ACP-2023-003

Temporary Danger Area for Protector T&E Flying at RAF Waddington

Submission – Version 1.2

Roles

Action	Role	Date
Produce	Airspace Change Team UAS CDC	15 Aug 23
Review	DAATM	15 Aug 23
Approve	Change Sponsor RAF AIR Cap	15 Aug 23

Drafting and Publication History

Issue	Date	Change Summary
1.0	15 Aug 23	Initial issue
1.1	18 Aug 23	Amendments made to Appendix A with respect to updated issue of Ref A (SARG Policy Statement). This statement was updated on 17 Jul 23 and amendments to paragraph numbering and text are highlighted with a vertical line in left margin
1.2	21 Aug 23	Amendment to para 10 reference the how details will be provided for stakeholders to provide feedback during the periods of the TDA activation.

Contents

Reference

A. SARG - Policy Statement - SPECIAL USE AIRSPACE - SAFETY BUFFER POLICY FOR AIRSPACE DESIGN PURPOSES

1. Introduction

1.1 ACP-2023-003 is a new airspace change, the purpose of which is to establish temporary segregated airspace in the form of a Temporary Danger Area (TDA) in the vicinity of RAF Waddington for a period of 3 weeks prior to the implementation (if successful) of new permanent airspace through ACP-2019-18.

1.2 On pages 5 and 6 of this document Figure 1 illustrates the lateral dimensions of the TDA at RAF Waddington and Figure 2 illustrates a cross-section of the TDA from a north/south perspective. Figure 3 illustrates a cross-section from a west/east perspective.

1.3 The airspace will be used by Protector, a large Remotely Piloted Air System (RPAS) being procured by the MOD and due to come into service late in 2023, for which the MOD has commenced an airspace change (ACP-2019-18). Protector has a 79ft wingspan and is 38ft long. It is powered by a single TPE 331-10 turbo-prop engine and will be certified to fly in UK airspace.

2. Timings

2.1 This TDA proposal aims to introduce the lower volume of airspace associated with ACP-2019-18 3 weeks early, to enable the MOD to conduct of a small number of time-critical proving flights.

2.2 The fundamental requirement for these flights is to demonstrate and confirm that the automatic take-off and landing capability[1] (ATLC) patterns at RAF Waddington are suitable for in-service operations prior to the commencement of the full Test and Evaluation (T&E) flying schedule post 30 Nov 2023. For this reason this initial activity has been brought forward by 3 weeks with the intention of completing 3 flights spread across the 3 week period.

2.3 Times of TDA activation will be promulgated by Notice to Aviation (NOTAM) at least 24 hours before the activity.

3. Feedback from Stakeholder Engagement

3.1 The Change Sponsor received responses from 17 stakeholders. The engagement responses did not provide any suggestions that led to amendment to the proposed TDA design and no comments requiring a change to the notification procedures or airspace management that had been presented in the engagement letter. Therefore, the final dimensions remain as proposed in the engagement material

4. TDA Dimensions

4.1 The dimensions of the TDA in the vicinity of RAF Waddington are in Table 1 below. Figures 1 - 3 depict the proposed TDA in plan and cross-section views

[1] Protector features an automatic takeoff and landing capability (ATLC) that allows the aircraft to be launched and recovered without any operator interaction

Identification and Lateral Limits	Vertical Limits	Remarks
EG DXXX A circle, radius 5 NM, centred on 530958N 0003126W	Upper Limit: FL105 Lower Limit: Surface	Activity: UAS Beyond Visual Line of Sight (BVLOS) Hours: Activated by NOTAM DACS: RAF Waddington Frequency: Waddington Zone on 119.500MHz and 232.700MHz Tel: Waddington ATC Switchboard on 01522 727452 Sponsor: MOD

Table 1- Dimensions for TDA at RAF Waddington

Figure 1 - RAF Waddington TDA Design

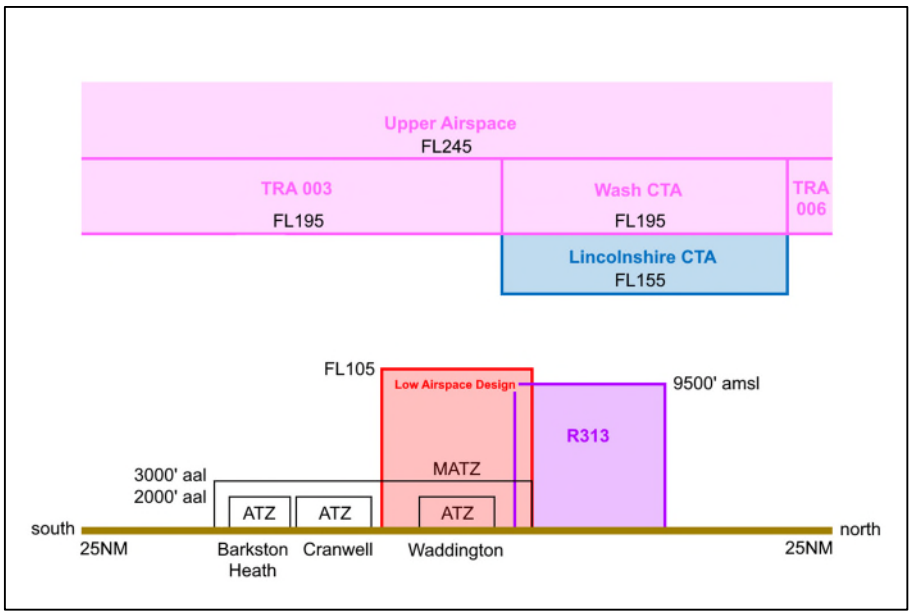


Figure 2 - RAF Waddington N/S TDA Cross-section

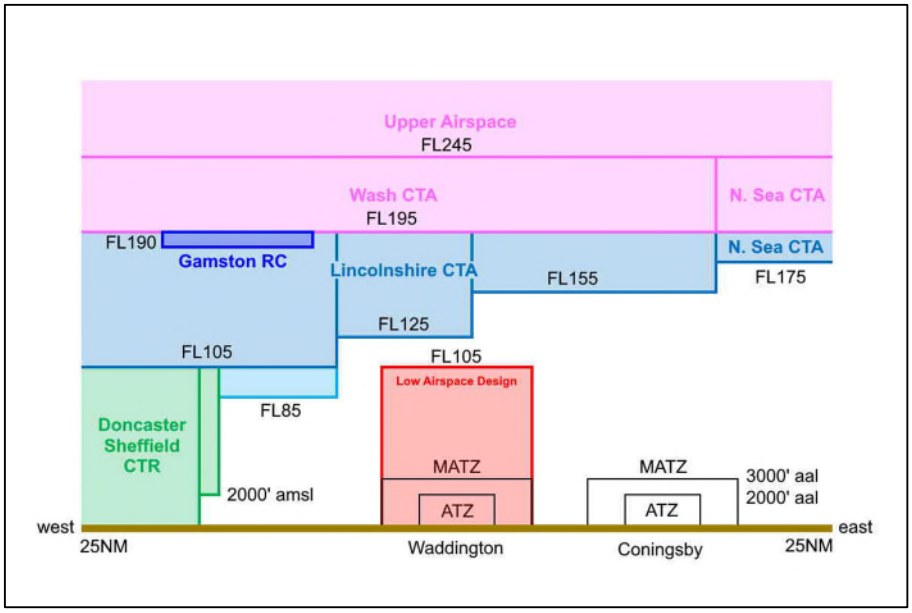


Figure 3 - RAF Waddington TDA W/E Cross-section

5. Airspace Management

5.1 The Operating Authority for the TDA is as follows together with details for the provision of a Danger Area Crossing Service (DACS) and a Danger Area Activity Information Service (DAAIS):

- Operating Authority - Waddington ATC;
- A DACS will be available during TDA hours of activation from Waddington ATC;
- A DAAIS will be available from Waddington ATC during TDA hours of activation and ATC opening hours. London Information[2] will also provide a DAAIS on 124.6MHz.

[2] See last record of Engagement Summary V1.0 Appendix B for email on agreement to provide service

5.2 Activation and de-activation of the TDA will be requested by RAF Waddington.

5.3 MOD has already drafted an extensive set of letters of agreement (LOAs) defining draft ATC procedures in association with ACP-2019-18 and presented them at Annex B to ACP-2019-18's Stage 4B submission to the CAA. The relevant LOAs are presented with this submission in draft form and make reference to both Protector and RAFAT activities in the 2 volumes of airspace associated with the permanent airspace change. The Change Sponsor proposes that those documents which are relevant to the TDA operation are finalised prior to activation of the TDA and will arrange for the CAA to have sight of the documents on completion if required. The draft documents are included in this submission at Appendix B.

6. Application for dispensation from CAA Safety Buffer Policy

6.1 The Change Sponsor has considered the proposed airspace's status with regard to the safety buffer criteria laid down in Ref A. Supporting work for ACP-2019-18 was undertaken within the MOD and with NATS with regards to the CAA safety buffer policy due to the proximity of the Lincs CTA to the proposed airspace designs. An application for the airspace proposed in this ACP is at Appendix A to this document. It is an abridged version of the application presented with ACP-2019-18. Appendix A also presents confirmation that NATS has accepted the mitigations presented by MOD and had no further comment or concerns. For clarity this confirmation is separate from that presented with ACP-2019-18.

7. Notification

7.1 The TDA will be activated via NOTAM, at least 24 hours in advance of operations.

8. Environmental Assessment

8.1 The Change Sponsor presented the CAA with a rationale to scope out the requirement to provide an environmental assessment for this ACP. The rationale was as follows:

- the TDA proposed under ACP-2023-003 is identical to the Low airspace design in the permanent ACP-2019-18;
- the analysis for ACP-2019-18 demonstrated that there would be minimal impact to other airspace users;
- the usage of the TDA is likely to be just 3 single flights during the 3 week period requested.

8.2 The CAA accepted this rationale along with items presented from the environmental assessment from ACP-2019-18 and information included in the engagement material for ACP-2023-003

9. Informing of any affected communities prior to airspace change decision

9.1 The Change Sponsor has a responsibility to determine if there are there any communities that may be affected by the TDA or by consequential impact of the TDA that have not been engaged with as part of the ACP process and if so to detail how these communities will be advised of any such impact. Firstly all communities that might have been impacted by this temporary airspace change have been engaged with during this process (the Change Sponsor did not restrict engagement to just aviation stakeholders, but extended to appropriate non-aviation authorities and organisations). In addition the mechanism for crossing the airspace associated with the TDA (via a DACS) would be very similar to that of crossing the MATZ, and the fact that the TDA has the same lateral footprint as the extant MATZ at RAF Waddington, any changes to traffic patterns should a DACS not be available is

likely to be very similar to those experienced today. Therefore, the Change Sponsor assesses that there is no requirement to formally inform any additional communities before a decision is taken by the CAA about its implementation.

10. MOD Action during TDA Activation

10.1 The MOD will collate, monitor and report to the CAA on stakeholder feedback received during the periods of the TDA activation. This will be managed throughout the duration of the TDA. The means by which to provide feedback will be communicated in 2 ways:

- The Change Sponsor will provide contact details for all stakeholders on the CAA ACP Portal in the event that the TDA is approved and will provide a link to all identified stakeholders via direct email;
- Details will also be provided in the AIC notifying the TDA.

10.2 Once the TDA has ended any feedback collected during the period of activation shall be compiled into a summary report and presented to the CAA for review.

11. Enquiries about the TDA

11.1 Enquiries relating to the subject TDA should be directed to AR Ops 01293 768202 in the first instance.

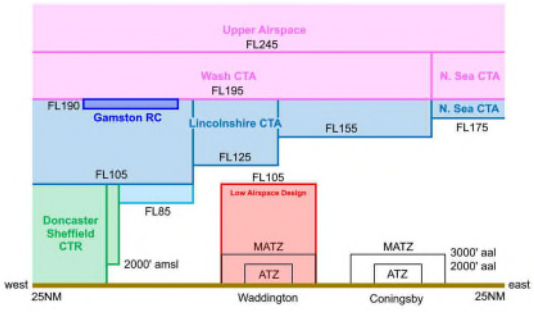
Appendix A

Application for Dispensation from the CAA Safety Buffer Policy wrt ACP-2023-003

Reference: SARG - Policy Statement - SPECIAL USE AIRSPACE - SAFETY BUFFER POLICY FOR AIRSPACE DESIGN PURPOSES dated 17 July 2023

1 ACP-2023-003 Airspace Design

1.1 The proposed airspace associated with ACP-2023-003 comprises one single volume of segregated airspace in the form of a temporary danger area as shown in Figure below:

<table>
<tr>
<td>  </td>
<td><u>Proposed Airspace Design</u>
 

Proposed airspace design cross-section WNW/ESE</td>
</tr>
<tr>
<td>Lateral Dimensions:

Low - 5 nm radius circle centred on RAF Waddington’s aerodrome reference point[3] (ARP).</td>
<td>Vertical Dimensions:

Low – Surface – FL105</td>
</tr>
</table>

Figure 1–Proposed Airspace Design

1.2 Protector requires access the proposed airspace to demonstrate and confirm that the automatic take-off and landing capability[4] (ATLC) patterns at RAF Waddington are suitable for in-service operations prior to the commencement of the full Test and Evaluation (T&E) flying schedule post 30 Nov 2023. For this reason this initial activity has been brought forward by 3 weeks with the intention of completing 3 flights spread across the 3 week period

[3] RAF Waddington’s airfield reference point is the midpoint of RW02/20 (530958N 0003126W)

[4] Protector features an automatic takeoff and landing capability (ATLC) that allows the aircraft to be launched and recovered without any operator interaction

2 **Safety Buffer Policy**

2.1 Paras 2.4 and 2.5 of the reference document lay out the types of activity which require a buffer to be applied and the buffer criteria. Of note for ACP-2019-18 and ACP-2023-003, it states:

> *2.4 …The following descriptors as listed in the UK AIP (ENR 1.1 Para 5.1.3.2.1) require the application of a lateral and vertical buffer:*
>
> *• High Energy Manoeuvres.*
> *• Unmanned Aircraft System Beyond Visual Line of Sight (BVLOS).*
> *• Unmanned Aircraft System Beyond Visual Line of Sight (BVLOS) with an Indicated Airspeed (IAS) of 150 KTS or less.*
>
> *2.5 The following buffer criteria shall be applied to the activities described in paragraph 2.4:*
>
> *a. Lateral Buffer Requirement. A lateral safety buffer shall be established and promulgated in order that the minimum separation between structures will be:*
>
> *(1) 5nm from the edge of a TMA, CTR or CTA (excluding the Upper CTA).*
>
> *(2) 10nm from ATS Routes above FL195.*
>
> *b. Vertical Buffer Requirement. SUA shall be established and promulgated in order that a minimum separation of 2000ft above or below structures will be maintained.*
>
> *c. The above criteria may be achieved through airspace design or ATM procedures. Similarly, where a new controlled airspace structure or ATS Route is proposed, it may not be established where the above criteria would be infringed.*

2.2 The document also contains the following note at para 3.3:

> *3.3 Where SUA is established only to support BVLOS UAS operating at IAS of 150kts or less, the airspace buffer as stated in sub-paragraph 2.5a may, subject to appropriate mitigation (see paragraph 3.1), be reduced by 2nm*

3 The ACP Change Sponsor is hereby applying for dispensation iaw Ref A, has assessed the separation requirements and presents the following application with appropriate mitigations.

- The proposed airspace was designed with safety buffer policy requirements in mind;

- Vertical dispensation is not required since the top level of the proposed airspace is 2000 ft below the relevant sectors of the Lincs CTA (CTA2 and CTA1);

- CTA3 and CTA13 have base levels of FL105 and are located within 5 nm of the proposed airspace. Therefore, dispensation to reduce lateral separation between these structures is sought iaw para 3.3 of the document (UAS with IAS of 150kts or less). The MOD presents additional mitigation in the form of positive ATC management provision. The minimum distance of the boundary of the proposed airspace is 3.1 nm from the closest points of CTA3 and CTA13, so an external 3 nm lateral buffer is achieved;

- In the event of a loss of link Protector will remain within its segregated airspace at all times.

4 NATS has accepted the mitigations presented by MOD and had no further comment or concerns (see Attachment 1 to this Appendix)

Attachments

1. Email from NATS to MOD dated 10 Aug 23

Appendix A - Attachment 1

From: [redacted]

Sent: 10 August 2023 14:58

To: UASCDC-ACP <UASCDC-ACP@qinetiq.com>

Cc: [redacted]

Subject: RE: UC ACP-2023-003 Stakeholder Engagement Letter V1.0

Hi [redacted]

With respect to ACP-2023-003, NATS has previously indicated that the TDA associated with this ACP has **no impact** on NATS NERL plc. The separate discussions associated with ACP-2019-18 are not relevant to this ACP (ACP-2023-003). NATS does not require to undertake any further safety analysis with respect to ACP-2023-003. NATS has no further comment to make regarding ACP-2023-003 with respect to the CAA's Buffer Policy

Regards

[redacted]

NATS

[redacted]

Manager NATS Operational Policy
E: [redacted]
M: [redacted]

NATS Internal

Appendix B

DRAFT MOD AIR TRAFFIC MANAGEMENT PROCEDURES FOR PROTECTOR AND RAFAT OPERATIONS IN SUPPORT OF ACP-2019-18.

Sponsor – 2 Group, Battlespace Management Ops SO2 A3/5 Area

The following draft procedures summary has been developed following a series of working groups led by 2Gp BM Ops in support of the Protector and RAFAT[5] Airspace Change Proposal (ACP)[6] submission. It is acknowledged that further development and refinement of the Protector procedures will be required as it is brought into service, and that these procedures are subject to change in consultation with relevant Air Navigation Service Providers (ANSPs).

References (B & C) have been greyed out are not relevant to the TDA submission.

References:

2. Ref A: 00000000-LoA-LINCS TATCC-56Sqn-78Sqn-WAD-CWL-RAFAT Draft-O
3. Ref B: 00000000-LoA Lincs TATCC & 78 Sqn RPAS handovers-O
4. Ref C: 00000000-78 Sqn NATS RPAS Procedures Draft-O
5. Ref D: 00000000-WAD LoA with LNAA Draft-O
6. Ref E: 00000000-WAD Twr BMFA LOA Draft-O
7. Ref F: 00000000-CON Rwy 07RH GCA vs RAFAT Order-O
8. Ref G: 00000000-WAD Ops Airspace Booking Procedure Draft-O
9. Ref H: 00000000-WAD Protector Start procedure-O
10. Ref I: 00000000-WAD Protector Procedures-O
11. Ref J: 00000000-WAD SAoC Protector-O
12. Ref K: 00000000-2Gp BM SAofC-02_23-Protector Operations-Draft-O

[5] Protector RG Mk1 is a certified category RPAS[5], due to operate in UK airspace on the Military Register from 2023. Initially, Protector will only be authorised to fly in segregated or controlled airspace with the aim being to subsequently achieve Flight in Non-Segregated Airspace (FINAS). MAA RA1600 details the classification of RPAS.

[6] ACP-2019-18

Letters of Agreement

1. The following major letters of agreement will be finalised prior to the commencement of RAFAT and Protector flying in Q3 2023:

   a. A draft LoA between 56 Sqn/Waddington ATC/Lincs TATCC/78 Sqn is at **Ref A** and includes:
      i. Airspace activation.
      ii. Prenotification of sortie details.
      iii. Conditions for transfer of control between agencies which is expanded via a further draft LoA at **Ref B** between Lincs TATCC and 78 Sqn.
      iv. Provision of a Danger Area Crossing Service (DACS) and communication between agencies with respect to DACS.
      v. Standing agreement coordination for the provision of separation minima against known, validated, and verified local sqks.

   b. An LoA between NATS/78 Sqn, for which draft procedures are at **Ref C** will include:
      i. Notification procedures of the aircraft's intended routing and levels.
      ii. Co-ordination procedures.
      iii. Communication procedures and actions in the event of 'lost link'.

2. A review of extant letters of agreement held at local level (RAF Waddington, Cranwell, Coningsby ATC and TATCC) has been conducted and draft changes to agreements and procedures are at Ref D, E and F, these include:

   a. **Ref D** – Draft LoA between Wad ATC and Lincs Air Ambulance
   b. **Ref E –** Draft LoA between Wad ATC and the British Model Flying Association.
   c. **Ref F** – Draft Changes to Cgy ATC procedures for operations when Rwy 07 is in use.

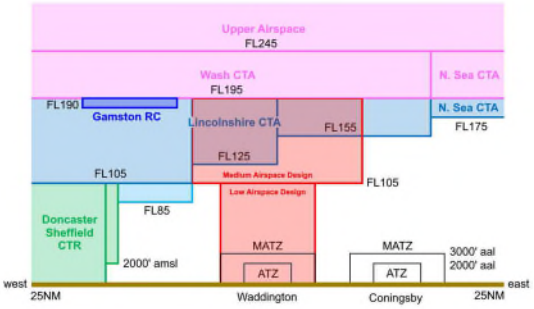
Airspace Design for ACP-2019-18

Combined Low and Medium Airspace Design Options

Activation:

Low would be used for both RAFAT and Protector activities.

Medium would be activated for Protector activity only, to enable Protector to continue climb into Classes A and/or C airspace and vice versa.



Combined airspace design cross-section WNW/ESE

3. Protector requires access to Classes A & C from Class G segregated airspace in order to be able to transit to its UK operating areas. The design above, comprising the Low and Medium airspace designs was produced to enable Protector's flight in Class G airspace up to FL195, and subsequent climb into Class C or into Lincs CTA for airways crossing or airways join (Class A).

4. RAFAT will make use of the Low airspace design only where it will conduct flying display training.

5. The Low and Medium airspace designs will be implemented in the form of danger areas. For the purposes of this document, they will be referred to as the Cylinder (low airspace design) and the Box (medium airspace design).

Airspace Activation

6. The Danger Area (DA) as outlined in ACP-2019-18 will only be activated when Protector or RAFAT flying is due to take place. Waddington Stn Ops will be responsible for booking the

requisite portions of the DA[7] via MAMC prior to D-1 0900hrs local, either the 'cylinder' alone for RAFAT flying, or the 'cylinder' and 'box' for Protector. The notification chain and procedures for airspace activation are detailed in both the LoA at **Ref A** and the RAF Waddington Station Operations Draft Procedure detailed at **Ref G**.

Aerodrome and Visual Circuit Procedures

7. Detailed draft procedures for 'aircraft start' and operating within the ATZ and DA are at **Ref H** and **Ref I.**

8. Due to the lack of a full 'Detect and Avoid' (DAA) capability on Protector at ISD/IOC, Waddington ATC will ensure that the visual circuit is sterilised for Protector arrivals and departures. RAF Waddington Air Traffic Control have conducted a relevant safety assessment to determine how the cessation and commencement of VFR Ops within the (M)ATZ are conducted which is at **Ref J**.

Air Traffic Services within the DA Structure.

9. To fulfil the criteria as defined in MAA RA 2320 with respect to the layered safety approach, it is presumed that Protector will be required to receive a Deconfliction Service (DS) within the DA structure in class G airspace. The challenges of rigorously applying DS separation standards in accordance with CAP 774 against all traffic outside of, but in close proximity to the DA structure were discussed at ATM working groups and it was determined that:

   a. BM Ops would explore an amendment to MAA RA 3238, that enables the use of current vertical deeming conventions to be utilised within the 'box' portion of the DA. This would prevent the issuing of avoiding action against traffic operating below the 'box' portion DA and has been approved in principle by MAA ATM Regulations[8].

   b. BM Ops would assist the Lincs TATCC in establishing standing agreement coordination procedures for use against known traffic operating outside of, but in close proximity to the DA. This will prevent the issuing of avoiding action against known traffic, maintaining outside of the DA and in receipt of an ATS from the Lincs TATCC.

Danger Area Crossing Service (DACS)

10. DACS will be provided by the Lincs TATCC (Waddington RADAR) and will be available for the duration of the notified airspace activation. Details are laid out at **Ref A**.

11. Instructions for airspace users on who to contact for DACS will be contained within the Airspace Activation NOTAM and will be published within the UK AIP.

[7] The low airspace design is referred to here as the "cylinder" and will be activated for RAFAT and Protector activity; the medium airspace design is referred to here as the "box" and will only be activated for Protector activity.
[8] Discussed at a SQEP panel between RAF BM STANEVAL and the MAA on 5 Dec 22.

Air Traffic Services and Co-ordination within Controlled Airspace

12. Until such time that Protector is capable of flight in non-segregated airspace and regulations permit control by civil controllers, ATS within CAS will be provided by MOD controllers at 78 Sqn. Prior to the T&E flying phase, preferred levels, and routes to designated segregated airspace structures will be discussed and agreed with NATS at 2Gp BM Ops led working groups. These will be promulgated in any subsequent LoAs and are in draft form at **Ref C**.

13. Intended levels and routing for crossing CAS will be communicated to the relevant civil sectors by 78 Sqn at the earliest opportunity.

Lost Link Procedures

14. Following a complete 'lost link' event, Protector will Squawk 7400 as per the Civ AIP ENR 1.6 and the aircraft will continue iaw its pre-programmed lost link mission, however this is configured. SOPs for its configuration are subject to agreement and can be developed iaw specific flight/airspace requirements. Example: 30min hold and proceed en-route or return to base. Specific procedures will be developed in due course through MOD ATM and NATS discussion and involvement in Protector sim activity. Further detail on lost link procedures and actions are contained within **Ref C** and **Ref I**.

15. Should the link be restored, tactical control of the RPAS may resume and normal ATC procedures will be recommenced.

MOD BM Policy, Doctrine and Training

16. 2 Gp Aerodrome Ops and 2 Gp BM Ops will collaborate to compile a safety assessment that will:

    a. Identify any additional training and policy items that need to be promulgated to the MOD ATM community prior to commencement of T&E flying.

    b. Update policy and orders accordingly.

17. A draft safety assessment is in development and the latest iteration is at **Ref K** and will include an implementation action plan for any policy or order changes.

[redacted]

[redacted]

14. BM Ops SO2 Area

[redacted]

Annex B – Ref A

LETTER OF AGREEMENT BETWEEN THE LINCOLNSHIRE TERMINAL AIR TRAFFIC CONTROL CENTRE, RAF WADDINGTON, RAFC CRANWELL, 78 SQN RAF(U) SWANWICK, 56 SQN, AND THE ROYAL AIR FORCE AEROBATICS TEAM (RAFAT) FOR THE CONTROL AND CO-ORDINATION OF EGD ## MILITARY DANGER AREAS.

Review Date: ######

PURPOSE

1. The purpose of this Letter of Agreement (LOA) is to define the procedures to be applied between the Lincolnshire Terminal Air Traffic Control Centre (Lincs TATCC), 78 Sqn RAF(U) Swanwick and RAF Waddington during Protector (PTR) and RAFAT operations.

SIGNATORY UNITS

2. Units participating in this temporary LOA:

a. RAF Waddington (WAD)
b. RAF Cranwell (CWL)
c. RAF Coningsby (CON)
d. Lincs TATCC (encompassing CON ATC, WAD Radar and CWL Radar)
e. 78 Squadron, RAF(U) Swanwick Mil (SWK)
f. 56 Sqn RAF Waddington (PTR).

INTRODUCTION

3. WAD (N53 10 W000 31) will facilitate the Operations of the General Atomics MQ9B PTR, Remotely Piloted Aircraft System (RPAS) by 56 Sqn beginning Feb 24. It is anticipated that the Civil Aviation Authority will approve the establishment of Managed Danger Area (MDA), EGD ##, overhead WAD and CWL which will be activated for PTR and certain RAFAT operations. The MDA is split into two parts: the 'tube'; 5nm radius circle centred on WAD, active from surface to FL105, and a 'box'; which extends from the southern edge of the 'tube', active FL105 to FL195. These will allow PTR to climb and descend safely into a known air environment.

HOURS OF OPERATION

4. The MDA activation will be notified by means of NOTAM at least 24hrs in advance.

5. PTR activity will be coordinated at the weekly Operational Planning Group (OPG) held internally at WAD. The OPG Record of Decisions (RODs) will be provided to military signatory units of this LOA to enhance situational awareness and aid planning.

6. A Danger Area Crossing Service (DACS) will be available from Lincs TATCC iaw para.12 whenever EG D## is active to aid flexible use of airspace (FUoA).

7. Although PTR can remain airborne for up to 48 hours; during the test and evaluation period it is expected that local sorties will be 3-4 hours. Subsequent flights are expected to be within the WAD flying window subject to operational requirements. While PTR is airborne, the MDA will remain active via NOTAM as WAD airfield is the only location into which PTR can operate below FL105 and land. This provides WAD protection for short notice recoveries in the event PTR returns unexpectedly early.

PTR FLIGHT PROFILE SUMMARY

8. PTR will depart WAD and climb within a 3nm spiral pattern inside the 'tube' to 3000ft WAD QFE. Control will be transferred from WAD ADC to WAD Radar as it passes 1500ft WAD QFE. WAD Radar will then continue the climb PTR to FL105 inside the 'tube'. It will take approximately 10 minutes from departure to reach FL105. Once established at FL105, PTR will re-position into the 'box' and will be given a further climb to FL190. As PTR passes FL160 it will be handed to SWK. The MDA airspace from FL160 to FL195 will then be delegated to SWK. Once PTR has vacated the MDA, responsibility for the airspace from FL160 to FL195 will revert to WAD Radar.

9. On recovery, PTR will enter the 'box' at FL190 and will be instructed to descend not below FL150. It will then be handed to WAD Radar on passing FL160. Wad Radar will then provide further descent to FL105. Once established, PTR will re-position into the 'tube'. Further descent will be conducted within a 3nm spiral pattern on the WAD QFE and will be subject to other activity at Waddington with the aim of achieving height 3500ft QFE before transfer to Waddington ATC for final decent profile. The recovery from FL105 will take approximately 10 minutes.

ATS AND COORDINATION

10. PTR will normally be under a Deconfliction Service (DS), with tactical co-ordination permitted ensuring a minimum of 1000ft separation.

11. Flight safety and expedition will be enhanced by the introduction of standing agreement coordination between the three units within Lincs TATCC and SWK, or by tactical coordination between WAD Radar and external agencies.

12. A DACS will be available from WAD Radar. Ac can contact WAD LARS on 119.5/232.7 and request a DACS, which will be subject to the position and intentions of PTR. The WAD Radar Supervisor will be responsible for monitoring traffic loading. When multiple DACS are being provided, WAD LARS may elect to offload other LARS ac to CON ATC and / or CWL Radar. A record will be kept of the number of aircraft requesting transit of the MDA, and specifically those refused a DACS.

AGREED FACILITATING PROCEDURES

13. For the purpose of this LOA, the MDA will be described as 'active / inactive' when referencing its published NOTAM activity. The MDA will be described as 'hot / cold' when the MDA is tactically stood up or down by WAD Radar and communicated as such to signatory units of this LOA.

14. **WAD ATC / Radar actions for PTR departure**. When PTR is on engine start:

a. WAD ATC will prenote WAD Radar who will declare the 'tube' MDA hot. A DACS will then be mandatory to all airspace users intending to penetrate the MDA.

b. WAD Radar will assign PTR the squawk 3630 to aid identification and situational awareness of PTR to surrounding ATC units.

15. WAD Radar will then take the following actions:

a. Notify SWK, who will co-ordinate the planned routing for PTR from the 'box' MDA if required, which should also be promulgated via an ACN.

b. Prenote the ac to SWK and declare the 'box' MDA hot once PTR is airborne.

c. When established en route, notify signatory units of this LOA that both elements of the MDA are cold, and de-select the TopSky overlays.

16. **WAD ATC / Radar action for PTR recovery.** Upon receiving a prenote from SWK that PTR is recovering WAD Radar will:

a. Provide the 3630 squawk and a frequency to SWK, declare the 'box' MDA hot, delegate FL150 – FL195 to SWK, and select the relevant TopSky overlays. A DACS will then be mandatory to all airspace users intending to penetrate the box MDA.

b. Once observed entering the 'box' MDA, WAD Radar will prenote WAD ATC (who will prepare circuit sterilisation), and declare the 'tube' MDA hot. If the 'tube' MDA is already hot for RAFAT, PTR will maintain FL105 in the 'box' MDA until RAFAT call complete. PTR can re-position into the 'tube' MDA at FL105 while RAFAT recover to Waddington.

c. Once established in the 'tube' MDA, provide a stepped descent to ensure IFR separation against any remaining circuit traffic is maintained. At 3500ft WAD QFE, PTR is to be transferred to WAD ATC.

17. Once PTR is in two-way comms with WAD ATC:

a. ADC will provide further descent to 1500ft WAD QFE to height deconflict against HELIMED activity, and eventually a final descent clearance when safe to do so.

b. WAD Radar will declare both MDAs cold. WAD ATC will inform AR Ops, so the NOTAM notifying the MDA as activate can be cancelled for the remainder of the day. A DACS will remain available for the remaining duration of the NOTAM.

c. When PTR has landed, LINCS TATCC will make the airspace COLD and inform local units if required so they are able to use the airspace. WAD ATC will inform AR Ops, so the NOTAM notifying the MDA as activate can be cancelled for the remainder of the day, informing the general aviation community that the MDA has become inactive. DACS will be available until the NOTAM is active.

18. **78 Squadron, RAF(U) Swanwick.** SWK will adhere to the following:

a. Once notified the MDAs are hot or active, SWK shall contact WAD Radar for a clearance to cross the MDA or advise their ac to contact WAD Radar for a DACS.

b. On receipt of a PTR prenote, SWK are to provide a sqk and frequency. The handover should begin once PTR has passed FL160. Once PTR has vacated the confines of the 'box' MDA, they will notify WAD Radar that PTR is safely en route.

c. On recovery to WAD, SWK shall prenote WAD Radar allowing sufficient time for them to declare the MDAs as hot. The prenote will allow WAD Radar to delegate the airspace from FL150 to FL195 to SWK, provide them with the 3630 squawk and a WAD frequency. SWK shall not descend PTR below FL150 and will initiate a handover as it passes FL160. Once the handover is complete, responsibility for the airspace from FL150 to FL195 will revert to WAD Radar.

19. **CWL**. CWL Radar, ATC and Gliding Club are to adhere to the following:

a. Once notified that either MDA is hot, if any ac under the control of CWL Radar/ ATC requires a DACS, CWL Radar /ATC will request permission from WAD Radar.

b. Some instrument procedures are affected; prior planning should prevent these being used, alternative a DACS may be sought, or the traffic held off ac until the MDAs are cold. Affected CWL instrument procedures are:

(1). NDB3 to ILS Rwy 26.

(2). TAC ILS Rwy 26.

(3). TAC Rwy 26.

(4). TAC Rwy 08 (Cat C,D,E) Instrument approaches affected.

c. CWL visual circuits to Rwy 19 are also affected; this visual circuit will be closed unless by prior agreement with WAD radar.

d. Due to the close proximity of the MDA to Temple Bruer (unlicensed airfield to north of CWL), CWL ATC shall advise these arrivals / departures to contact a CWL frequency before departing/recovery to facilitate an early DACS from WAD Radar.

e. Before commencing flying, CWL Gliding Club shall confirm the MDA status for the period of their flying activity. If the MDAs are planned to be active and CWL ATC are closed, the Gliding Club supervisor shall call WAD ATC on 01522 727451/2 to facilitate deconfliction and coordination.

20. **CON ATC.** CON ATC are to adhere to the following:

a. Once notified either MDA is hot, permission for DACS will be requested from WAD Radar.

b. CON MID North, East or South departures will be restricted to FL090 until laterally clear of the MDAs. Westerly departures will be subject to coordination with WAD Radar. Performance departures can be approved with the caveat of 'remaining outside of the EG ## MDAs'.

c. Current IFR recovery profiles to Rwy 07RH require a 'sterile area' to be ceded by CWL radar to CON radar; this area infringes a small portion of the 'tube'. When IFR recoveries to Rwy 07RH are required, CON ATC will notify WAD radar as soon as able, and request a DACS. PTR may be able to stop climb/descent or delay take off if CON ac have priority, either by individual status or by volume of recoveries. A priorities list will be published under separate cover to aid decision making.

d. TACAN approach profiles to Rwy 07RH conflict with the 'tube' MDA. Prior planning should prevent CON attempting this type of approach when the MDAs are hot. Ac/ controllers may seek a DACS to facilitate them or hold off ac until the MDAs are cold.

e. Additional procedures and full holdings for CON Ty operating to Rwy 07RH will be in force, including singletons only, downwind joins and circling approaches.

LOST LINK

21. In the event of a Lost Link, PTR will squawk 7400 and will follow the existing clearance to a point where they will hold for a prescribed amount of time before following the previous track back to Waddington. In event that this occurs, all standing agreements are suspended. Tactical coordination is to avoid crossing below a descending PTR or above a climbing PTR. Wherever possible, the MDA should be avoided until contact is made with the pilot via landline to confirm intentions and aid recovery to Waddington.

RAFAT

22. The 'tube' MDA is also utilised for RAFAT to conduct display practices at WAD. Activation and publication procedures will be conducted iaw paras 4-6. Activity will mostly occur Mon to Fri 0800L-1730 local, but can also take place on weekends.

23. Restrictions on other local airspace during RAFAT activity will remain iaw paras 10-20. RAFAT are to be reminded not to overspill the airspace to the sector south to east during CON and CWL flying periods due to proximity of flying.

DUAL OPERATIONS

24. Simultaneous PTR and RAFAT operations within the 'tube' MDA will be subject to height separation provided by WAD Radar (eg RAFAT operations permitted once PTR not below FLXX), and should be the exception, not the norm.

APPLICATION OF LOA

25. The contents of this LOA should not prevent any pilot, air traffic controller or controlling authority from using discretion in the case of an emergency or to exercise a duty of care iaw CAP 774. However, PTR should remain within the MDA when below FL100, only leaving in extremis to meet deconfliction minima. The relevant unit shall be informed of any departure from the agreed procedure as soon as possible.

26. Permanent amendment to this LOA will only be affected with the written consent of all signatories.

27. The agreed procedures will be detailed where necessary in signatories' unit order books.

SIGNATORIES

OC OSW, RAF Waddington (WAD)

OC Ops Wg, RAF Coningsby (CON)

OC Ops Wg, RAF Cranwell (CWL)

Lincs TATCC Cdr (encompassing CON ATC, WAD Radar and CWL Radar)

OC 78 Sqn, RAF(U) Swanwick Mil (SWK)

OC 56 Sqn, RAF Waddington (PTR)

OC Cranwell Gliding Club

Annex B – Ref B

File Ref: 20230217-Protector TATCC to 78 Sqn Handovers

17 Feb 23

LETTER OF AGREEMENT (LOA) – PROCEDURES FOR THE HANDOVER OF PROTECTOR REMOTELY PILOTED AIR SYSTEMS (RPAS) BETWEEN THE LINCONLNSHIRE AIR TRAFFIC COTNROL CENTRE (LINCS TATCC) AND 78 SQUADRON (SWANWICK MIL)

References:

Ref A: RA 3233

Aim

1. This LOA formalises arrangements between Lincs TATCC and 78 Sqn for Protector RPAS handover procedures between the two units. The aim of this procedure is to safely and expeditiously manage the transfer of control of RPAS within DAXX to facilitate efficient en-route transit from, and recovery to, RAF Waddington.

User Requirements

2. The following procedures are agreed:

a. **Handover from Lincs TATCC to 78 Sqn.**

1) The RPAS is to be prenoted to 78 Sqn who will issue a 78 Sqn discrete SSR code and pre-brief frequency.

2) Lincs TATCC will climb the RPAS to FL190 and initiate the handover in accordance with Ref A, passing FL160.

3) As part of the handover, Lincs TATCC will provide 78 Sqn with clearance to operate within DAXX with appropriate level constraints, e.g., “not below FL160”.

4) 78 Sqn will verbally confirm “airspace clear” via landline once the RPAS has vacated DAXX

b. **Handover from 78 Sqn to Lincs TATCC**

1) The RPAS is to be prenoted to Lincs TATCC who will issue approval to enter DAXX between FL150-190 (or other suitable levels) and issue a discrete SSR code and pre-brief frequency.

2) Control of the RPAS will be transferred from 78 Sqn to Lincs TATCC within the confines of DAXX no later than passing FL160 in the descent.

3. This LoA remains in force from the date of signature and is to be reviewed no later than 5 years from signing. Either party may withdraw from the agreement and any time, after first giving notice to the other agency.

[redacted]

Sdn Ldr

Lincs TATCC Commander

Royal Air Force Coningsby

[redacted]

Wg Cdr

Commanding Officer

78 Sqn

Annex B – Ref C

File Ref: 20230217-Protector CAS Crossing Procedures

17 Feb 23

78 SQN PROCEDURES FOR CROSSING CONTROLLED AIRSPACE WITH PROTECTOR RPAS

References:

Ref A: Lincs TATCC and 78 Sqn LoA for the handover of Protector within the MDA structure

Aim

1. This ***draft*** document outlines arrangements between 78 Sqn and NATS for the facilitation of CAS crossing for Protector RPAS.

Background

2. During the test and evaluation phase of Protector flying and throughout its progression to IOC, CAS crossings will be required to enable Protector to transit from the Danger Area (SUA) structure above RAF Waddington, to the D323 complex and subsequently return.

User Requirements

3. The following procedures are to be utilised:

a. **Handover from Lincs TATCC to 78 Sqn.**

1) The procedures for handover from Lincs TATCC to 78 Sqn are outlined in the LoA at Ref A and allow for sufficient time for negotiation between 78 Sqn and NATS controllers for the crossing of CAS.

b. **Crossing CAS**

1) 78 Sqn will negotiate a Cleared Flight Path (CFP) utilising one of the crossing routes detailed at Figure 1; however, should circumstances allow, tactical freedom to cross CAS using the most expeditious and direct routing will be negotiated between 78 Sqn and PC East.

2) Ordinarily, transits should be conducted in level flight between FL200 and FL240 to minimise impact on civil ATC, network operations and Civil Air Traffic (CAT). Tactical coordination can be undertaken between controllers, dependent on the traffic situation, to provide flexibility to the aircraft when the CAT situation dictates.

3) Outbound, the RPAS will remain within the confines of the ‘box’ portion of the MDA, ensuring that the 3nm CAS buffer is observed and the 78 Sqn controller

4) will request a cleared flight path (CFP) with the relevant civil sectors for the intended routing.

5) Inbound – Once notified by the RPAS operator of the intention to RTB, the 78 Sqn controller will confirm the intended routing with the RPAS operator and arrange a CFP with the relevant civil sectors.

c. **Lost Link Procedures**

1) Following a complete 'lost link' (LL) event, Protector will Squawk 7400 as per the Civ AIP ENR 1.6 and the aircraft will continue iaw its pre-programmed lost link mission, however this is configured, this should reflect the latest ATC clearance. Detailed LL procedures will be confirmed between both operations ahead of implementation and simulated using extant ATC and Protector simulators prior to live flying commencing.

2) Once an RPAS is determined to be operating LL, either via observation of a 7400 Sqk or through other communication means between the RPAS Ground Control Station (GCS) and the controller, the expected RPAS profile should be confirmed via landline.

3) The profile should be relayed to the appropriate civil sector and any other relevant ATM agencies to ensure that the profile can be flown unimpeded and enable both 78 Sqn and NATS controllers to enact any additional deconfliction/coordination.

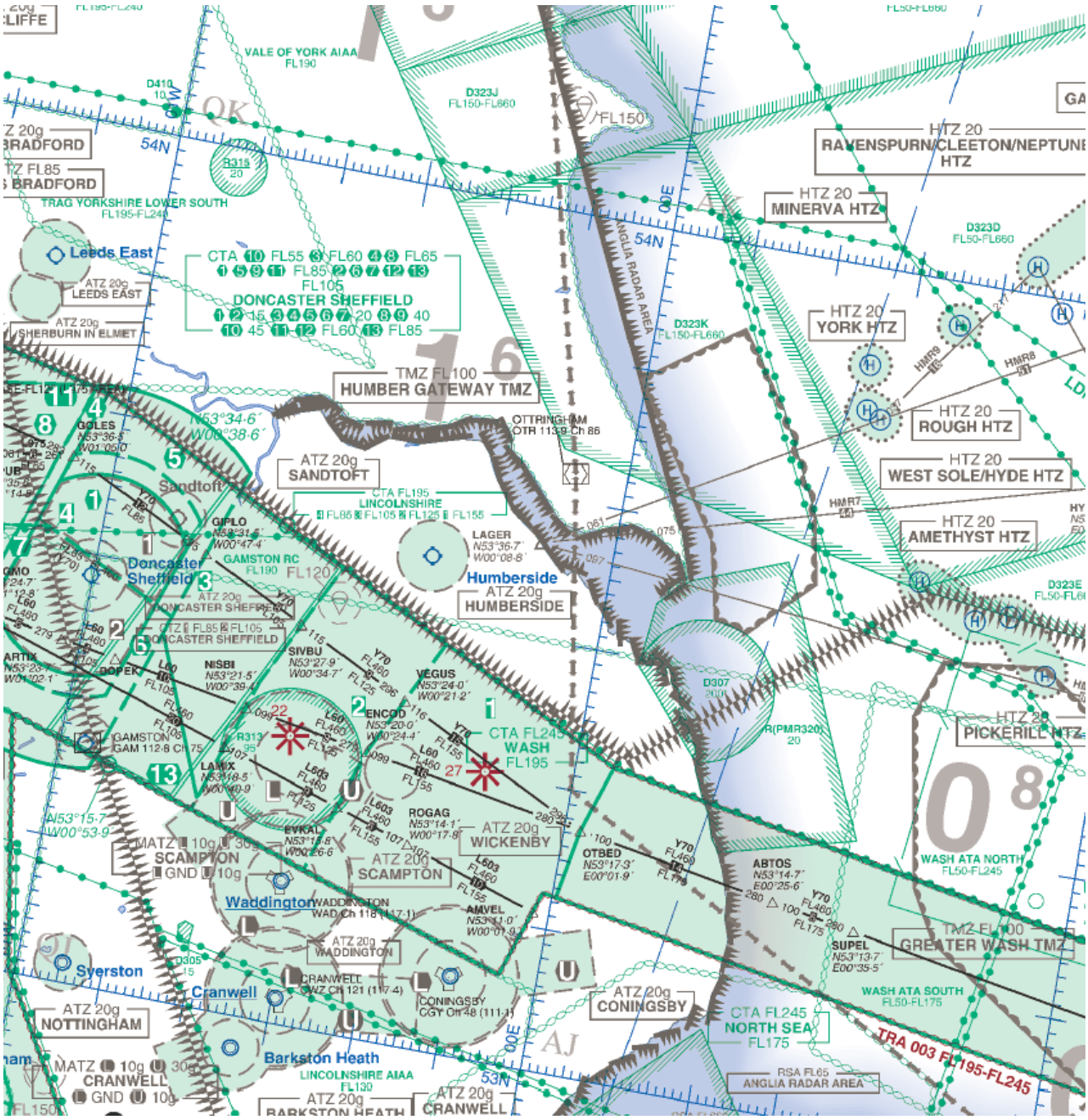


Figure 1

Route A (Dark Blue): CWL-ERKIT-323s

Route B (Orange): CWL-OTR-323s

Route C (Yellow): CWL-CGY-OTBED-OTR-323s

Note: All routes will be flown at or above FL200.

Annex B – Ref D

Letter of Agreement Between RAF Waddington and Lincolnshire & Nottinghamshire Air Ambulance

Introduction

1. The purpose of this Letter of Agreement (LoA) is to define the procedures for the use of RAF Waddington (WAD) by the Lincolnshire & Nottinghamshire Air Ambulance (LNAA), following their relocation to new premises adjacent to the A15 on 10 May 2021.

Background

2. LNAA is a charity providing regional critical care via rotary and road assets; RAF Waddington station is within sufficient proximity to support the LNAA rotary flying activity within 5Nm of RAF Waddington. During the established flying window, WAD provides Air Traffic Services (ATS) and limited material support in extremis to enable LNAA's operation.

Basing

3. As of 10 May 2021, LNAA shall operate from their Headquarters known as 'Kookaburra' based alongside the A15, North of WAD airfield boundary (53.10.17.2N 000.30.2W). LNAA will provide its own handling, fuel and support.

Provision of Air Traffic Services (ATS)

4. To ensure safe coordination of activity by both organisations, LNAA agree to comply with the RAF Waddington Defence Aerodrome Manual (DAM). The specifics of this activity are covered at Annex NN, Section B, Order 223.[9]

5. Upon rotors start and prior to take-off from Kookaburra, LNAA will notify of their intention to depart on Wad Twr Freq 121.30. Included in this transmission should be the numbers of persons on board, direction of travel, destination and any relevant information. While inside the WAD MATZ, LNAA should comply with any imposed restrictions communicated from WAD ATC in order to deconflict from other known aircraft. The LNAA task will be prioritised appropriately.

6. WAD ATS will be provided during published opening hours.

Meteorological Information and Air Charts

7. During published opening hours, weather information prior to and during flight is available through WAD ATC on request and through ATIS on Tel:01522 727305, in all other respects WAD will offer no support in regards of Meteorological reports and updates. LNAA are advised to seek assistance from the MET Office under their own arrangements.

[9] The DAM is available at Reference A and by request from WAD-Ops-DutyOpsController@mod.gov.uk.

8. WAD will offer no provision of air charts and mapping. LNAA should seek to source items through their own channels and funding.

9.

Contingency Plans

10. In the event of a failure of LNAA refuelling assets, support from RAF Waddington may be available. LNAA should liaise with WAD Duty Ops Controller (DOC) on Tel: 01522 726532 in advance of undertaking sorties, to confirm availability of a refuelling provision from WAD. This capability will be provided on a 'best effort' basis with no guarantee of provision. Under no circumstances will refuelling vehicles be able to leave the confines of WAD.

11. In the event of Kookaburra HLS becoming unusable for operations, WAD will endeavour to provide an alternate operating area within the airfield boundary to enable LNAA operations to continue. This service will be provided on a 'best effort' basis with no guarantee of provision.

12. LNAA helicopters will not be afforded any air system de-icing whilst at WAD.

Fees & Fuel at RAF Waddington

13. Prior to any use of WAD aerodrome, LNAA are to provide a current Certificate of Insurance detailing indemnity to the Crown iaw the Form of INDEM 3.81/Form 4a. This Certificate will be held on file within RAF Waddington Station Operations for the duration of its validity. LNAA are to provide updated Certificates of Insurance upon each renewal via email to WAD-Ops-DutyOpsController@mod.gov.uk.

14. LNAA helicopters landing at WAD will be waived landing and parking fees in accordance with Reference B, available on https://www.gov.uk/.

15. Any invoices for charged services will be forwarded to the address below for payment. Details of how to pay for services will be included in the invoice.

Lincs & Notts Air Ambulance Headquarters
HEMS Way
Bracebridge Heath
Lincoln
LN4 2GW

16. LNAA may request to conduct Flying Training activities within WAD circuit, these will be considered for approval on a case-by-case basis subject to planned station flying sorties. Requests should be made 24hr PPR.

Handling and refuelling at RAF Waddington

17. The available fuel type at WAD is F-34 FSII (Fuel System Icing Inhibitor). This will be supplied via a fuel bowser with a non-pressurised gravity-fed fuel system.

18. WAD will not provide any ground handling or marshalling for LNAA helicopters. In addition, WAD personnel are not authorised to refuel LNAA helicopters; any refuelling activities must be undertaken by LNAA crews. Requests for fuel should be made through WAD DOC, preferably before landing. WAD will make every attempt to expedite the refuelling
19. process but there may be a delay in the provision of fuel due to WAD operational commitments.

20. In the event of a fuel spill during the refuelling process of a LNAA helicopter, the fuel bowser driver will carry out initial containment measures and escalate the response as required. LNAA crews are requested to ensure the bowser driver is made aware of any fuel spills that may occur during the refuelling process.

21. In the event of LNAA helicopter unserviceability at whilst landing at WAD, the LNAA crew should inform WAD DOC immediately where the necessary coordination will take place to expedite the process of recovering the aircraft. LNAA will be expected to remove any unserviceable aircraft from WAD in a reasonable timeframe.

Emergency Cover

22. In the event of a crash on or seen from the airfield involving LNAA, RAF Waddington Fire & Rescue Services will only be provided on a 'best effort' basis to help preserve life and maintain survivable conditions for the crew. Response times may be affected by the geographical location of LNAA HQ, other emergencies in progress or to prevent changes to the WAD Crash Category affecting operational capability.

Application of this LoA

23. LNAA will ensure that the requirements and procedures within this LoA are made known to all crews and staff members.

24. All LNAA staff should ensure they are familiar with the WAD Defence Aerodrome Manual, available at Reference A and by request from WAD-Ops-DutyOpsController@mod.gov.uk

25. Permanent amendment to this LoA will only be affected with the written consent of both signatories.

26. WAD retain the right to refuse support at any time and to terminate this agreement with one month's notice.

27. This LoA will be reviewed five-yearly, led by WAD AO in consultation with LNAA staff.

Signatories

[redacted]
OC Operations Support Wing
RAF Waddington
High Dyke
Waddington
LN5 9NB

[redacted]
Chief Executive Officer
Lincolnshire & Nottinghamshire Air Ambulance, HEMS Way
Bracebridge Heath, Lincoln
LN4 2GW

References:

A. WAD Defence Aerodrome Manual
B. JSP 360 - Use of Military Aerodromes by Civil Aircraft
C.

Annex B – Ref E

File Ref: 20230217- Wad Twr BMFA LoA

17 Feb 23

LETTER OF AGREEMENT (LOA) – PROCEDURES FOR THE FLYING OF MODEL AIRCRAFT WITHIN THE CONFINES OF DAXX

Aim

4. This LOA formalises arrangements between RAF Waddington and the BMFA for the safe operation of model flying withing the confines of DAXX. The aim of this procedure is to safely ensure the maximum flexible use of airspace.

User Requirements

5. The following procedures are agreed:

a. No flying is to take place when DAXX is NOTAM'd as active without prior approval from Waddington ATC.
16.

b. **PRIOR TO MODEL FLYING.** BMFA members are to ring Waddington ATC on 01522 727451 in order to request permission to fly. They are to provide Waddington ATC with levels, duration and area required and a means of communication.
17.

c. **On Completion of Flying.** BMFA members are to contact Waddington ATC on 01522 727451 to notify Waddington ATC they are complete.

d. Suppression of Model Flying can be requested by WAD ATC on the pre agreed method of communication if safety measures require it.

6. This LoA remains in force from the date of signature and is to be reviewed no later than 5 years from signing. Either party may withdraw from the agreement and any time, after first giving notice to the other agency.

[redacted] [redacted]

Sdn Ldr

RAF Waddington SATCO

Royal Air Force Waddington

BMFA

Annex B – Ref F

LINCS TATCC OB – TEMPORARY ORDER 003/23

Lincs TATCC OB 5.12

Order 512 - CON ATC Instrument recoveries to Rwy 07RH whilst MDA ## active for RAFAT operations.

1. When MDA ## has been NOTAM'd as active, Con Stn Ops will publish a B+## fuel requirement in anticipation for potential delays iaw with paras 2.c-d.

2. The downwind leg of the CON Rwy 07RH standard pattern infringes on the WAD MATZ prior to the base leg turn at 10nm. When MDA ## is active for RAFAT activity, the following procedures are to be followed by CON ATC when recovering ac to Rwy 07RH:

a. If Met conditions allow it IAW with Ref A, all ac are to be recovered visually or vectored by CON ATC as either R2V or R2I, remaining outside of the MDA.

b. When instrument recoveries are required, CON ATC are to request co-ordination from WAD Radar/ATC. For typh singleton recoveries at 2200ft CON QFE, RAFAT will be asked to operate not below 3500ft WAD QFE. For pairs/ trials typh recoveries at 2700ft CON QFE, RAFAT will be asked to operate not below 4000ft WAD QFE. These agreements will achieve at least 1000ft separation.

c. When instrument recoveries are required and tactical coordination between WAD Radar and CON ATC is unachievable, circling approaches are available under the following parameters:

(1) The CON visual circuit is to be clear prior to the commencement of a circling approach

(2) All circling approaches are to land only

(3) Trials approaches are not permitted

(4) The procedure minimum for circling approaches is 700ft

(5) Circling approaches are prohibited when CWL are operating Rwy 26.

d. If the above procedures are unachievable CON ATC are to seek coordination with CWL Radar to facilitate feed-ins from the south, or extended line-ups from the west.

e. TACAN approaches to Rwy07RH are prohibited whilst MDA## is active.

5.12 References

A. RAF Coningsby FOB

Annex B – Ref G

RAF WADDINGTON STATION OPERATIONS

Draft Airspace Booking Procedure

No	TBC/23	**Date**	XX/03/2023
Valid Fm	WIE	**Valid To**	TFN
Subject	EG D (X) ACTIVATION		

All,

RAFAT / Protector Ops are to confirm on a Wednesday (Before 15:00L), via email (DOC Multi-user) their airspace requirements for the following week. Upon receiving this information, the DOC/DOS are to submit an activation request for EG D (X) if required.

RAFAT / Protector Ops should then update their slides on the OPG Teams site ready for discussion on a Thursday.

An example of how to correctly submit the activation request for EG D (X) is shown below.

Activation EG D (X)

Timeline: In line with AIC (Airspace Link), EG D (X) will be notified for activation by NOTAM

Email arops@caa.co.uk using the following template.

Activation Request:

Activity Number: TBC

Date: INSERT DATE

~~*Timings: INSERT START - END TIME (it is important to specify local (L) or UTC (UTC or Z)*~~

TDA: EG D (X)

Therefore, if you want to activate the airspace, 10:00 – 11:00 & 13:00 – 14:00 on 18 and 19 Mar 23, the email will read:

Activation Request:

Activity Number: TBC

Date: 18-19 Mar 23

Timings:

18th 10:00-11:00(L), 13:00-14:00(L)

19th 10:00-11:00(L), 13:00-14:00(L)

TDA: EG D (X)

Upon receiving confirmation that the NOTAM has been activated from AR Ops, the DOC/DOS should forward any notification / NOTAM number to the requesting Sqn/s.

Annex B – Ref H

Order X - Royal Air Force Waddington Protector Start

General

1. Protector will be arriving at RAF Waddington, Oct 2023. Protector will be towed and started by the Ground Crew on MRE. After engine start the aircrew will then take control of the aircraft and check in on WAD GRD Frequency.

ADC

2. Protector Ground Crew request start on MRE and are provided with the start approval with the Surface wind and QFE.

3. Protector Aircrew then check in on GRD frequency 342.125 with the correct ATIS code. If the ATIS code is incorrect the aircraft will then be provided with any new/correct information.

4. Protector is then treated the same as any other aircraft from this point with ATC being aware of a requirement for an increased lookout due to reduced visibility on this platform.

Annex B – Ref I

Order X - Royal Air Force Waddington Protector Operations

General

1. Protector will be arriving at RAF Waddington, Oct 2023. A Danger Area (DAxx) will be established whilst Protector is airborne, with a 5nm radius centred around WAD, from the surface up to FL105. Whilst Protector is airborne the DA will remain active as currently WAD is the only location that Protector can land.

2. Protector will take off from WAD and climb within the DA up to FL105 which will take approximately 10 minutes. On passing 3000' WAD ATC will then handover control of Protector to Lincs TATCC. On recovery, Protector will descend within the DA to land at WAD; this will take approximately 10 minutes.

ADC

3. When Protector calls for start, an information call is to be passed to Lincs TATCC at the earliest opportunity to allow them to establish 'DA HOT'.

4. Protector will operate on QFE in HPa.

5. The circuit and MATZ is to be sterile for all Protector movements. Therefore, a 'Call for Release' will be imposed by RA.

6. A minimum of 3 minutes separation is to exist if departing/arriving after another AS due to wake turbulence limitations.

7. Protector has a max approach speed of 113 KIAS and is classified as CAT B.

8. Protector is equipped with retractable gear, therefore SOP for gear checks apply.

9. Wind limitations. Max crosswind for take-off and landing is 20kts. Max tail wind is 10kts.

10. Protector is not cleared to trample RHAGs, therefore back tracking and amended taxi patterns may be required. However standard RHAG configuration can be maintained during operations in support of diversion commitments. Protector can take off and land with the overrun RHAG up.

11. Expect departure instruction to be "climb to height 3000ft report passing height 1500ft" this is to facilitate the safe separation of the LNAA and minimise the impact on their procedures

12. On recovery, Lincs TATCC will prenote WAD ATC on Protector entering the 'Box'. WAD ATC will then sterilise the visual circuit. Lincs TATCC will descend Protector to not below 3500ft QFE and H/O to WAD ATC. Once two-way with WAD ATC, the phraseology for the descent should be Join RWY___, QFE___, Circuit State, descend NOT BELOW Height 1500ft".

13. The phraseology for starting the ATLC to land is "Final descent approved, report final gear down". On reporting the gear is down the aircraft is given clearance to land.

14. Helimed and [TBC] have agreed that if Helimed is visual with Protector, then Helimed can continue to operate when Protector is making its final descent or climbing out.

ACR ASOS

15. When receiving the 'DA HOT' information it is to be annotated in the information box on the weather page of TopSky. This information is also to be passed to Stn Ops.

RWC

16. SOPs apply.All TRC Controllers are to conduct a 'walk around' of the AS in order to familiarise themselves with the system before the flying phase of the trial commences. These visits should be arranged through the ASOM.

Other Information

17. Protector will require 1000ft separation from other traffic.

18. Once Protector has vacated the DA and is safely en-route, DA COLD is then updated on TopSky. Remember, the DA remains active by NOTAM until the customer has completed their use for it on the day (RAFAT/Protector).

19. Once established in the DA, a staggered descent can be used to allow sufficient time for DACS/circuit and radar traffic to vacate the DA. Lincs TATCC shall not descend Protector below 3500ft QFE unless authorised by WAD ATC.

20. The Protector TCAS mode is selectable by the remote pilot, but usually it will be in RA mode, which enables automatic execution of RAs. The pilot can override the automatic manoeuvre. If the aircraft goes Lost Link, it will automatically set the TCAS to TA only, so that auto RA manoeuvres are inhibited, but the aircraft will still coordinate with other TCAS-equipped aircraft if a collision avoidance manoeuvre is needed.

21. When Protector has completed the last sortie of the day, inform Stn Ops is 'DA INACTIVE' (as opposed to 'COLD' because the NOTAM is about to be cancelled) COLD'. Lincs TATCC cannot close until the DA is confirmed inactive by way of the cancelled NOTAM, as a DACS must always be available when the DA is active.

22. For NOTAM cancellations at the weekend, this should be conducted direct with the NOTAM office linked here. ATC cannot close until the DA is confirmed inactive by way of the cancelled NOTAM, as a DACS must always be available when the DA is active.

Emergency

23. In the event of an emergency, extant procedures are to be followed.

    a. Emergency ATC reference cards[10] are located in the VCR, ACR and TRC.

24. In the event of Lost Link, Protector will fly on its last cleared route before returning to land on a pre agreed route (tactically managed to minimise disruption) before landing at RAF Waddington.

Security

25. In the event of any frequency interference, report immediately to WAD-CyberOpsSqn-AST (MULTIUSER) WAD-CyberOpsSqn-AST@mod.gov.uk and include any relevant details, i.e. frequency, channel number, time.

26. CONPLAN 5[11]. In the event of any unauthorised or malicious use of UASs within the RAF Waddington Flight Restriction Zone (FRZ) CONPLAN 5 is to be followed.

Communications

27. The GCSs will have direct landline communications which can be used to enhance planning and communications with the pilot and other crew during normal operations or in an emergency or loss of RT communications. The incoming phone numbers the GCSs will use to contact ATC is ext. 7040.

[10] SkyGuardian ATC Emergency Reference Cards
[11] RAF Waddington CONPLAN5

Annex B – Ref J

SAFETY ASSESSMENT OF CHANGE RAF WADDINGTON PROTECTOR – 2023/01

Part 1a: Background	
Introduction	RAF Waddington (WAD) has been selected to station MQ-9B Protector, Remote Piloted Aircraft System (RPAS) from Oct 23. With authority from the CAA a Danger Area (DA) will be established whilst Protector is airborne, with a 5nm radius centred around WAD, from the surface up to FL100. This allows Protector to climb and descend safely within a known air environment. Protector can remain airborne for up to 48 hours. Whilst Protector is airborne the DA will remain active as WAD is the only location that Protector will be provided with the segregated airspace required for the ATLC required for safe arrivals/departures. This provides WAD protection for short notice recoveries in the event Protector returns early due to weather or suffers a technical issue. Protector will take off from WAD and climb within a 3nm spiral pattern inside the DA up to FL100 which will take approximately 10 minutes. WAD ATC will handover control of Protector to WAD Radar (Lincs TATCC) on passing 3000'. On recovery, Protector will descend within the DA to land at WAD; this will take approximately 10 minutes. The aircraft will be handed over to WAD ATC from WAD Radar (Lincs TATCC) on passing 3000'. Protector will normally be operating under a Deconfliction Service (DS) and should be treated the same as any other Air System (AS), separation minima remain the same as per CAP 774 and Protector will be treated as IFR.

Assessment Process	The process has involved holding online SQEP panels with surrounding aerodromes and airspace users to identify any potential hazards and to discuss ways of working to reduce the impact and cause as little disruption to the wider aviation community as possible. We will utilise the safety work carried out by SkyGuardian and look for any LFE PTN to further assess. Liaising with all Sqns based at WAD as well as regular airfield users discussing any concerns of operating alongside a RPAS.

	Bowties and analysis occurred regularly between key pers at WAD and surrounding units to help form this safety assessment. References as link (live): Also attached at the bottom of this doc (not controlled) SkyGuardianUK21 SAoC Protector Procedures SQEP Panel
Key Stakeholders	WAD Aerodrome Operator WAD HoE ISTAR Fce DDH (WAD Cdr Air Wing) CON DDH RAFAT DDH 3 FTS DDH 6 FTS DDH GA DDH equivalent
Pers Conducting Assessment	[redacted] (BMFSO) [redacted] [redacted] (Dep BMFSO/ Occ Manager) [redacted] (LEMSCO)

Part 1b: Proposal (for change only)	
Details of Change	To allow Protector to operate in UK airspace the CAA require segregated airspace inside uncontrolled airspace (Class G). The CAA elected for a DA to be established around WAD. This provides a safe, known air environment for Protector to operate within. As this is the first-time a Beyond Visual Line of Sight (BVLOS) RPAS has stationed at a Main Operating Base (MOB) in the UK this SAoC highlights potential hazards when Protector operates on the ground and in the local airspace around WAD. This SAoC will only cover up to IOC for Protector at WAD but can be used to help form other SAoC in the future.
Proposed Date of Introduction	TBC

Part 2.1: BM Hazard Analysis (can be supported by Bow Tie)	
Hazard	Protector operator view limited / no peripheral vision on the ground and ATC line of site restricted
Undesirable Event	Ground collision leading to damage to Protector, operating surface, air system, vehicle, or person
Causal Factor	Shared operating surface. (Protector vs vehicles, pedestrians, air systems, wildlife)
Pre-Existing Preventative Controls	• ATC Lookout • RPAS Pilot Lookout (limited) • Red lights at entrance to movement areas • All airfield drivers trained and have AAP • Runway Caravan • AWCU • CCTV • Third party visually detecting an object and calling ATC Emergency Ext 333
Pre-Existing Recovery Barriers	• ATC instructing RPAS to hold position • ARFF • PCM • MCO to manage the media Lines to Take
Consequence	• Near miss between Protector and vehicle, AS, pedestrian or wildlife • Collision between Protector and other AS, vehicle, pedestrian, or object leading to death or injury, damage to object, loss of capability • Reputational damage to General Atomics / RAF, especially being the first time operating in the UK at a MOB
Worst Credible Consequence	• Near miss between Protector and vehicle, AS, pedestrian, wildlife. 19. Pre-existing barriers are sufficient to reduce the likelihood of a collision.
Potential Preventative Controls	a. Extra training for all regular airfield users b. Familiarisation of WAD airfield to Protector pilots c. All Sqn pilots briefed by Sqn reps about Protector limited field of view d. Installation of barriers at all entry points of the AOS e. Dedicated access to runway, bypassing normal taxi / vehicle route (QRA Track) f. Improved camera capability / field of vision on Protector
Potential Additional Recovery Barriers	g. Protector Crash TTX

Barrier Measures for implementation	• A – E & G

Part 2.2: BM Hazard Analysis (can be supported by Bow Tie)	
Hazard	Protector operator unfamiliar with WAD AOS layout
Undesirable Event	• Protector Runway / taxiway incursion
Causal Factor	• Protectoe operator not familiar with WAD airfield layout
Pre-Existing Preventative Controls	• ATC Lookout • Runway Caravan Lookout • Pilot Lookout • HFCT (ATC Pers) • CCTV • Third party detecting and calling ATC Emergency ext 333
Pre-Existing Recovery Barriers	• ATC Lookout • Runway Caravan Lookout • Pilot Lookout • ARFF • PCM
Consequence	• Protector taxi onto runway where an AS has been issued a clearance to use the runway, resulting in a go around / near miss or crash • ATC / Pilot initiated go around after clearance has been given • Protector taxi enters an incorrect taxiway
Worst Credible Consequence	• ATC / Pilot initiated go around after clearance has been given. 20. Due to WAD layout, most likely scenario would be Protector entering the runway at Charlie Holding Point when taxiing to 02 threshold
Potential Preventative Controls	a. ATC aircrew brief b. Staged integration c. Regular washups d. MRE broadcast informing Protector taxiing e. Info call of Protector location when other AS call for taxi f. Block off entrance to AOS
Potential Additional Recovery Barriers	• Nil
Barrier Measures for implementation	• A - F
Part 2.3: BM Hazard Analysis (can be supported by Bow Tie)	

Hazard	Protector has no equivalent detect and avoid capability
Undesirable Event	• MAC / Airprox / near miss / TCAS TA/RA
Causal Factor	• Pilot in the visual circuit unable to visually identify Protector due to its low profile / colour • Pilot losing situational awareness against Protector • Protector not detecting non cooperative traffic • Protector reduced ability to see and avoid using on board cameras
Pre-Existing Preventative Controls	• Pilot lookout • Limited RPAS lookout • ATC Lookout • Runway Caravan Lookout • TCAS • ADS-B • DA protection • Air Traffic Monitor (ATM) in VCR
Pre-Existing Recovery Barriers	• TCAS RA/TA • ATC traffic information / deconfliction advice
Consequence	• AS unable to visually identify Protector at certain angles due to its slim profile and grey colour • AS loses visual ident with Protector when banking • Airprox • MAC
Worst Credible Consequence	• Airprox. 21. Aircraft in visual circuit rely on pilots being visual with each other, if manned AS loses visual ident on unmanned AS, there is a greater chance of an airprox in the visual circuit

Potential Preventative Controls	a. Clear Visual CCT during Protector departures / recoveries (below 3000') b. No booking PD's during Protector arrivals/departures c. Segregation by sequencing d. Co-ordinate Station flying with Protector at the weekly OPG. e. Establish DAxx for Protector operations f. Liaise with LNAA to establish a procedure to allow CAT A flights to continue g. No MFTS trainees during Protector departures / recoveries (below 3000') h. Sterilise the MATZ for Protector operations i. Protector broadcast its location IVO WAD visual circuit

Potential Additional Recovery Barriers	k. Use of the ATM in the VCR to call traffic info if visual ident lost
Barrier Measures for implementation	• A - I & K

Part 2.4: BM Hazard Analysis (can be supported by Bow Tie)	
Hazard	WAD runway not available for a Protector recovery
Undesirable Event	• Protector will have to orbit until at BINGO fuel
Causal Factor	• AS crash at WAD, obstructing or damaging the operating surface • Weather out of limits for Protector landing
Pre-Existing Preventative Controls	• MET Office forecasting • Eng support • Airfield support elements • PCM
Pre-Existing Recovery Barriers	• ARFF • MCO manage media interaction

Consequence	• Protector orbit until WAD RWY is fit for use • Protector unable to land at WAD and terminate IAW ACN • WAD RWY remains unfit and utilise another area inside the TDA to land safely
Worst Credible Consequence	• Protector unable to land at WAD and terminate. 22. WAD RWY unavailable due to incident
Potential Preventative Controls	a. Designate another area to establish a DA b. Protector carry more fuel reserves c. Limit Practice Diversions at WAD d. Ensure equipment readily available at WAD to repair RWY if damaged

Potential Additional Recovery Barriers	e. Create a procedure to utilise Delta taxiway as alternative landing area in emergencies only f. Protector fly to another country where it can operate in another countries FIR to land g. Allow Protector to have a known 'crash site' for when WAD aerodrome isn't available.
Barrier Measures for implementation	• D,E • Operator led discussions for B, C & F

Part 2: BM Hazard Analysis (can be supported by Bow Tie)	
Hazard	***This table is to be reproduced for each hazard when required**. A Hazard is defined as any condition, event or circumstance that could induce an accident (ESARR 4). For instance, 'controllers' are not a hazard in and of themselves because there is no context; however, 'a controller who makes an error in assessing ac separation' is a hazard, with the separation assessment giving the context.*
Undesirable Event	*A stage in the incident sequence where the credible outcome will occur, unless an active recovery measure is available and is successfully used. Thus, continuing the example above, the loss of the ability of the ATM system to maintain separation would be an undesirable event that indicates that pre-existing barriers failed.*
Causal Factor	*A factor which, in isolation or in combination with other causal factors, could result in an undesirable event. Typically, BM related causes tend to occur from within 3 specific areas 'People', 'Procedures/Process' and 'Eqpt'. List all causal factors.*

Pre-Existing Preventative Controls	*A preventative control is something that prevents a cause from leading to an undesirable event, in effect, it reduces the likelihood of the event occurring. List all pre-existing preventative controls and provide comment on their efficacy.*
Pre-Existing Recovery Barriers	*A recovery barrier is something that reduces the severity of an undesirable event. List all pre-existing recovery barriers and provide comment where appropriate on their efficacy.*
Consequence	*Each undesirable event will have a series of credible consequences which range in severity from 'Catastrophic', which has a relatively low likelihood of occurrence, to 'Negligible', which has a higher likelihood of occurrence. List the credible consequences of each undesirable event.*
Worst Credible Consequence	*State the worst credible consequence and provide a justification for its choice. The rationale should be based on existing quantitative evidence where appropriate and/or available, explaining the incident sequence and which pre-existing barriers and mitigations were breached.*
Potential Preventative Controls	*When considering mitigation strategies, nothing should be discounted, especially if it initially appears too difficult or too costly to introduce. Costly or difficult to implement strategies should be part of the decision-making process at higher levels. List all potential preventative controls, adding more rows as required.*
Potential Additional Recovery Barriers	*When considering mitigation strategies, nothing should be discounted, especially if it initially appears too difficult or too costly to introduce. Costly or difficult to implement strategies should be part of the decision-making process at higher levels. List all potential additional recovery barriers, adding more rows as required.*
Barrier Measures for implementation	*Not all preventative controls and recovery barriers will be feasible; list those that are to be implemented to control the hazard, for example, a, b and e. A rationale for the selection should be included.*

Part 3: Action Plan				
Ser No	**Actions Required**	**Action Lead**	**Due Date**	**Date Completed**
1	Review Current LoA's	DSATCO	Mar 23	
2	Create Protector Aircrew brief	LEMSCO	Sep 23	
3	Create ATC brief on Protector operations	LEMSCO	Sep 23	
4	Create ATC order for RPAS Start/Taxi LNAA	UStanO	Mar 23	

	RPAS ATLC H/O to Radar			
5	Create Protector brief for all Sqns at WAD informing them of hazards and actions on certain events	BM Cap Dev	Sep 23	
6	Create Protector brief to send to sections of all regular AAP holders	UStanO	Sep 23	
7	Create orders for utilising Delta as a secondary landing area	BMFSO	Aug 23	

PART 4: Key Stakeholders Comments - WAD Aerodrome Operator			
Name/Appt		**Date**	

PART 4: Key Stakeholders Comments – WAD HoE			
Name/Appt		**Date**	

PART 4: Key Stakeholders Comments - ISTAR Fce DDH			
Name/Appt		**Date**	

PART 4: Key Stakeholders Comments – CON DDH			
Name/Appt		**Date**	

PART 4: Key Stakeholders Comments – RAFAT DDH			
Name/Appt		**Date**	

PART 4: Key Stakeholders Comments – 3 FTS DDH

Name/Appt		Date	
PART 4: Key Stakeholders Comments – 6 FTS DDH			
Name/Appt		**Date**	

Part 5: BM Unit Cdr Comments			
Name/Appt		**Date**	

Part 6: Force HQ Comments (only required for an assessment of change)			
Name/Appt		**Date**	

Part 7: Hazard Owner Statement			
Name/Appt		**Date**	

Part 8: Review (for change only)			
Name/Appt		**Date**	

Part 9: Closure			
Name/Appt		**Date**	

Annex B – Ref K

03 March 2023

File reference: 20230303-2Gp BM SAofC-02_23-Protector Operations-DRAFT

2Gp BM SAofC 02/23 – Protector Operations

Introduction

1. Protector operations are expected to commence from RAF Waddington in Q3 2023, subject to joint CAA and MAA approval of the Protector Airspace Change Proposal (ACP). In support of the ACP, 2 Gp BM are required to assess the unique Air Traffic Service (ATS) requirements of Protector when compared to conventional air systems. Where necessary procedure development is then required to facilitate Protector operations throughout both IOC and FOC.

Background

2. In Mar 22 the MAA released an initial Airspace Integration Position Paper that informed the development of the Protector Programme. Whilst providing guidance on attainment of a Military Type Certificate the paper also provided direction regarding the ATS provision and airspace requirements for Protector operations.

3. Whilst Flight in Non-Segregated Airspace (FINAS) is a key requirement of Protector FOC, the MAA require assurance regarding the capabilities of Protector's Detect and Avoid (DAA) capability. At the current IOC stage this 'level' of AI has not been assessed as suitable for FINAS, resulting in IOC operations being restricted to segregated or controlled airspace. In addition to the airspace restriction there is also a requirement for separation assurance through an ATS that ensures deconfliction from other air systems.

4. The Danger Area (DA) proposed within the ACP and outlined at Annex A is fundamental to IOC Protector operations because of the restriction on FINAS. The DA provides segregated airspace to facilitate the transit of Protector between RAF Waddington and controlled airspace above FL195. Whilst the low-level airspace element will also be utilised for RAFAT operations the medium-level airspace is solely for Protector operations.

Assessment Model

5. The assessment process consists of an overarching 2 Gp BM Safety Assessment (SA) that considers the ATS requirements across the BM AOR. This is then supported by individual unit level SAs / SQEP panels that consider the impact to unit level procedures and agreements. Whilst the unit level assessments focus on the requirements for each ATS provider independently the overarching BM SA assesses ATS provision to Protector in terms of each operating stage. Linked below are the individual unit level SAs / SQEP panels. The hazards and proposed mitigations from these are then collated within the Combined BM Hazard Analysis at Annex B.

a. Waddington ATC SAofC 01/23 – Protector Operations
b. Lincs TATCC SQEP Panel – Protector Operations

c. 78 Sqn CTA Transit Profile Discussion

Hazard Identification

6. **Stage 1 – DA Establishment and Management.** Waddington Stn Ops will be responsible for DA establishment via MAMC on a D-1 basis, with notification to the aviation community through NOTAM. Due to the temporary nature of the DA there is a hazard that both military and civil aircrew will be unaware of the Waddington DA in the same way they would be aware of permanent airspace restrictions. **(Haz 1a)**.

7. Whilst the DA's purpose is to facilitate Protector operations, along with RAFAT training, there will be periods of time where the DA is officially active but not in use by either Protector of RAFAT. To allow flexible use of the airspace during these periods a DACS will be offered, however with multiple ATS agencies involved there is potential for confusion in DA ownership between the ATS agencies. **(Haz 1b)**.

8. **Stage 2 – Ground Operations.** The Protector ground operation consists of a Ground crew managed start followed by a Flight crew managed taxi. Whilst Fight crew can communicate with ATC via radio, Ground crew cannot and therefore require start-up approval to be passed via MRE. This presents an alternative process to conventional AS ground operations as MRE is routinely manage by ASOS pers and not ATCOs. **(Haz 1c)**.

9. **Stage 3 – Visual Circuit Operations.** In line with the MAA's direction, regarding the requirement for an ATS that ensures deconfliction, Protector will require a sterilised visual circuit during take-off and landing phases. Whilst the DA will provide an element of airspace protection, the airspace is also an active airfield supporting other activities. The possibility of interaction between Protector during take-off / landing and another AS within the Waddington visual circuit therefore presents a hazard **(Haz 3a)**.

10. **Stage 4 – DA Operations.** Whilst the DA will be established entirely within Class G airspace, the MAA's requirement for an ATS that ensures deconfliction restricts the ATS options to Deconfliction Service (DS) only. Unlike conventional AS that ATCOs are familiar with the performance characteristics of Protector will require additional consideration when providing a DS. ATCOs will be required to issue avoiding actions instructions at a greater range than usual to ensure separation standards are achieved. The change in mindset and AS appreciation that is required by ATCOs therefore presents a hazard **(Haz 4a)**.

11. Due to its location and surrounding controlled airspace there is a significant level of both civil and military traffic ivo the DA airspace. Whilst the provision of DS is achievable, the requirement for ATCOs to maintain standard separation of 5nm and 3000ft between Protector and all non-coordinated traffic will present a significant impact on Protector's freedom to manoeuvre through multiple avoiding action (AA) instructions. When combined with the requirement for Protector to remain within the DA structure this further restricts the ability to manoeuvre potentially to point that prevents operations **(Haz 4b)**. There is currently no regulation or standing practice regarding the provision of DS within a DA. To address the balance between DS provision and operating freedom, a range of ATS provision options are outlined at Annex C.

12. Whilst acknowledging that the DA provides airspace protection, the potential for an unauthorised airspace infringement will always remain. Should this occur and ATCOs are required to provide AA there is a hazard that Protector may exit the DA structure whilst

13. following the AA **(Haz 4c).** ATCO responsibilities in the event of exiting the DA are included within the ATS provision options at Annex C**.**

14. **Stage 5 – Controlled Airspace (CAS) Operations.** Whilst the DA structure will provide Protector with a means of transiting into CAS, upon initial exit from the DA Protector will enter a Temporary Reserved Area (TRA)[12]. The TRA exists between FL195 and FL245 and whilst classified as Class C, ATS provision is iaw UK Flight Information Services (FIS). With TRAs enabling military aircraft to enter and operate autonomously within them, whilst a DS is achievable the airspace doesn't prevent non-cooperative traffic from interacting with Protector **(Haz 5a)**.

15. Protector is expected to conduct IOC operations within the D323, D513 and D613 MDA structures. To access these there is therefore a requirement to cross both the Wash CTA and North Sea CTA. Recognising the performance characteristics expected of Protector dynamic crossings of CTAs will present a significant challenge for Civil sector ATCOs **(Haz 5b)**.

16. **Stage 6 – Managed Danger Area (MDA) Operations.** Whilst operating within the MDA structure, Protector will retain a DS iaw MAA direction and BM orders[13]. Operations with co-operating traffic also in receipt of an ATS / Tactical Control will be deconflicted. However, for co-operating traffic operating autonomously there will be no clear deconfliction process available **(Haz 6a)**.

17. **Stage 7 – Lost Link Procedure.** In the event of a lost link, Protector will initially display the mode 3A code of 7400 before then continuing iaw the last clearance. This expected behaviour will both inform relevant ATS agencies whilst also providing a predictable initial response. On completion of the last clearance i.e., reaching the waypoint, Protector is expected to establish an orbit for a period of time before then recovering along the reciprocal route. Although these procedures still require confirmation as part of the operating manual, all activities during individual lost link profiles will be subject to authorisation from the relevant ATS agencies. With the unknown nature of both Protector and specifically Lost Link procedures there is a potential that both ATCOs, both mil and civ, will make inaccurate presumptions regarding Protectors Lost Link profile (**Haz 7a**).

18. **Stage 8 – Diversion Procedure.** At present due to the unique operating characteristics of Protector there are no authorised diversion aerodromes. There is an expectation that Leuchars will become the routine diversion however to achieve this a separate ACP will be required to establish segregated airspace iaw the IOC limitations of Protector. To support this ACP a SAofC will be conducted specific to Leuchars, identifying any specific hazards.

[redacted]

SO2 BM Safety A5

Annexes:

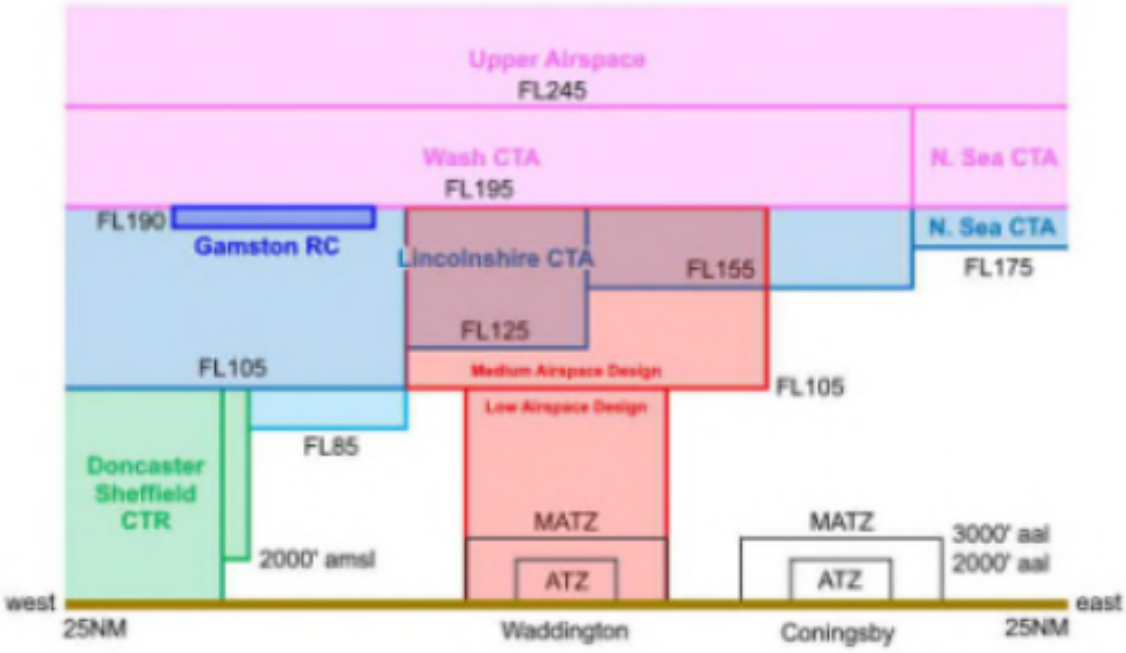
A. Combined Low and Medium Level Airspace Designs.
B. Combined BM Hazard Analysis.

[12] UK Civ AIP ENR 5.1.5
[13] BM Orders 128

C. ATS Provision Options.

Annex A to
File reference 20230303-2Gp BM SAofC-02_23-Protector Operations-DRAFT
03 March 2023

Combined Low and Medium Level Airspace Designs



Low-Level Airspace

5nm radius circle centred on RAF Waddington's aerodrome reference point (ARP).

Surface to FL105.

Intended for use by both RAFAT and Protector.

Medium-Level Airspace

18 x 13nm rectangle aligned to and abutting the southern edge of the Lincs CTA.

FL105 to FL195.

Intended for use by Protector only, enabling transit in/out of controlled airspace.

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Combined BM Hazard Analysis

Black: BM AOR wide hazards **Red**: Waddington specific **Blue**: Lincs TATCC specific **Green**: 78 Sqn specific

Hazard	Undesirable event & causal factor	Consequence *(Worse credible in **bold**)*	Mitigations
Stage 1) Danger Area Establishment & Management			
1a) Non-awareness of DA by military / civil aircrew.	Unauthorised airspace infringement of the Waddington DA, through non-awareness.	**Airprox** Loss of Safe Separation Avoiding Action	AS in receipt of an ATS from Lincs TATCC will be reminded of the DA status dependent on the transit routing. Protector will be in receipt of a DS throughout, enabling monitoring of the DA and provision of Avoiding Action as required. Education of the local aviation community through Regional Airspace User Working Groups to increase DA awareness.
1b) Confusion in DA ownership between ATS	DACS provided by an ATS agency whilst not the DA airspace owner.	**Loss of Safe Separation**	Establishment of clear DA Airspace ownership procedures between the multiple ATS agencies.

agencies when providing a DACS.		Avoiding Action Restriction of Waddington Circuit activity	
Stage 2) Ground Operations			
2a) Start Clearance passed through MRE to ASOS rather than ATCO.	ASOS unaware of Protector start operation and fails to follow the correct procedure.	**Protector authorised for start without the required airfield support**	Protector start-up procedure to be clearly outlined in Waddington Local Order with both ASOS and ATCOs trained accordingly.
		Protector start delayed	
2b) Restricted operator view during taxi	Ground collision due to both ATC line of sight restricted and restricted operator view	**Ground collision**	Review of and amendment to Airfield Access orders that ensures suitability and awareness of Protector taxi routes for all airfield users.
		Ground near miss	

Hazard	Undesirable event & causal factor	Consequence *(Worse credible in **bold**)*	Mitigations
Stage 3) Visual Circuit Operations			
3a) Interaction between Protector and AS during take-off and landing phases.	Protector is authorised to commence the take-off / landing phases whilst the ATZ/MATZ is active with either cooperative or non-cooperative AS.	**Loss of Safe Separation**	Establishment of clear visual circuit sterilisation procedures at RAF Waddington, that are instigated by Waddington ATC prior to authorising Protector to commence take-off/landing phases.
		Avoiding Action	
		Cancellation of take-off/landing approval.	Call for Release requirement introduced on all Protector take-off authorisations to ensure sterilisation of the DA, ATZ & MATZ.
Stage 4) Danger Area (DA) Operations			

4a) Appreciation of Protector performance characteristics.	ATCOs fail to appreciate the unique performance characteristics when providing an ATS.	**Loss of Safe Separation** Late Avoiding Action **Cancellation of sortie**	Creation of synthetic packages for ATCOs, that provide awareness of Protectors performance characteristics and what level of anticipation is required to provide a DS.
4b) Provision of DS within a high traffic area.	Protector's freedom to manoeuvre is significantly restricted due to the standard separation requirements of DS.	Elements of sortie not completed	To address the balance between DS provision and freedom to manoeuvre a range of ATS provision options are outlined at Annex C.
4c) Protector exits the DA.	Protector exits the DA whilst following an AA.	**Operation in Class G without MAA approval**	
4d) Local Airspace Users	Interaction between Protector and a Local Airspace user, previously authorised to operate within the DA.	**Airprox** Loss of Safe Separation	Review and amendment of LoAs between Lincs TATCC / Waddington and Local Airspace users to ensure awareness of Protector operations and DA restrictions.
4e) Handover between Lincs TATCC and 78 Sqn	Handover conducted without associated control of airspace, reducing airspace protection.	**Loss of Safe Separation** DA Infringement	Establishment of a clear LOA between Lincs TATCC and 78 Sqn that addresses AS handover alongside airspace authority transfer.
4f) Adjacent unit departure and approach profiles	DA infringement due to an adjacent unit departure / recovery profile.	**Loss of Safe Separation** DA Infringement	Amendment of the CWL MID1C departure and CON RW07 Ext feed to ensure DA deconfliction.

Hazard	Undesirable event & causal factor	Consequence *(Worse credible in **bold**)*	Mitigations
Stage 5) Controlled Airspace (CAS) Operations			
5a) Autonomous operations within the TRA.	Interaction between Protector and non-cooperative autonomous AS operating within the TRA.	**Airprox** Loss of Safe Separation	Removal of the ability for military AS to enter and operate autonomously within the TRA structure.
5b) Dynamic crossing of CTAs.	Dynamic CTA crossing of Protector results in Civil sector ATCOs having to delay / amend GAT routings.	**Avoiding Action** Defensive control instruction Delay to GAT routing	Restriction on dynamic crossing for Protector. All CTA crossings to be conducted iaw an electronic / verbal Cleared Flight Paths utilising designated crossing routes agreed with relevant civil sectors.
Stage 6) Managed Danger Area (MDA) Operations			
6a) Operations with co-operating autonomous traffic.	No active deconfliction because of traffic not being in receipt of an ATS / Tactical control.	**Airprox** Loss of Safe Separation	For operations with autonomous but co-operating traffic airspace segregation should be formally established as part of the MAMC airspace allocation plan.
Stage 7) Lost Link Procedure			
7a) Incorrect presumptions of Lost Link profile.	Mil / Civ ATCO incorrectly presume the Lost Link profile of Protector, through a lack of awareness.	**Loss of Safe Separation** Incorrect avoiding action Incorrect defensive control	Creation of a BM order that advises military ATCOs regarding the Lost Link profile of Protector and what to expect. This would then be included in the NATS / Mil LOA to ensure civil ATCO awareness.
Stage 8) Diversion Procedure			

8a) Lack of diversion with unavailability of Waddington runway.	Protector has no diversion aerodrome and Waddington runway is declared black.	**Loss of Protector AS**	Development of emergency procedures at Waddington that enable taxiway Delta to be utilised for landing.

Annex C to
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ATS Provision Proposal

Background

1. **Separation Standards.** Under a DS iaw CAP 774[1], ATCOs are required to ensure deconfliction minima against uncoordinated traffic of 5NM laterally or 3000ft vertically. RA 3228[2] then enables military ATCOs to apply reduced separation of 3NM laterally or 500ft vertically, providing a range of requirements are met. The application of reduced vertical separation to civil AS should be exceptional rather than routine, and there is standing practice of ensuring 1000ft vertical separation between manned and unmanned AS. Therefore, reduced vertical separation will not be applied to Protector during the IOC phase.

2. The separation standards outlined above are based upon interactions between AS operating in airspace of the same classification. When operating within CAS, RA 3238[3] enables ATCOs to deem separation to exist between the AS under control and AS operating outside of CAS subject to a range of criteria. However, when operating with DAs there is no equivalent regulation regarding deeming conventions.

3. Most traffic transiting ivo Waddington will request an ATS from Waddington LARS. Whilst military traffic is generally mandated to be in receipt of a TS / DS which requires identification, civil traffic will routinely only request a BS and therefore there is no requirement for identification. Without identification of traffic, ATCOs are unable to apply reduced separation through standing agreement co-ordination and subsequently need to either ensure standard separation or verbally co-ordinate individual AS.

CoA Proposals

4. To address the balance between DS provision iaw above and freedom to manoeuvre for Protector, a range of ATS provision options are outlined below with comparison provided in Appendix 1. Subject to the ACP approval, these will then be presented to the MAA for agreement before presentation to Protector DDH.

5. **CoA 1) Standard DS.** Protector is provided with a standard DS iaw CAP 774 ensuring 5NM and 3000ft separation throughout, irrespective of the airspace protection provided by the DA. With the DA radius being 5NM, for non-cooperating traffic transiting at the DA edge this would result in Protector's operating area being restricted by half until the traffic had passed. Reduced lateral separation of 3NM could be applied against identified traffic in receipt of an ATS however this would require all BS LARS transits to be identified which would increase controller workload at the Lincs TATCC significantly.

6. **CoA 2) DS with Deeming.** Protector is provided with a DS iaw CAP 774 .

[1] CAP 774 - UK Flight Information Services
[2] RA 3228 – Separation Standards
[3] RA 3238 – Controlled Airspace Deeming Conventions

7. **CoA 3) Airspace Deeming.**

Appendix 1 to
Annex C to
File reference 20230303-2Gp BM SAofC-02_23-Protector Operations-DRAFT
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ATS Provision Proposal Comparisons

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