Therefore, the same amount and type of noise is likely to impact the local population as is currently the case. Since the change is likely to impact only 1 or 2 civil airspace users on the busiest flying day and considering the mitigations put in place (e.g. NOTAM, SUACS), the overall impact of the proposed change on noise is thought to be negligible.

3.4.6 It is felt that the requirement for noise modelling as per CAP2091 is disproportionate to the numbers of aircraft which might be affected and, therefore, the Change Sponsor requests that formal noise modelling be scoped out of the airspace change requirement. Therefore, the Change Sponsor has not confirmed a noise modelling category for this ACP.

3.5 Tranquillity and biodiversity

3.5.1 CAP1616 also requires Change Sponsors to consider effects of new airspace on tranquillity and biodiversity. In a similar vein to the noise-modelling requirement, the Change Sponsor proposes that formal assessment of effects on tranquillity and biodiversity as out of scope for this airspace change. The number of GA aircraft that currently request routing through Marham's MATZ and overhead is deemed to be less than 30 on peak days according to Marham ATC's qualitative assessment, the quantitative assessment discussed in para 3.4 supports this. Most of these aircraft will continue to request and obtain a SUACS to cross the airspace in their current manner, with only a small percentage of them requiring a reroute due to activity within the segregated airspace. This small percentage may result in an interaction with some sensitive areas but the numbers are thought to be so small that the Change Sponsor proposes a formal assessment would be disproportionate to the numbers of aircraft affected and should be scoped out. That said, the Change Sponsor will continue to work with RAF Marham where possible in a co-operative manner to minimise overflight of sensitive areas.

3.6 Habitats Regulations Assessment – Early Screening Criteria

3.6.1 The airspace proposed is designed to segregate activity of a singular air system from other airspace users for a short period (approximately 10 minutes) on an occasional basis. Otherwise, the traffic patterns and number of movements below 3000 feet are considered to be business as usual, excepting when Protector is utilising, or is shortly due to utilise, the airspace. In this instance, traffic levels are likely to be less than usual. Therefore, the Change Sponsor proposes that the Habitats Regulations Assessment is not required.

4 Section 4

4.1 Next steps in this proposal

4.1.1 This document will be submitted to the CAA as evidence to support the ACP-2023-022 Stage 2B.

4.1.2 It is part of the documentary evidence for the Stage 2 Assessment Gateway, scheduled for 26 Apr 2024).

4.1.3 The following CAP1616 timeline is anticipated:

Gateway Event as per CAP 1616	Planned Date
Stage 3 – Consult	31 May 2024
Stage 4 – Update and Submit	23 Sep 2024
Stage 5 - Decide	13 Jan 2025
Stage 6 - Implement	17 Apr 2025

Appendix A: ACP-2023-022 - Baseline Scenarios V2.0

1. Context.

1.1. Year of implementation

1.1.1. RAF Marham sits within class G airspace, which does not provide adequate protection or segregation for the equipment configuration of Protector. Civil[1] and military[2] regulations specify that without an appropriately approved Detect And Avoid (DAA) capability to enable compliance with the Rules of the Air appropriate to the class of airspace, Protector must be flown using a Layered Safety Approach that specifically requires flight in segregated airspace. Protector does not currently have an appropriately approved DAA appropriate to Class G airspace and therefore, is unable to access the airspace above and around RAF Marham. A map of the local area is at Figure 1.

1.2. Year 10

1.2.1. As the Protector programme progresses, it is anticipated that there would be advances in technology permitting the development and instalment of an appropriate DAA system on the airframe within the next 10 years. Should this be the case, then the required airspace would either be significantly reduced or negated.

2. Structures routes, procedures and behaviours.

2.1. Year of implementation

- RAF Marham Air Traffic Zone (ATZ) is a circle 2·5 nm radius centred on Marham's aerodrome reference point (ARP), notified from surface to 2000ft Above Aerodrome Level (AAL). The Military Air Traffic Zone (MATZ) is a circle 5 nm radius centred on Marham's ARP and is notified from surface to 3000ft AAL. Pilots must call Marham Zone on frequency to obtain permission to enter the ATZ. No reply on the Zone frequency will indicate that Marham MATZ can be crossed but pilots must continue to avoid the ATZ unless operating in accordance with previously agreed procedures. Marham Zone is activated in order to protect operational flying and so aligns with its military flying requirements; all opening hours are routinely promulgated via a Notice To Aviation (NOTAM).

2.1.1. Directly above and surrounding RAF Marham the airspace is Class G up to Flight Level FL195; Class C extends from FL195 upwards. During specified hours, the airspace is activated as a Temporary Reserved Area (TRA 003). Although the background classification between FL195 and FL245 is Class C, to avoid operational restrictions, military aircraft may operate autonomously or in be receipt of an air traffic service (when not occupied by Unmanned Air Vehicles (UAV)). MOD and United States Air Force (USAF) aircraft are the predominant users but use of the TRA is not restricted to military users. Above the TRA is the East Anglia Military Training Area (EAMTA), FL 245 to FL 660. A cross-section diagram of the local airspace is at Figure 2.

2.1.2. RAF Lakenheath and RAF Mildenhall are situated adjacent to one another approximately 15NM to the South of RAF Marham. The airfields each have an ATZ (2.5 NM radius, up to 2000ft) and have a Combined MATZ (CMATZ) with a 5NM radius centred on each RP with a vertical limit of 3000ft. RAF Lakenheath provides the radar ATC services for both airfields. A Letter of Agreement (LOA) is in force between RAF Lakenheath and RAF Marham to mitigate the risk of collision of departing and arriving Air Systems (AS) at both airfields. RAF Lakenheath is home to the U.S. Air Forces in Europe (USAFE) Fighter Wing operating F-35 and F-15 aircraft. RAF Mildenhall serves heavy air transport aircraft including the KC-135 aerial refuelling capability, RC-135V/W Rivet Joint reconnaissance aircraft plus the MC-130J and CV-22 Osprey transport aircraft.

[1] CAP 722 - Unmanned Aircraft System Operations in UK Airspace - Guidance (caa.co.uk)

[2] RA 2320 – Flight Procedures: Role Specific S2 and Certified Remotely Piloted Air Systems (publishing.service.gov.uk)

2.1.3. To the East of RAF Marham by approximately 20 NM is Norwich Airport (NAL), surrounded by a Control Zone (CTR) and a Control Area (CTA), both up to 4000ft. An LOA is in place to facilitate safe ATC service to traffic to and from NAL and aircraft operating under the control of RAF Marham.

2.1.4. EG D208 Stanta is a Danger Area located 10 NM South East of RAF Marham. Utilised for ordinance, para dropping and Unmanned Air Systems (UAS) it is active from surface to 2500ft ALT (Occasionally (OCNL) up to 7500ft by NOTAM) and controlled by Lakenheath zone on 128.900MHz.

2.1.5. RAF Marham is 10NM to the South of Sandringham House, which is subject to Restricted Area (RA) EG R219, with 1.5M radius centred on 524948N 0003049E from surface up to altitude 2000ft.

2.1.6. Sculthorpe MOD Training Area is located around 15 NM North East of RAF Marham for Close Air Support (CAS), Joint Force Air Component (JFAC) or Para/Air-dropping activity. All UK Military AS's operating in the vicinity of Sculthorpe are to contact RAF Marham on VHF 124·150[3].

Figure 1: RAF Marham Local Area. Source data: CAA VFR Aeronautical Chart 1:500K

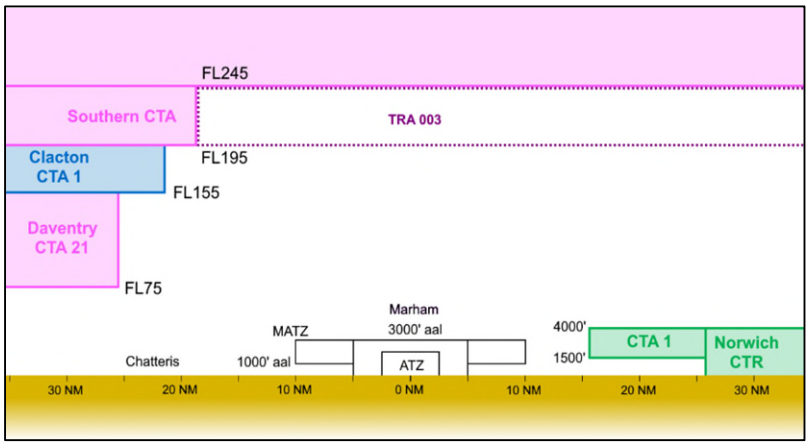


Figure 2: Cross-section Diagram of RAF Marham Local Airspace

2.2. Year 10

2.2.1. No anticipated changes.

Airspace usage.

2.3. Year of implementation

2.3.1. RAF Marham.

i. RAF Marham's assets are:

- The F-35 Lightning (617 & 207 Sqns), a 5th Generation, multi-role, stealth fighter.
- Two Slingsby Aviation Firefly aircraft for the provision of flying training through the RAF Aero Club, which is active both during the week and at weekends in the local vicinity (up to 15NM away).
- A small Model Flying Club, active mainly during weekend hours or outside flying operations.

[3] Source: UK MIL AIP AD 2 – EGYM

- Marham also has 809 Naval Air Squadron, with further force growth planned[4].

ii. The aerodrome operating hours are notified as follows, although it should be noted that RAF Marham currently operates a flexible flying window and times may differ from them at short notice:

- 0800 – 2359 Mon – Thu

- 0800 – 1800 Fri

iii. It is not possible to quantify routine aviation activity at RAF Marham[5] as there is no typical day. F-35s may operate as single AS or in formation, conducting anything from four to seven sorties in a 24-hour period. These may consist of; visual and instrument circuits at the aerodrome; departure to operate within 30NM for general handling; departure to operate in EG D323 over the North Sea.

iv. RAF Marham hosts numerous practice diversions (PD) throughout the day, mainly from RAF Lakenheath and RAF Cranwell, averaging 4 – 5 PDs per day.

2.3.2. Other military activity.

i. The airspace directly surrounding and overhead RAF Marham is used by fast jets for training up to FL245 by RAF Coningsby, RAF Lakenheath and RAF Marham airspace users, who conduct general-handling and air combat training, as well as simulated surface attack in vicinity of RAF Marham.

ii. The local Stanta range is also host to many close air support and forward air control exercises, supported by fast jets. The F-35B Practice Flame Out (PFO) approach demands surface--10,5000ft within 5nm of the airfield for overhead PFOs.

iii. On a daily basis Lakenheath departures and arrivals route through the Marham overhead to/from the D323 complex; departures from Lakenheath over fly the edge of the RAF Marham western MATZ stub and aircraft returning under VFR over fly the central MATZ. The vast majority of Mildenhall departures transit in the vicinity of Marham due to the TACAN provision.

iv. RAF Marham also accepts occasional Practice Diversions (PDs) from RAF Lakenheath; these are all co-ordinated through routine ATC means. RAF Cranwell and RAF Barkston Heath on occasion make use of Marham as their booked Diversion. Any such diversion commitment would be for up to 19 aircraft (Prefect) potentially plus four aircraft (Phenom).

2.4. Year 10

2.4.1. Forecasting out to 10 years is a challenging task from a MOD perspective. Over the past 4 years, RAF Marham's annual airfield movements have seen an increase from 5002 in 2020, to 8582 in 2023, shown at Table 1[6]; almost 60% in traffic growth. This is a result of the RAF receiving 37 F35s to date, less than half of the total expected number.

Year	Total No. of Airfield Movements
2020	5002
2021	5422
2022	7727
2023	8582

Table 1: RAF Marham Annual Airfield Movements

[4] Growth rate of 809 Naval Air Sn was not provided by the stakeholder

[5] Source for all RAF Marham activity data: RAF Marham ATC

[6] Source: RAF Marham ATC

2.4.2. RAF Marham expects to host a total of 87 F35s, divided into 4 Sqns (three operational and 1 trg). This will represent a significant increase in sortie rate within the proposed airspace. Increased force growth at Lakenheath and cooperation with USAFE F35s means it is likely that RAF Marham air traffic levels will continue to grow the rate seen over the last 5 years for at least the next five.

3. Civilian Aviation Activity.

3.1. Year of implementation

3.1.1. NAL, serves circa 2700[7] aircraft movements annually, including scheduled and charter aircraft as well as offshore oil/gas/wind farm transportation. The CTA and CTR do not impact the RAF Marham MATZ.

3.1.2. The local area is populated by numerous civil airfields and airstrips supporting leisure flying (general aviation, gliding, paragliding and parachute activity). Of note are East Winch and Broughton (North and South) private landing strips, all of which are within the RAF Marham MATZ. LOAs have been implemented with these airfields, in addition to agreements with Rookery Farm, Great Massingham and Southery Airfields which are situated in the local vicinity.

3.1.3. The East Anglia Air Ambulance (EAAA) from both Cambridge and Norwich operate in the local area and require occasional access to cross the RAF Marham ATZ/MATZ at short notice in response to Helicopter Emergency Medical Service (HEMS) tasking.

3.1.4. RAF Marham is frequently used for both FW and RW VVIP movements, military and private. VVIP FW movements require the establishment of CAS-T.

3.1.5. Gliding activity generally takes place to the west and south of RAF Marham and is predominantly up to 4000ft. When the weather conditions are suitable, gliders also frequently cross to the north and east of Marham.

Whilst the MATZ is not a mandatory avoid for civil pilots, the majority of civil pilots call RAF Marham ATC when flying in proximity to the aerodrome and when requiring to transit within 5 nm of RAF Marham. A qualitative assessment was obtained from Marham ATC regarding the number of requests from civil airspace users to cross overhead RAF Marham (both inside and outside the MATZ). On an average day, RAF Marham ATC estimates that it will receive around 20 requests for MATZ and overhead crossings from general aviation (GA) aircraft (both leisure and sporting) passing within 5 nm overhead and operating below 7000 FT AAL. This may peak to the high 20s on the busiest flying days, but is estimated to be less than 30 on any given day. Supporting quantitative evidence has also been obtained from RAF Marham ATC in the form of a monthly breakdown of MATZ crossing requests for the 12 months Oct 2022 – Sep 2023 (inclusive). The figures are provided in Table 1[8] below. Since Marham ATC does not routinely operate at weekends the figures apply to requests for Monday to Friday only and no further granularity is available. Most requests for MATZ crossings are approved with minimum restrictions to the requested route and altitude. An occasional route alteration may be proposed by ATC to sequence crossers with RAF Marham traffic patterns either by lateral or vertical means. Outside the ATZ pilots are not duty-bound to accept the re-route and do not always do so, choosing to follow their stated route and keep a good lookout.

3.1.6. Approximately 10 civilian aircraft per day transit the RAF Marham overhead, above the MATZ. In addition, it is estimated that 50-60 military aircraft also pass overhead. Predominantly from RAF Lakenheath, the aircraft depart heading 240° for 3NM, then turn to the NE to pass over RAF Marham above FL 70.

3.1.7. The airspace surrounding Marham benefits from air traffic services provided by several military and civilian ATC units with good coverage under the Lower Airspace Radar Services (LARS) network. Aircraft operating in the vicinity RAF Marham who wish to obtain an air traffic service typically receive a LARS from

[7] Source: Table_03_Aircraft_Movements_PDF.rdl (caa.co.uk)

[8] Source: RAF Marham ATC

either RAF Marham or NAL. The Change Sponsor is not aware of any particular issues regarding operational delays or choke points which should be considered.

Month	Number of MATZ Xers
October 22	48
November 22	41
December 22	14
January 23	32
February 23	33
March 23	71
April 23	73
May 23	36
June 23	83
July 23	46
August 23	57
September 23	54

Table 2: MATZ Crossers Oct 2022 to Sep 2023

3.2. Year 10

3.2.1. Estimated Class G airspace traffic growth in this area is likely to be generated by USAFE operations together with GA traffic and will be dependent on various economic and social factors that are impossible to predict (e.g. fuel costs, GDP etc.). Therefore, although the data provided below at Table 3[1] indicates an overall increase in both LARS traffic and MATZ crossers at RAF Marham, no further granularity is available on which to evaluate a reliable 10 year forecast.

3.2.2. The MOD is not aware of any significant forecast increase in civil traffic in the vicinity of RAF Marham, from both the commercial and GA perspective.

Year	LARS	MATZ Crossers
2020	4043	599
2021	4952	907
2022	5815	615
2023	5556	616

Table 3: RAF Marham Annual Statistics

4. Safety Risks.

4.1. Year of implementation

4.1.1. There are no anticipated safety risks.

4.2. Year 10

4.2.1. There are no anticipated changes to safety risks.

5. Local features below 7,000ft.

5.1. Year of implementation

[1] Source: RAF Marham ATC

5.1.1. Within the RAF Marham MATZ there are no densely populated areas. Whilst there are no adjacent National Parks[2] or Areas of Outstanding Natural Beauty (AONB)[3], an Air Quality Management Area (AQMA)[4] has been located on the edge of the MATZ boundary at Swaffham.

5.2. Year 10

5.2.1. There are no anticipated changes to local features below 7,000ft.

European sites overflown below 3000ft.

5.3. Year of implementation

5.3.1. The Change Sponsor is aware of one current Special Area of Conservation (SAC) pertaining to the Norfolk Valley Fens[5]. There are no Special Protection Areas (SPA)[6]; Ramsar sites[7] (wetlands of international importance) or Compensatory habitat (areas secured to compensate for damage to SACs, SPAs and Ramsar sites).

5.4. Year 10

5.4.1. There are no anticipated changes to European sites overflown below 3000ft.

6. Environmental impacts.

6.1. Year of implementation

6.1.1. There are no anticipated environmental issues (including tranquillity, biodiversity or air quality) within the structure.

6.2. Year 10

6.2.1. There are no anticipated changes to environmental issues (including tranquillity, biodiversity or air quality) within the structure.

7. Local Context.

7.1. Year of implementation

7.1.1. There are currently nine planning applications in place within the Marham MATZ (7 minor, two major), none of which impact the airspace; there are no planning agreements[8][9].

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[2] Source: https://www.nationalparks.uk/

[3] Source: Areas of outstanding natural beauty (AONBs): designation and management - GOV.UK (www.gov.uk) and Magic Map Application (defra.gov.uk)

[4] Source: Defra, Air Information Resource Air Quality Management Areas (AQMAs) - Defra, UK. Breckland District Council Air Quality Management Area Number 2 Order 2017 is an area to the north and south of Swaffham town centre with declared Nitrogen dioxide NO2 pollutant (https://uk-air.defra.gov.uk/aqma/details?aqma_ref=1654#1259)

[5] Source: Norfolk Valley Fens - Special Areas of Conservation (jncc.gov.uk). The Norfolk Valley Fens is where main concentration of lowland Alkaline fens occurs, plus species of Narrow-mouthed whorl snail and Desmoulin's whorl snail.

[6] Source: Natural England Access to Evidence - Special Protection Areas Map

[7] Source: Ramsar (England) | Ramsar (England) | Natural England Open Data Geoportal (arcgis.com)

[8] Source: View and track planning applications | View and track planning applications | Borough Council of King's Lynn & West Norfolk (west-norfolk.gov.uk)

[9] Source: MyNearest | Borough Council of King's Lynn & West Norfolk (west-norfolk.gov.uk)

7.1.2. RAF Marham has existing noise abatement procedures[10] to avoid Fincham and Castle Acre. There are no noise action plans[11] within the RAF Marham MATZ that the Change Sponsor is currently aware of.

7.2. Year 10

7.2.1. There are no anticipated changes to the local context.

Local Trade-offs and Priorities

7.3. Year of implementation

7.3.1. There are no anticipated local trade-offs of priorities.

7.4. Year 10

7.4.1. There are no anticipated local trade-offs of priorities.

[10] Source: UK MIL AIP AD 2 – EGYM

[11] Source: Noise Action Plan (2019): Agglomerations (Urban Areas) (publishing.service.gov.uk)